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MISSION STATEMENT

We, the editors and staff at the University of Southern California Journal of Law and Society, are committed to providing a forum for undergraduates to engage their peers and the academic community. By providing this forum, the publication will promote interdisciplinary research, provoke critical thought and exhibit new perspectives on legal issues surrounding the world today. We are an independent journal and every process is created, edited and proofed by the undergraduates who run the publication. Though we may at times run articles on controversial issues, this journal remains nonpartisan and unbiased, and the articles express only the sole intentions of that author.

If you are interested in submitting an article or contributing to the USC Journal of Law and Society, please send an email to uscjls@usc.edu. Thank you!

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FACT ABUSE: THE CULTURAL CONTEXT OF
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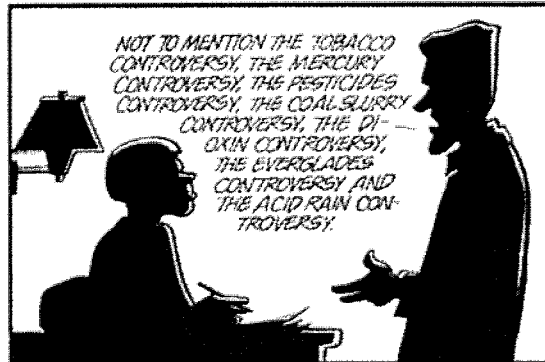
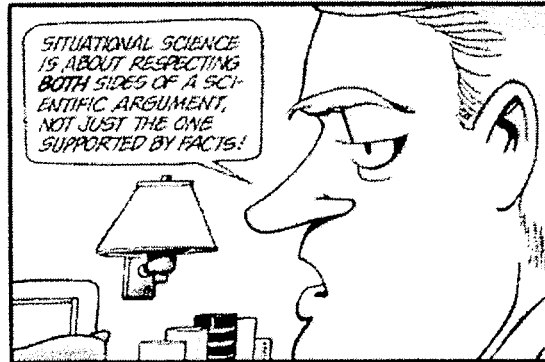
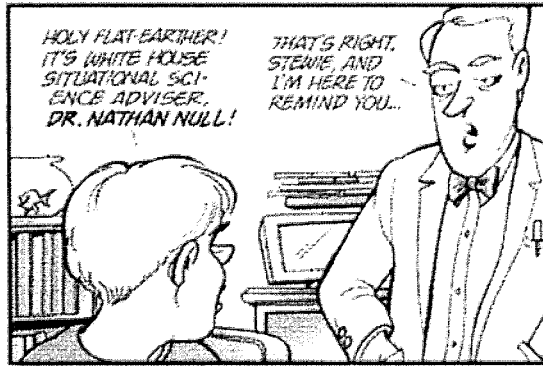
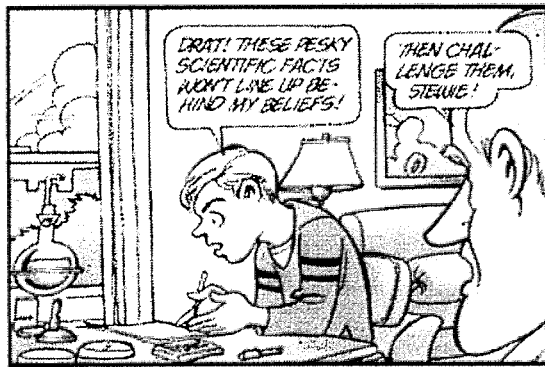
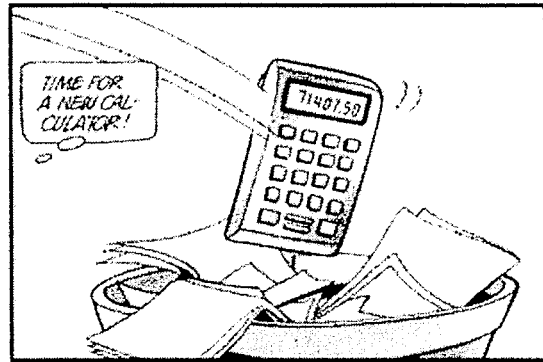
COLIN D. KOPROSKE*

The problem of "scientific integrity" has stimulated a great deal of rancor both in the arena of federal science policy and within academic discourse surrounding the philosophy of science and public policy research. Scientists, politicians, and industry players continually clash on issues requiring scientific input, such as global warming, environmental and health regulation, stem-cell research, reproductive rights, and science education. In the interest of providing context and a broader conceptual framework from which to view the Bush Administration's treatment of science, I address the philosophical underpinnings of anti-scientific attitudes and argue that science is inaccurately and dangerously misinterpreted when viewed as an ideological interest (or as an inherently political practice) rather than a reliable mode of inquiry dependent on consensus. Secondly, I assess instances of political interference with science, focusing on the study of climate change, controversial legislation, and the commercialization of research. Finally, I outline several cultural and institutional changes which are necessary in order to restore "scientific integrity" to the U.S. government.

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(Doonesbury 1/14/07 – Gary Trudeau)

FACT ABUSE: THE CULTURAL CONTEXT OF SCIENCE POLITICIZATION

Synopsis of Argument:

Through scholarship and journalistic investigation, it has been well established that the Bush Administration has been guilty at various points of abusing, neglecting, deriding, misinterpreting, and politicizing science for its own ideological and political ends. Specific examples come from the Administration's treatment of global warming, stem-cell research, public health policies, education policies, environmental policies, and in its explicit support of religious ideology over the secular or empirical in both culture and government practice.

In this thesis, I hope to build upon the existing science policy scholarship in three important ways: First, I wish to establish the abuse of science as a problem in a larger philosophical context, as opposed to a distinctly political view that labels corrupt bureaucrats and right-wing evangelicals as the sole perpetrators of misinformation. By tracing the development of anti-science sentiment in contemporary thought, as well as integrating sociological observations from Richard Hofstadter on cultural anti-intellectualism, I will show that opposition to science and empiricism is far more deeply rooted than many have supposed.

Second, I hope to avoid the idealization of science as a pristine and infallible institution, or even as an institution at all, and to construct a notion of empiricism and rationalism that appeals not only to the minds of researchers and scientists, but to voters and decision-makers as well. Science as a "method of inquiry" rather than a particular ideological interest or aristocratic niche is not only a better sell, but it is also a more accurate portrait of what the scientific community is and strives to be. By better understanding the way scientific knowledge is created and agreed upon, voters and policymakers can more adequately integrate scientific advisors and experts into their political decisions. It is equally important to avoid the trap of overly "democratizing" science, which, while proposed by several science policy scholars and presented under the guise of "leveling the playing field" and making publicly-funded research transparent and socially relevant, can only worsen the polarization and politicization of science by those ill-equipped to determine its direction.

And third, I will attempt to submit practical ideas on how the cultural and political tension between science, religion, and politics might be better reconciled. The process in which scientists interact with public officials has become severely politicized since the "Republican Revolution" of the mid-1990s, and a renewed emphasis on the importance of non-partisan, consensus scientific opinion is desperately needed. Citizens and officials alike, I argue, ought to insist on empirical argument, transparency, and rationality in the arena of public policy. The science advisory process needs restructuring, and the institutions designed to advise the government on science issues need expansion. Emotion, ideological rhetoric, and dramatic flare hold a dear place in the modern political landscape, but practices and institutions which allow for inaccurate information and sensationalism to reign cannot function responsibly.

*USC JOURNAL OF LAW AND SOCIETY***Part I**

INTRODUCTION

Dr. James Zahn was a microbiologist in the employ of the United States Department of Agriculture. While conducting research dealing with hog farms in Missouri and Iowa, Zahn discovered antibiotic-resistant bacteria in the air at significantly high levels. In an effort to further investigate the air pollution issue and its causation, Zahn began gathering data with the encouragement of his superiors, but a significant policy change in 2000 brought new obstacles to the scientist's work. Government and departmental officials began to prevent his work from being published and presented at conferences, and Zahn asserts that he "...was prohibited on at least 11 separate occasions from publicizing his research on the potential hazards to human health posed by airborne bacteria resulting from farm wastes."¹ In February 2002, the USDA issued a directive to all staff scientists to seek institutional approval before speaking or publishing on any "sensitive issues" including "...agricultural practices with negative health and environmental consequences, e.g. global climate change; contamination of water by hazardous materials (nutrients, pesticides, and pathogens); animal feeding operations or crop production practices that negatively impact soil, water, or air quality."²

This is one of many case studies brought to light by scientists working for and with U.S. federal agencies which illustrate institutional suppression of scientific findings – just part of the puzzle of "fact abuse" which has diminished the integrity and reliability of public science policy in the twenty-first century. In addition to creating bureaucratic blockades designed to filter unflattering research out before it reaches the presses, the Bush Administration has stacked agencies and committees, originally intended to provide objective scientific advice, environmental protection, and public health recommendations, with ideologues who lack both the expertise and the nonpartisan impartiality required to do their jobs effectively. Leon Kass, appointed to chair the President's Council on Bioethics, is a morally-motivated conservative who has gone on record as decrying cadaver research and dissection, calling abortion "feticide," and justifying his stances with a notion he calls "the wisdom of repugnance," a theory which draws its ethics from emotional recoil rather than dispassionate intellect. Kass admits, speaking on the issue of cloning, that his ethical conclusion "...is finally one of those instances about which the heart has its reasons that reason cannot entirely know."³ While the University of Chicago bioethicist must give comfort to President Bush and much of his base with such comments, he can hardly be said to be fit for a job in which ethical and scientific arguments must work together in a constructive way. By framing important issues in which scientific data plays a central role with emotional and even spiritual rhetoric, many officials in the Bush Administration have made significant headway in politicizing science and removing impartial oversight from the policymaking process.

Many of these appointees and bureaucratic officials, ideologically charged as they are, have moved past mere contrarian philosophy into abusive praxis, editing and manipulating reports, data, and recommendations to comport with the stated administrative agenda. More often than not, this favors industry and discourages the kind of governmental regulation often called for by scientists and

¹ This account is taken from "Scientific Integrity in Policymaking: An Investigation into the Bush Administration's Misuse of Science". *Union of Concerned Scientists*. March 2004. <ucsusa.org> p. 13

² "Lists of Sensitive Issues for ARS Manuscript Review and Approval by National Program Staff – February 2002 (revised)," USDA, February 2002.

³ Chris Mooney, "Irrationalist in Chief". *The American Prospect*. Princeton: Sep 24-Oct 8, 2001. 12:17, p. 12.

environmentalist interest groups (leftist environmental groups, to be sure, have been guilty at times of misinformation themselves, but the systematic and institutional nature of administration science abuse has

FACT ABUSE: THE CULTURAL CONTEXT OF SCIENCE POLITICIZATION

been far more significant in scope).⁴ In 2007, Bush appointee Julie MacDonald, Deputy Assistant Secretary in the U.S. Department of the Interior and engineer with no biology training, edited scientific reports on endangered species to prevent several species from receiving federal protection and ordered the Fish and Wildlife Service (FWS) to adopt her changes.⁵ According to the Union of Concerned Scientists, a group in the front line of defense in what journalist Chris Mooney calls “The Republican War on Science,” a FWS survey indicated that 84 percent of its scientists “reported having been directed to inappropriately exclude or alter technical information from FWS scientific documents.”⁶ This kind of interference from bureaucrats is deleterious to integrity of the scientific advisory process. It also discourages researchers, who must face the reality that their findings may be cherry picked or discarded altogether for political purposes.

Bureaucratic abuses might be interpreted as singular, unrelated events or as products of individual lapses in judgment; but the danger to science has played out on a grander, more public scale as well. Governmental officials and “culture warriors” in the media have attacked science, arguing that its practitioners are as ideologically motivated as any special interest, and thus are deserving of no more respect and of equal suspicion as any other lobby. Further, many have engaged in what John Tirman, Director of MIT’s International Studies Program, calls “know-noting disassembling,” by exercising unfounded skepticism and creating controversy and ambiguity where there is little to be found.⁷ This brand of skepticism was perfected by the tobacco lobby, now famous for “manufacturing uncertainty”; big tobacco has consistently fought unfavorable scientific studies linking their products to negative health consequences and addiction by disparaging the science behind the findings as unsubstantiated, while paying thousands to experts willing to vouch for their cause.⁸ A 1998 study published in the *Journal of the American Medical Association* found that the odds of a scholarly article about second-hand smoke reaching a “not harmful” conclusion were 88.4 percent higher if its authors had tobacco industry affiliations.⁹

Creating controversy in the public and among policymakers where none exists in scientific literature is a tremendously effective way of lessening the impact of unfavorable data (when it cannot be suppressed or altered prior to publishing), and industry, cultural, and political forces alike have become adept and this art of “manufacturing uncertainty.” Conservatives have coined the phrase “sound science” to signify an outlook which places emphasis on uncertainty and frugal risk-assessment in determining federal science policy; ironically, this outlook has nothing to do with the practice of science itself, as its name suggests. Rather, it is a preference for skepticism when science suggests that federal action might be necessary, in

⁴ For more on the abuses of the left in politicizing science in both the academy and politics, see Part III.

⁵ “Systematic Interference with Science at Interior Department Exposed”. Union of Concerned Scientists. Oct. 30, 2006. <http://www.ucsusa.org/scientific_integrity/interference/endangered-species-act-interference.html>

⁶ Ibid.

⁷ John Tirman, *100 Ways America is Screwing Up the World*. New York: HarperCollins, 2006. p. 120.

⁸ “Documents released as a result of litigation in the state of Minnesota show that Big Tobacco paid a group of scientists thousands of dollars each to write letters to scientific journals ... disputing the findings of a 1992 Environmental Protection Agency report linking secondhand smoke to lung cancer.” Chris Mooney, *The Republican War on Science*. Basic Books, 2005. p. 22.

⁹ Chris Mooney, *The Republican War on Science*. Basic Books, 2005. p. 10.

opposition to a more precautionary political stance. So instead of recognizing this tactic as an exclusively political measure, the “sound science” advocates have cleverly criticized the science itself.¹⁰

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These efforts at delegitimizing scientific research have resulted in increased incredulity regarding claims dealing with issues from climate change to pesticide bans. Perhaps the most egregious and well-known example of the “scientific uncertainty” tactic is the Intelligent Design movement, which will be discussed in Part II.

The evidence shows that serious abuse of scientific fact has been committed and many of the culprits have been caught red-handed in either altering information to their liking or disregarding it altogether. Journalists such as Chris Mooney, Seth Shulman, Esther Kaplan and Michelle Goldberg have documented these controversies as well as numerous academics and organizations (such as the Union of Concerned Scientists and the National Academy of Sciences) have echoed most of their indictments. Peaceful accord can no longer be assumed in the relationship between science and civil society; to be sure, as *Research! America* president Mary Woolley writes, “Countless pro- and antisience interests are now at work galvanizing citizen attention to the way priorities are set for the expenditure of tax dollars.”¹¹ Part III of this thesis will provide additional case studies of abuse and examine more closely the players involved in interactions between politics and science, as well as the institutional dynamics which have evolved toward a regulatory culture over the past few decades.

Before any serious conclusions can be drawn from recent experience in science policy, a firm foundation of theory in the relationship between science and politics is needed. Part II of this thesis will trace the development of scientific theory with respect to political interaction and engage with several different conceptions of both the legitimacy of science as a method for obtaining objective information and as a functional toolset for policymakers. I will address the differences between science and technology, as well as the oft-debated line between knowledge and political action that is imperative in navigating theories dealing with science in policymaking.

Uncertainty is also an important notion in the philosophy of science, and in many ways it has come to the forefront in the way sociologists and historians of science address the scientific establishment. The idea that science owns a privileged space in the realm of ‘truth’ is a polemical debate in the social sciences and humanities, and the assertion that public policy is and can be based upon hard facts is described as naïve and presumptive by some.¹² Reconciliation of opposing sides in this argument is critical to moving forward in science policy; as long as scientists and non-scientists differ greatly on the nature of certainty, it will be difficult for organizations assigned with ensuring effective scientific research to function within the policymaking process. When the research side of the science policy equation incessantly complains of political interference and yet the political and sociological sides continually call for increased oversight over research, there is a serious problem with regard to philosophy.

In locating accountability for the failure of scientific integrity in government, I intend to address the threats to science advisory in broader American culture. In Part II, I will advance the argument that the impending demise of science, along with the Enlightenment notions of reason and empiricism, in the

¹⁰ *Ibid*, p. 74.

¹¹ Mary Woolley, “Populism and Scientific Decision Making.” *Science Communication* 20.1 (1998) p. 53.

¹² Funtowicz and Ravetz in *Uncertainty and Quality for Science in Policy* (1990) note that “Politics can no longer be assumed to be based on scientific information that is endowed with a high degree of certainty” (p. 1) and lament the fact that “[t]he faith in ‘hard facts’ still persists, among publics, decision-makers and experts alike.” (p. 2)

public sphere has as much to do with anti-intellectual and populist trends in the American psyche as it does with the decisions of George W. Bush. Drawing upon the astute observations of historian Richard Hofstadter as well as the work of contemporary scholars on the subject of anti-intellectualism, I will show that a resistance to intellect and suspicion of scholars and experts imbedded in U.S. culture has “set the stage” for institutional abuses of science to take place.

FACT ABUSE: THE CULTURAL CONTEXT OF SCIENCE POLITICIZATION

A thorough look at the sources of anti-science attitudes in the American public must take into account (1) scientific and technological tragedies from the advent of the atomic bomb to Chernobyl and Challenger¹³, and (2) the natural consequences of increased reliance upon and awareness of science in the public square, which can only lead to the intermingling of political ideology with the scientific enterprise¹⁴. However, I argue that the unique sense of populist egalitarianism that is part of America’s heritage¹⁵ leads to anti-elitist and anti-academic tendencies, which have proven harmful in the arena of science policy.

Americans are not wholly un-scientific or opposed to notions of scientific progress. The vast majority of us fully embrace the technological developments of science, from cell phones and DVD players to pace-makers and MRIs. It is when the science challenges our politics or our faith that opposition to empiricism begins to take hold. When science is utilized by the forces of industry to improve the human condition, increase mankind’s “dominion over nature,” etc, even the most ardent of religious conservatives fall in line; however, when scientists insist on environmental regulations, lobby for animal protection, or call conventional wisdom or religious mythology into question, the battle begins. Thus, few have a real problem with science as a reliable method for acquiring information about our world or for developing new technologies. The issues truly at stake are *money* and *morality*. Part III will show that an overwhelming majority of case studies involving the abuse of science have either industry pressure (*money*) or personal ideology (*morality*) at their heart.

Certainly, as I discuss in Part II, science cannot play the role of policymaker in governance; industry and ideology have their role in determining the direction of research, and the direction of the state for that matter. As Sheila Jasanoff observed in her 1990 book, *The Fifth Branch: Science Advisors as Policymakers*, the trade-off between risks to public health or the environment and the cost of preventative measures or regulation is a recipe for public mistrust and political conflict. Because neither risk assessment or preventative policy are exact sciences, politics and ideology often emerge as the deciding factors in creating science policy, and thus many become disillusioned by the notion of ‘facts’ informing federal action.¹⁶ Science must be viewed as a consistent method of obtaining accurate information, and policymakers must work to translate this information into action that makes moral and practical sense. It is when money and morality wear the mask of science, and when the process thought to be dispassionate and reliable becomes influenced by the ebb and flow of ideology, that we approach a crisis in scientific advisory in this country.

The political marriage of free market conservatism with religious fundamentalism forged in the 1980s under the Republican resurgence of Ronald Reagan allows a perfect vantage point from which to view the nexus of opposition to science – industry executives have a strong interest in sustaining the ability to call scientific oversight into question and in using their financial wherewithal to shape the modern academic

¹³ Chernobyl, the site of the 1986 nuclear disaster that created anti-nuclear sentiment for decades, and the failure of the space shuttle Challenger in the same year created a significant shift in attitudes toward the correlation of science and progress as well as the worthiness of science as a wise destination for tax dollars.

¹⁴ David H. Guston and Kenneth Keniston, (Ed.) *The Fragile Contract: University Science and the Federal Government*. Massachusetts Institute of Technology, 1994. p. 24.

¹⁵ See Richard Hofstadter, *Anti-Intellectualism in American Life*. New York: Vintage Books, 1963.

¹⁶ Sheila Jasanoff, *The Fifth Branch: Science Advisors as Policymakers*. Harvard University Press, 1990. p. 3.

landscape, and religious conservatives have sought refuge against the assault of cold-hearted empiricism that has formed the bulk of its opposition for centuries. The power of the market in the United States, while hailed as a panacea for most economic and technological problems, is often at odds with the interests of science – especially when it comes to open-ended research aimed at increasing understanding rather than profits.

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When the monetary pressure of commodification joins with moral or ideological opposition to academic science, it is all but impossible for researchers to do their jobs well. Scientists in all fields have encountered ideological difficulty, not only from the Bush Administration's faith-friendly policies and rhetoric, but in the continuing postmodern development of social sciences and humanities in higher education.

The subject of postmodernism and radical skepticism in academia brings us to the second important argument of this thesis (which will be dealt with in detail in Part II), and that is the notion that while not nearly as pernicious as the conservative evangelical movement in opposing scientific information, the liberal academe in American higher education has created a relativist backdrop from which institutional abuse of science and decreasing respect for academic elites is accepted. As Paul Gross and Norman Levitt argue in their controversial book, *Higher Superstition: The Academic Left and Its Quarrels with Science*, the academy has shifted significantly leftward since the 1960s and in many places adopted the "constructivist" view that science is inherently politicized, that its use is often more harmful than helpful, and that its capacity as a method of "truth-seeking" is far more limited than most practicing scientists seem to think. In a world where ethics, values, and even truth claims are simply subjective socially constructed interpretations, the power of scientific inquiry to usher in consensus on issues ranging from public health to global climate change is severely limited.

Further, the characterization of the scientific community as embattled and innately prone to human bias makes it difficult to establish an argument for public science funding, objective scientific advisory, and for widespread support of empiricism writ large. I will concede that the relativistic academic movements in question have done a tremendous amount of good in the pursuit of knowledge, in opening an otherwise rigid lens of Western philosophical and empirical thought to critique from all sides and questioning the stubborn notions of certainty and scientism that often plague the research community and lead its subjects down dead-end paths. Scholars specializing in the social study of science and science policy, such as David Guston of Arizona State University and Sheila Jasanoff at Harvard's Kennedy School of Government have taken for granted that science is not value-free, and insist on increased transparency, regulatory power, and productivity assurance in federally-funded research ventures.

Many scientists are frightened by these encroachments on the historically privileged status of scientific work and call for a renewal of confidence in the capacity of a meritocratic scientific community to self-regulate and create reliable information; Lewis Wolpert, a biologist at University College, London, goes as far as to claim that the skepticism shown from philosophers of science "has no relevance ... and can be ignored."¹⁷ Clearly, there lies a philosophical gap to be bridged between the observers of science policy who call for greater public control over the scientific enterprise and scientists who feel that their intellectual freedom and integrity is being compromised by external forces. In order to move forward in this debate, radical skepticism from the left must be curtailed, and public respect for both the ability and importance of scientists to our progress writ large must be revitalized. To advance the argument, as many scholars do, that scientific inquiry is just one method among many for reaching conclusions about the

¹⁷ Lewis Wolpert, *The Unnatural Nature of Science*. Cambridge: Harvard University Press, 1992. p xiii.

world, no better than, say, revelation or cultural tradition, opens the door to deconstructive epistemological relativism, and should be avoided.

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The final portion of my thesis, Part IV, will be devoted to finding a new path in science policy and the relationship between science and society. I will further an argument for empiricism as a cultural value and as an institutional practice, in the interest of countering the aforementioned threats of misinformation, political framing, Christian evangelicalism, radical populism, and postmodernism. A renewed commitment to science as a method for reaching better conclusions, rather than as an elite special interest of isolated, arrogant intellectuals, is necessary to assuage the public's perception of scientists and also to hold scientists themselves accountable for their data and recommendations. Accepting the arguments (from Steve Fuller and others) that science is inherently flawed and thus ought to include anything and everything under its wings while giving up its special place in epistemology will only result in further politicization, and the scientific community may, as some have even suggested, divide into ideological camps – confirming the radical left's thesis that scientific knowledge is nothing more than inappropriately accepted ideology made into "fact."

On a more pragmatic level, I recommend, as many have, the reinvigoration of the Office of Science and Technology Policy, in order to achieve a similar stature in science advisory as discontinued Office of Technology Assessment, the scientific advisory agency which provided objective research and policy proposals for leaders but was ended abruptly by Newt Gingrich's Congress as part of a budget overhaul and ideological purge.¹⁸ Additionally, I believe that streamlined, transparent, and depoliticized mechanisms for scientific advisory and oversight ought to be established to divorce research from the rhetoric and savvy framing of bureaucratic officials, politicians, and industry staffers. Congress and constituents must insist on a reevaluation of advisory appointment philosophy; the Bush Administration has been painfully consistent in creating ideologically homogeneous advisory panels, making it difficult for dissent to emerge from the numerous agencies and committees in Washington.

Finally, we must ensure that the future of science in the US is not inexorably tied to mere economic competition, commercial utility, or applicability to national defense. While the rise of China, India, and other industrialized competitors may incite increases in funding for research and a renewed emphasis on math and science in education (similar to the Eisenhower response to Sputnik in the 1950's), a future in which the creativity of young scientists is aimed only at a new "space race" of economic or military parameters is bleak. Ensuring that responsibility remains paramount in both the funding and practice of research and that the preceding recommendations are considered will aid in turning the current tide of distrust between the scientific community and government. It is my belief that such renewed effort would go a long way in creating a pro-science consensus among policymakers and their constituents, which, if embraced carefully and thoughtfully, can only lead to a more rational political arena.

¹⁸ Bruce Bimber, The Politics of Expertise in Congress: The Rise and Fall of the Office of Technology Assessment. Albany: State University of New York Press, 1996.

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Part II

PHILOSOPHY IN SCIENCE AND POLITICS

“Even the deductive form of science mirrors hierarchy and compulsion ... The impartiality of scientific language deprived what was powerless of the strength to make itself heard and merely provided the existing order with a neutral sign for itself.”

Theodor Adorno

“Modern science... abolishes as mere fiction the innermost foundations of our natural world: it kills God and takes his place on the vacant throne so henceforth it would be science that would hold the order of being in its hand as its sole legitimate guardian and so be the legitimate arbiter of all relevant truth... People thought they could explain and conquer nature - yet the outcome is that they destroyed it and disinherited themselves from it.”

Vaclav Havel

The quotes above, the first from one of the Frankfurt School’s most ardent critics of modernity¹⁹ and the second from the Czech Republic’s first president²⁰, illustrate the notion of ‘science as totalitarianism’ – a theme not uncommon in twentieth century social science and philosophy. Further reading reveals that neither man is entirely against science; both acknowledge its validity as a method for comprehending, at the very least, the particulars of the universe. Adorno noted that “reason is the organ of calculation, of planning,” but emphasized that “it is neutral with regard to ends”²¹; Havel observed that “Today, for instance, we may know immeasurably more about the universe than our ancestors did, and yet, it increasingly seems they knew something more essential about it than we do, something that escapes us.”²² In a larger sense, these two have captured what any respectable scientist would gladly acknowledge – that what we choose to do with our lives, our time, and our society operates independently of what we may know about the world from science. More importantly, the two writers go further to protest the rigidity and pervasiveness of scientific thought, which they perceive as depriving humanity of its capacity to *feel* and behave in morally meaningful ways.

Are Havel and Adorno really attacking science? A prudent reader of these seemingly anti-scientific thinkers would note the context in which they are writing – Adorno, a German ex-patriot living in Los Angeles during World War II, and Havel, a Czech dissident who overcame Stalinism and a life filled with government repression and stays in prison.

¹⁹ Theodor Adorno and Max Horkheimer. *Dialectic of Enlightenment*. (1944) Ed. Gunzelin Schmid Noerr, Trans. Edmund Jephcott. Stanford, California: Stanford University Press, 2002. p. 16-17.

²⁰ Quoted by Jim Holt in *The New York Times Sunday Magazine* (12.11.05), 25-28.

²¹ Adorno, p. 69.

²² Vaclav Havel, “The Need for Transcendence in the Postmodern World.” Speech at Independence Hall, Philadelphia, 4 July 1994. <<http://dieoff.org/page38.htm>>

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One might reframe the question at hand with regard to the philosophy of science; instead of “*Is science good?*”, a more appropriate question which can be accurately addressed in these contexts is “*Given the extent of our scientific knowledge, has humanity truly advanced?*” Adorno and Havel clearly respond in the negative. This is a small part of a larger critique of enlightenment philosophy and values which has become somewhat prevalent in academic circles. The central argument against enlightenment and the flourishing of ‘reason’ and ‘rationality’ is that the movement took its own hegemony for granted, becoming as dogmatic as the social creeds that preceded it.

Immanuel Kant, who defined enlightenment as having “the courage to use your own understanding,”²³ went as far as to elevate personal values to the status of ‘*moral facts*’ in the spirit of universal reason. In the spirit of Descartes, Kant believed that the realms of ethics and philosophy were as subordinate to the gaze of rationality as physics and mathematics. In 2007, noted Harvard scientists Edward O. Wilson and Steven Pinker continue along a similar path, refusing to limit scientific thinking only to the area of nature; they posit the usefulness of science in the study of human behavior, limitations, abilities, and even morality. Wilson’s theory of “consilience” asserts the “unity of knowledge,” a notion strongly rooted in enlightenment philosophy which concludes that our complete understanding the universe would be made up of data that falls entirely within the epistemological territory of reason, rather than divided into disparate fields of endeavor and ways of knowing.²⁴ Recent scientific endeavors in neuroscience and cognitive psychology are no less exasperating for moral philosophers. Evolutionary biologist Marc Hauser and primatologist Frans de Wal have both recently written books on the neurological origins of moral and social behavior²⁵, and a study co-authored by the University of Southern California neuroscientist Antonio Damasio suggested the importance of certain brain circuits in forming emotions and ethical decisions.²⁶ While social scientists and philosophers dismiss this research as more examples of science treading “out of its territory,” the trend toward scientific analysis in areas once thought to be the domain of theologians, moralists, ethicists, or perhaps to the subjective whims of individuals is overwhelming.

I raise these questions about the boundaries of scientific inquiry and the nature of human behavior because the way we think about science is central to the role our culture allows it to play in political decision making. I raise such questions also to frame my argument that our uneasiness with respect to scientific progress is a concern bound up in ethical ‘ends’ and the moral direction of humanity, not necessary a concern with the procedure of science itself. As scientific knowledge expands, the portion of our lives and surroundings which remain “mysterious” becomes further and further diminished; this realization, to many, is a cause of concern and often alienation. British biologist Lewis Wolpert is keenly aware of this tension, observing that “...[science] is viewed with a mixture of admiration and fear, hope and despair, seen both as the source of many of the ills of modern industrial society and as the source from which cures for these ills will come.”²⁷

²³ Immanuel Kant, “An Answer to the Question: What is Enlightenment?” Konigsberg in Prussia, 30th September, 1784.

²⁴ Edward O. Wilson, *Consilience*. New York: Alfred A. Knopf, 1998.

²⁵ Nicholas Wade, “Scientist Finds the Beginnings of Morality in Chimp Behavior.” *New York Times* 20 March 2007.

<<http://www.nytimes.com/2007/03/20/science/20moral.html?em&ex=1174708800&en=3aa8caacde344310&ei=5087%0A>>

²⁶ Carl Marziali, “Moral Judgment Fails Without Feelings.” *USC Today* 7 March 2007.

<<http://www.usc.edu/uscnews/stories/13596.html>>

²⁷ Wolpert, p. x.

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Discomfort with the onslaught of technical understanding is part of our culture and looms dominant in the landscape of twentieth century literature, art, and philosophy – from Mary Shelley’s *Frankenstein*, to Aldus Huxley’s *Brave New World*, and to the writings of thinkers from Nietzsche and Heidegger to Adorno and Havel. How do the arguments that science robs man of his dignity and that technical understanding actually distances humanity from its true nature affect our current attitudes toward science? And in a more practicable sense, how can we cope with these criticisms, ranging from religious/moral to sociological and empirical, in creating a functional scientific environment at our nations’ educational institutions and government agencies?

I believe that even withstanding such discomfort with science and criticism from within academia, a consensus view of science is possible which would enable a renewal of trust to form between the scientific and political worlds. While we must acknowledge that ‘science’ put broadly cannot be separated from its practitioners and interpreters, it is necessary to avoid slipping into “constructivism,”²⁸ and concluding, as Harvard’s Sheila Jasanoff does, that “...scientific ‘facts’ are, for the most part, socially constructed.”²⁹ While murderous inventions such as the hydrogen bomb and technical disasters such as Chernobyl signify the powerful consequences of scientific ‘progress,’ we cannot conflate pure understanding with technology and human behavior. And while innumerable difficulties exist in maintaining an independent and yet publicly accountable scientific institution in the U.S., an effective relationship between science and governance is possible, if not necessary for our continued success. This venture into the philosophy of science, then, will be focused on (1) clarifying the most prevalent criticisms of science in society, (2) establishing a notion of scientific enterprise that encourages both widespread public support and careful oversight, (3) illuminating the differences between science and technology which are often ignored in discussions about the support of science, (4) assessing the problem of “uncertainty” in science and its cultural implications, and lastly, (5) ascertaining the proper place of science in politics and of politics in science.

Science and Human Progress

In the beginning to form a more useful picture of science, let us first examine the claim that science in some way “robs us of our spirit” and endangers our moral sense as humans by framing the world in rationalized terms. The Enlightenment and the Industrial Revolution played the largest roles in ushering in such criticism. In my view, there are three important components to this concern. First, this concern deals deeply with the concept of *comfort* in human psychology and its relationship to knowledge – coping with new, complex explanations for natural phenomena, not to mention the sheer volume of information about the universe, is exasperating for those who prefer to see existence in simpler or more local terms. Second, this concern involves a conflation of science and technology, finding the pursuit of knowledge at fault for the trespasses of industry tycoons, imperialist armies and technological innovations which dramatically alter society. Third and last, this criticism of science seems to call for what I think is a perfectly valid solution to these “science-gone-awry” problems, and that is ever-vigilant oversight of what we *do* with scientific knowledge and careful awareness of where we steer our inquisitive ingenuity.

²⁸ “Constructivism” is further explained in David Guston’s *Between Politics and Science* and discussed further on in this section. Guston’s definition of this view involves the idea that science is not an objective collection of facts about reality, but rather a method intertwined with sociological, psychological, political, and technical interference and limitations.

²⁹ Sheila Jasanoff, *The Fifth Branch: Science Advisors as Policymakers*. p. 13.

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In order to address the discomfort of rationality, we must realize the limits of science – what it *is* and *is not* designed to do – and finally become open to the possibility of change and academic study in the areas in which science works. Properly understood, science and scientists are neutral with regard to ends; that is, the concern of research is to discover information, or more controversially, ‘truth,’ about the world, *not* to govern our choices or behavior as people. Tolstoy was correct in stating that science cannot answer the question, “What shall we do and how shall we live?” Science can inform us that splitting an atom is indeed possible and show us how, but it cannot tell us whether we ought to power a city or build a bomb with this knowledge. Science can show us the harmful effects of trans fats or tobacco use on our bodies, but it can give no advice as to whether such substances should be banned. Thus, the role of the scientist is to discover and provide accurate information about the world around us, including ourselves. Some worry, as did Dostoevsky³⁰, that too much information, especially in the area of human behavior and psychology, will be deleterious to society. Others, however, such as Max Weber in *Science as a Vocation*, have voiced an argument for “intellectualization” – namely, to recognize that “the world is disenchanted,” and that “[o]ne need no longer have recourse to magical means in order to master or implore the spirits, as did the savage, for whom such mysterious powers existed. Technical means and calculations perform the service.”³¹

Critics of ‘sociobiology’ – the analysis of social phenomena through biological investigation – fear the reduction of human will into a comprehensible system of genetics and cognitive processing. Clearly, attempts to quantify completely our decisions and interactions would be overambitious, but we should not discourage investigation into human psychology where it can provide useful and predictive information. When new facts are discovered about our own circumstances, we must see this as enlightening rather than limiting, as freeing us from ignorance about our condition rather than depriving us of hope or mystery in the face of the unknown. An alternative, hopeful view of science is provided by Lewis Wolpert:

Science can be quite uncomfortable to live with – at least for some people. It offers no hope for an afterlife, it tolerates no magic and it doesn’t tell us how to live. But there is no good reason to believe, with D.H. Lawrence, that scientific understanding creates a ‘dry and sterile world’ by apparently removing all mystery. To quote Einstein, ‘the greatest mystery of all is the (partial) intelligibility of the world.’ And science itself can be very beautiful.³²

³⁰ For Dostoevsky, not only would everything be permitted under an atheistic, scientifically understood world (*The Brothers Karamazov*), but scientific thinking would lead to human action being reduced to a series of calculus equations, easily predictable and devoid of possibility or free will. “Therefore all there is left to do is to discover these laws and man will no longer be responsible for his acts. Life will be really easy for him then. All human acts will be listed on something like logarithm tables, say up to 108,000 and transferred to a timetable... They will carry detailed calculations and exact forecasts of everything to come, and so no adventure and no action will remain.” (*Notes from the Underground*).

³¹ Max Weber, *Science as a Vocation*. Munich: Duncker & Humblodt, 1919.

³² Wolpert, p. xiv.

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Next, a clear distinction must be drawn between science and technology. Wolpert, a biologist at University College London, weighs in here as well, explaining that technology predates science and works independently of it. What we do with knowledge is separate from knowledge itself.³³ William D. McElroy, the late well-known biochemist, former chancellor of the University of California at San Diego, and former Director of the National Science Foundation described the public misunderstanding of the science – technology relationship in a 1972 essay:

Because technology in the United States has come to be regarded as a mixed blessing, so has science – through guilt by association. In the minds of many, especially large numbers of young people, technology – and, by extension, science – is equated with weapons of war, with industrial pollution and the deterioration of our environment, with what they feel, rightly or wrongly, is a wasteful expenditure of vast sums in areas remote from pressing human problems, and the depersonalization of our society. In this view, the disutility of science outweighs its contributions to mankind as a whole.³⁴

Carnegie Corporation President David Hamburg argues that much of this ‘guilt by association’ comes as a consequence of “enormously high expectations that were doomed to serious, troubling disappointments”³⁵ in the realm of technology. With the rise of science came the naïve expectation that technical innovation would be the panacea for all of society’s ills, from biological epidemics to urban crime and educational disparity. The inability of scientific understanding to dramatically alter human existence for the better fell so far short of these expectations that public confidence in science has faltered. Additionally, the advance of science is too often related with military technology, which is no mere coincidence; the push for federal and public support of science was born out of the demands of World War II and Cold War competition with the USSR,³⁶ and budgeting for Research and Development at the federal level is routinely dominated by defense allocation. For the fiscal year 2008, the U.S. has reserved over 78 billion dollars for defense research, with Health and Human Services coming in second at just over 29 billion. The figures for NASA, energy, education, the National Science Foundation, and agriculture come nowhere close.³⁷ These realizations support the thesis that much of the animosity toward science is, in fact, involved much more with technological issues and spending disparities than with the scientific process or its practitioners.

Lastly, in dealing with the argument that science has failed at bettering humanity, the positive recommendation that we concern ourselves more intently with the direction of scientific innovation should be considered. If science has created more new weapons than vaccines in the last century, perhaps our budgetary planning, not the nature of science itself, is at fault. Our tremendous technology illustrates how far our creative capacity can take us, while also reminding us how important circumspection is along the way. Inventions like the atomic bomb and the advent of the assembly line have been attributed to “science left unbridled,” but in reality, these developments were in no way consequences of an end-in-itself approach to science.

³³ Ibid. p. xii.

³⁴ McElroy, William D. “The Utility of Science.” p. 19.

³⁵ David A. Hamburg, “Constructive Responses to the Changing Social Context of University-Government Relations.” p. 228.

³⁶ The first important connections between the science establishment and the federal government were created in the period following WWII, with Vannevar Bush’s *Science: The Endless Frontier* (1945) as the primary political catalyst.

³⁷ Taken from Office of Science and Technology website – “Federal Research and Development Spending” for 2008. <<http://www.ostp.gov/html/budget/2008/Federal%20R&D%20Budget%20Table.pdf>>

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The methods of science can be used as a powerful tool, but they are first and foremost geared toward the end of understanding. Funding, political attention, media coverage, and public support rarely surface behind the drab banner of ‘understanding,’ however; the tools of inquiry are most often aimed at particular purposes, such as treating heart disease, maximizing crop outputs or creating safer bridges. Scientists and the societies they serve stand to benefit terrifically from a more watchful eye on the aims of research and a more dedicated effort toward supporting basic, fundamental research geared toward understanding. J. Robert Oppenheimer, a man well acquainted with the dynamics of science and technological goals, stated the case for balancing public investment in science eloquently when he wrote, “[s]ociety supports science for two ‘disturbingly different’ reasons: science is useful, and the pursuit of science is ennobling. “...finding the state in which both are optimized is a worthy goal for science policy.”³⁸ It is precisely because science is useful that we must ever be on guard against those who might use it for reasons we oppose. Recklessness in this respect is costly to society and to scientists who lose support because of the others’ scientific abuse.

An Anti-Science Culture?

Conservative politicians and crooked scientists have received much of the blame tossed about by those attempting to find the origins of our current conflicts with science. One argument remains unaddressed with respect to poor scientific literacy and the lack of respect for higher education in general found among U.S. media and government. Could American culture be ‘hard-wired’ against science? Observers and historians have long noted themes in American sociology which run ‘against the stream’ of scientific values and priorities: to name a few, an evangelical religious tradition, a political love for populism, a commitment to business and the ‘Protestant work ethic,’ and a suspicion of experts, intellectuals, and impractical knowledge. While a scholar addressing current dilemmas in science must be wary of using the broad strokes of historical anthropology and sociology to explain away the choices of our elected officials, he or she cannot ignore the greater cultural context in which the politicization of science takes place. Perhaps a brief glance at our cultural heritage will support the admittedly ambitious thesis that the contemporary abuse of science by policymakers and industry groups and the subsequent toleration of such abuse by American society and academia is, sadly, *to be expected*.

In his Pulitzer Prize-winning attempt to discover the character and foundation of *Anti-Intellectualism in American Life*, historian Richard Hofstadter first turned to religion. The educated Protestant clergy who dominated ecclesiastical life in early American history were the collegiate intellectuals of their time, delivering long sermons on theological polemics and upholding the austere tradition of demanding educational standards inherited from the English church. As pioneers ventured westward and towns sprang up in the wild, churchgoers became increasingly distanced from the religious aristocracy of Protestantism, and fiery preachers speaking of hellfire and brimstone populated settlements at alarming rates. The message promoted by this new breed of spiritual leader was simple – one needs only the Bible and his own heart to attain salvation. Emphasis was placed on spiritual *feeling* – the guttural concept of experiencing God in one’s own personal way quickly gained popularity among a rural population familiar more with hard work than with books. The “old guard” clergy, commonly at seminaries and universities in the Northeast, disowned the burgeoning evangelicals and protested their ignorance of philosophy, history, and advances in science. Ultimately, the clergy could not sustain a significant enough following among the public to hold sway in American religious culture. Here lies the beginnings of American anti-intellectualism, argues Hofstadter.³⁹

³⁸ J.R. Oppenheimer, *Science and the Common Understanding*. New York: Simon & Schuster, 1953. p. 5.

³⁹ Hofstadter, See Chapter III: “The Evangelical Spirit.”

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The same religious fundamentalism that led our westward settlers to resent the secular, aristocratic city dwellers and higher education in general can be witnessed in the modern era through conflicts between religion and science – most notably in the now 150 year-old debate between Darwin's theory of evolution and *creationism*, a philosophy which is predominantly based on Christian theology. As the history surrounding popular opposition to the theory of evolution, the Scopes "Monkey Trial" of 1925, and the following court battles⁴⁰ illustrate, religious animosity toward the findings of science has been a powerful trend in American history. Religious belief continues to function as a prevalent factor in Americans' attitudes toward morality, politics, and science. President George W. Bush has allowed his personal spiritual convictions to dictate public policy; evidence for this can be found in the passing of his "Faith-Based Initiatives" in 2001, his stances on abortion and stem cell research, and in occasional telling public statements, in which he has proclaimed Jesus Christ his favorite political philosopher,⁴¹ and admitted to consulting God in deciding whether or not to invade Iraq.⁴²

In a 2004 American Gallup poll on the relationship between science and religion, only 24% of the sample felt that the two sides were in general agreement. If the vast majority of Americans are religious (studies indicate that approximately 88% of Americans believe in God), and yet only 24% think that science is compatible with religion, then one might conclude that Americans seem to be choosing religion over science. The late NYU sociologist Dorothy Nelkin argued in "The Public Face of Science: What Can We Learn from Disputes?" that the primary origin of moralist, right vs. wrong thinking in current scientific debates lies in the American Puritan tradition.⁴³ It is clear that religious belief continues to serve as an obstacle to scientific education and research. While scientific data changes every day, religious doctrine does not – all indications are that the fight between religiously-informed worldviews and the progression of science will be a lengthy one.

Anti-intellectualism and the resentment of higher education have cultural roots that transcend religious belief, however, as Carnegie Corporation President David Hamburg observes:

Research universities are said to be too elite, arrogant, expensive, unwilling to admit rank-and-file students, altogether a rich and privileged sector that generates envy and resentment in a lopsided society – a society that has become much more lopsided in the past dozen years than ever before in my lifetime. That lopsided character of the distribution of rewards and power in the society has predictably generated growing resentment. To some degree, the research universities, particularly the most elite ones, have suffered as a result.⁴⁴

⁴⁰ The 2005 *Kitzmiller v. Dover* decision serves as somewhat of a "final verdict" on the teaching of creationism, or "Intelligent Design," as it was creatively repackaged, in public school science courses. Judge John Jones III delivered a powerful and decisive ruling that clearly labeled creationism as religious doctrine and evolution as established scientific consensus; therefore, only evolution may be taught in public science classes.

⁴¹ Bush provided this answer in response to a question from a moderator of a 2000 Republican Party Primary debate.

⁴² Sydney H. Schanberg, "With God on his side." *Working for Change*. April 20, 2004.

⁴³ Dorothy Nelkin, "The Public Face of Science: What Can We Learn from Disputes?" p. 110.

⁴⁴ Hamburg, p. 226.

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In 1973, Caryl Haskins, the former president of the Carnegie Institution of Washington, D.C., spoke of much the same theme:

One of the most pervasive factors [in opposition to science] may well be the widespread, vague, but often intense general mistrust of our time in the intellect itself. A progressively orthodox reliance on the sufficiency of reason to solve all man's relationships with the world (a reliance that increasingly characterized the latter half of the nineteenth century and the first half of the twentieth) may be responsible for the considerable loss of faith in reason itself, which is conspicuous in our time. But the very fact that our problems are so complex and that we are only at the very earliest empirical phases of pondering how to tackle them (consider the problems of health delivery as one example) has greatly augmented such loss of faith, a loss that might readily evolve to an attitude not only anti-scientific but anti-intellectual, as well.⁴⁵

This "general mistrust" of "intellect itself" must be overcome if we are to adequately utilize the vast resources of our universities and the brightest minds in our nation.

Science and the Nature of Truth

Sheila Jasanoff, one of the United States' most respected science and technology scholars, credits the sociology of science with providing the important observation that "[w]e regard a particular factual claim as true not because it accurately reflects what is out there in nature, but because it has been certified as true by those who are considered competent to pass upon the truth and falsity of that kind of claim," and thanks Thomas Kuhn⁴⁶ for "positing that accepted scientific activity in any period is merely that which conforms to the prevailing paradigm."⁴⁷ While such claims have become part of the canon in the sociology and philosophy of science (and throughout the social sciences and humanities), most practicing scientists would shudder at such skepticism – particularly the assertion that scientific 'truth' does not necessarily correspond to objective reality. In fact, scientists routinely state exactly the opposite – that discoveries in science are judged ultimately only by their congruence with the "real world."⁴⁸ Wolpert dismisses all the sociological findings Jasanoff has found so helpful in one stroke:

It might be thought that either philosophers or sociologists would have been able to illuminate the nature of science and why it has been so successful. Alas, not only have they failed to do so but some have instead provided what they regard as good reasons for doubting whether science really does provide an understanding of the way in which the world works... Fortunately for science, these philosophical claims have no relevance to science and can be ignored. There are numerous 'styles' for doing science; the only constant is the need to measure one's ideas against the real world.⁴⁹

⁴⁵ Caryl P. Haskins, "Science and Social Purpose." p. 10. In James A. Shannon, (Ed.) Science and the Evolution of Public Policy. New York: The Rockefeller University Press, 1973.

⁴⁶ Kuhn's famous work, *Structure of Scientific Revolutions* (1962), cemented the idea in philosophy of science that the acceptance of one theory or paradigm over another was more a matter of politics and social psychology than hard, objective reality, although Kuhn himself denied accusations of relativism.

⁴⁷ Sheila Jasanoff, The Fifth Branch: Science Advisors as Policymakers. p. 13-14.

⁴⁸ Wolpert, p. xiii.

⁴⁹ *Ibid.*

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Wolpert argues that most laymen misunderstand science and the scientific process when they assume that researchers work in rigid patterns and produce results influenced more by presuppositions and prejudice than proof. The only true standard of establishing scientific prominence is the capacity to accurately describe and predict phenomena in the world. Karl Popper would follow suit and add that theories rely on constant attempts at falsification in order to pass muster. As attempts toward falsification fail and confirming evidence piles up, a theory becomes scientific consensus.⁵⁰ The number of scientific facts involved in, say, driving one's car to work is nearly immeasurable; I doubt, however, that any philosophers of science hesitate before starting their car in the morning, worried that just one of the millions of physical or chemical laws involved is merely the result of one scientist's popularity. What do advocates of the social constructivist paradigm cite as evidence? Most often, string theory is used as the archetypal example of how scientists, in some cases, must take a "leap of faith" in following one theory or the other. The controversial nature of string theory and its conflicts with quantum physics and gravitational theory have been central in contributing to the widespread assumption that much of what we take for granted as scientific "fact" is, in fact, still being fought over in the academy, and even more disheartening, these theories could change tomorrow. Shaky ground on the edges of physics is no reason to lose confidence in the bulk of established theory (such as gravitation or color theory), and in no way should scientific disagreement lead one to become disillusioned with the notion of objective "truth." If anything, competitive and active disputes in science reaffirm the sense internal fact-checking and review that makes science such an effective mode of inquiry.

Regardless of the established rules of scientific inquiry, many science policy scholars, like David Guston of Arizona State University, subscribe to the constructivist vision of scientific 'truth,' and regard the assertion that science can be either objective or self-regulatory as naïve.⁵¹ In truth, any respectable scientist must concede that too often money, power, and politics play important roles in influencing which experiments are done, which results get published, and what resources are available for research. After all, the influence of money, power and politics on science is the very subject of this thesis. The important distinction is that these variables are not an inherent characteristic of scientific practice, forever dooming scientific data to debatable significance; they are unfortunate side-effects of human interaction, social organization, and economic competition. Scientists deserve and need the respect of a society which recognizes the efficacy of the scientific process, which above all else must remain concerned with discovering 'truth.' In the words of the late mathematician Jacob Bronowski, "[t]he end of science is to discover what is true about the world. The activity of science is directed to seek the truth, and it is judged by the criterion of being true to the facts... We can practice science only if we value the truth. ... [Science] is meaningless, and indeed cannot be carried out, if we do not care what is true and what is false."⁵²

⁵⁰ The 'consensus' concept raises further difficulties with those who see science as dogmatic, elitist, or disturbingly far from democratic ideals. As centuries of thinkers have established, however, science is not a democracy. Because such a high degree of specialization is needed in order to contribute effectively, and because truth is not relative in science, a combination of consensus meritocracy with the capacity for immediate change and revolution is more accurate.

⁵¹ David H. Guston, *Between Politics and Science: Assuring the Integrity and Productivity of Research*. United Kingdom: Cambridge University Press, 2000. p. 140.

⁵² Jacob Bronowski, *A Sense of the Future: Essays in Natural Philosophy*. Cambridge: Massachusetts Institute of Technology Press, 1977. p. 212.

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Uncertainty is a related and important issue in the relationship between science and truth. As I stated in the introduction, interest groups often “manufacture” uncertainty in a given area of data by criticizing individual scientists or studies in a field, paying researchers to come to certain conclusions, or misrepresenting information to skew results in one way or the other. Much uncertainty in science is *not* manufactured however – judging the predictive capacity of certain studies and theories is a central component of practicing good science, and often this means acknowledging the weakness of particular studies or calling for more research before coming to worthwhile conclusions. The spectrum of reliability when it comes to predictive claims of science is quite problematic when scientists must provide guidance in the political world, unfortunately. Politicians are increasingly asked to make “hard” decisions with “soft” data, which is ironically opposite to the historical view that political acts are “soft” in nature and scientific “hard” in its objectivity.⁵³ In matters of public health or the environment, for example, scientists must often project the results of a few studies and general theory into population-wide scenarios. Experts cannot be certain that a particular dam will cause the extinction of several species of fish or whether a particular new method of birth control will lead to widespread abuse and changes in sexual behavior.

Climate change, or “global warming,” provides an excellent case study for the effects of scientific uncertainty on political discourse. The International Panel on Climate Change (or IPCC), made up of hundreds of scientists from around the world, released its fourth report on the causes and impact of global warming in February 2007. The documents resulting from their collective efforts reported a consensus that a global warming trend is “unequivocal,” and that human activity was “very likely,” (or with greater than 90 percent certainty) at fault for the warming occurring over the last 50 years.⁵⁴ At a February 8th hearing in front of the U.S. House Committee on Science and Technology, leading experts from the IPCC panel were received with tremendous skepticism by some committee members, with California Republican Dana Rohrabacher at the forefront of the debate.⁵⁵ Rohrabacher, now somewhat infamous for his efforts at debunking the notion of climate change, raised his voice at one point, demanding that one of the scientists give the exact percentage of methane gas humans are responsible for releasing into the atmosphere. Because no scientist could answer the question without seemingly equivocal qualifications and scientific jargon, Rohrabacher grew frustrated and concluded that the science behind calling humans accountable for the warming trend simply was not reliable.

Rep. Rohrabacher’s website has a section devoted to global warming, in which he protests environmental legislation which draws from “emotional junk science rather than data based on reproducible, rigorous, tested, peer-reviewed results,” and invites visitors to consider “the growing scientific consensus that global warming is not manmade, if it is in fact even occurring.”⁵⁶ (Misspellings of “reproducible” and “occurring” are his). Calling the scientific consensus of the IPCC report, which involved over 600 authors from 40 countries, “emotional junk science” and proposing a separate “consensus” that global warming is not even occurring is an extreme example of ‘uncertainty abuse’ at work. Atmospheric reports and temperature modeling simply do not provide the kind of ‘hard facts’ the House Republican expects, but in scientific terms, climatologists are engaged in a great deal more than guesswork.

⁵³ Silvio O. Funtowicz and Jerome R. Ravetz, *Uncertainty and Quality in Science for Policy*. Netherlands: Kluwer Academic Publishers, 1990. p. 1.

⁵⁴ See “IPCC 4th Assessment Report: Summary for Policymakers”, <<http://www.ipcc.ch/SPM13apr07.pdf>>.

⁵⁵ See <http://www.science.house.gov/publications/hearings_markup_details.aspx?NewsID=1264>

⁵⁶ <<http://rohrabacher.house.gov/ConstituentServices/globalwarming.htm>>

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The uncertainty involved in predicting climate change, which each expert in the Feb. 8th hearing repeatedly acknowledged, is an important part of accurately portraying the reliability of their work, but citizens and policymakers must not confuse scientific *theory* with a common-place sense of doubt or ambiguity.⁵⁷

Science and Politics: A Philosophical Perspective

In 1945, Vannevar Bush's *Science: The Endless Frontier* set the modern landscape of science policy in motion. The engineer and administrator made numerous recommendations to the President; most notable among his contributions were the 'government-as-patron' paradigm and his insistence on 'technocracy' – or, the control of decisions about science by scientists themselves. Bush maintained that federal support of science was necessary for national well-being, that medicine, basic research, and universities needed greater funding, that long-term projects required accommodation in spite of political pressure for quick pay-offs, that a national foundation should be created to support science (this would become the National Science Foundation), and that federal science agencies should leave the policy, personnel, methodology, and scope concerns to research institutions themselves, rather than handing down detailed direction from above. While this approach caught on successfully for many years, the federal science picture is starkly different today. Science policy scholars such as Sheila Jasanoff and David Guston take an almost diametrically opposed view, arguing that greater oversight and regulation is needed in the relationship between the government, 'boundary organizations,'⁵⁸ and research institutions, that science cannot be trusted to self-regulate or hold itself accountable, and that a much more democratic, participatory model (moving away from 'technocracy') is needed to involve citizens and stakeholders in the science policy process.⁵⁹

The tension between science and politics, and thus the difficulty of streamlining the mechanisms for creating science policy, seems unavoidable. The continual balancing act between assessing risks to public health or the environment, for example, and determining the financial and societal costs of preventing or regulating the areas of risk requires endless debate.⁶⁰ Neither the prediction of risk or the projection of prevention/regulation costs is an exact science, and therefore politics and ideology enter the equation.⁶¹ Each policymaker must decide between a *preventionist* approach, assuming maximum risk and providing adequate attention and funding to the problem, and a more conservative approach, refraining from using tax dollars and federal bureaucracy to curtail threats without substantial evidence backing them up. Policymakers also face the challenge of properly addressing both the demands of their constituents and the independence of the scientists they support. In the words of retired Republican congressman Robert S. Walker, former chairperson of the House Science Committee,

⁵⁷ In his annual address as President of the American Association for the Advancement of Science, Gilbert S. Omenn writes that "[i]n science, the term 'theory' carries connotations of elegance and a strong evidentiary basis. The 'theory' of evolution is ranked together with the theory of gravitation. To most laypersons, however, 'theory' is closer to 'speculation.'"

⁵⁸ "Boundary organizations" is the term Guston gives to federal agencies which serve as intermediaries between the state and scientists, such as the National Institutes of Health, the Centers for Disease Control or the Environmental Protection Agency.

⁵⁹ See David Guston's *Between Politics and Science* and Sheila Jasanoff's *The Fifth Branch: Science Advisors as Policymakers*.

⁶⁰ Jasanoff, *The Fifth Branch*.

⁶¹ Dorothy Nelkin, "The Public Face of Science: What Can We Learn from Disputes?" p. 112.

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It is no longer enough to regard research grants as entitlements...[T]he public supports research, but it is also demanding accountability. The “trust us, we’re smart” approach no longer works.... A fine line exists between the role of Congress as stewards of the public purse and the micromanagement of the programs we fund. On the one hand we want to ensure that the departments and agencies that propose and manage science programs are held to high standards; on the other hand we don’t want to create a situation in which Members of Congress are telling scientists how to do their research.⁶²

David Guston and Kenneth Keniston outline three sources of tension between politics and science in their introduction to *The Fragile Contract* – a collection of scholarly essays dealing with the relationship between government and science. First, ‘populist tension’ occurs when popular will does not correspond to goals of particular scientific projects or with science generally, and, the authors argue, science ought to exist as subject to popular will. Second, ‘plutocratic tension’ occurs because the organization of science as a meritocracy is fundamentally at odds with egalitarian, democratic principles held dear in larger society. Third, an ‘exclusionary tension’ exists because while “[d]emocratic decision making encourages and expands participation, scientific decision making limits it.”⁶³ Each brand of tension is virtually unavoidable, given the nature of modern scientific and political structure, and thus it is the task of all involved to find ways to best navigate the programmatic disparities between the interests of the public, the state, and the institutions of science.

In order to avoid overly politicizing science policy – as, I will argue in Part III, the federal government does today – partisan confrontations between opposing sides should be shunned, and transparency should be encouraged.⁶⁴ Instances in which ‘Democratic science’ seems to be in contradiction with ‘Republican Science’ or others in which politicians directly conflict with scientists on a matter rarely lead to positive resolutions or clarity.⁶⁵ Politicians must use available data with circumspection, acknowledge when ideology comes into play, and maintain the scientific enterprise as a method for acquiring information, not for combating political opponents or supporting previously held views.

Lastly, the government officials responsible for overseeing and regulating science must be vigilant in restraining the tendency to demand accountability, direct research goals and processes, and limit the funds of scientists working under the federal dollar. Over-emphasis on timely and marketable results equates to a strict ‘means-to-an-end’ mentality toward science, and science must be considered at least in part as an end in itself in order for true innovation and creative enterprise to take place. As William McElroy observed in his 1972 essay, “The Utility of Science,” many of our most useful technologies and modern theories had their beginnings in open-ended, fundamental research. Number theory, once a casual pastime of mathematicians, led first to digital computing, later to simulation technology and finally to the launching of spacecraft, as well as to economic and population modeling.⁶⁶

⁶² Robert S. Walker, “The quest for knowledge versus the quest for votes.” *IEEE Technology and Society Magazine* 16.1 (1997): 4-7.

⁶³ David H. Guston and Kenneth Keniston, p. 27-28.

⁶⁴ Jasanoff, *The Fifth Branch*. p. 246.

⁶⁵ Ibid, also see Wendy Wagner, “The Perils of Relying on Interested Parties to Evaluate Scientific Quality.” *American Journal of Public Health* 95.S1 (2005) S99-S106.

⁶⁶ William D. McElroy, p. 22.

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In closing, we might finally address the query of Tolstoy, who asks what use science might be if it cannot tell us how we ought to go about making our world a better place to live. Biologist Lewis Wolpert lends us yet another telling reply:

“I cannot offer specific solutions, for the nature of discovery precludes that, but knowing how the world works may be an essential requirement for helping to save it.”⁶⁷

Part III

THE ABUSE OF SCIENCE IN CONTEMPORARY AMERICAN POLITICS AND GOVERNANCE

“How radically we have moved away from regulation based on independent findings and professional analysis of scientific, health and economic data by the responsible agency to regulation controlled by the White House and driven primarily by political considerations.”

Russell Train, Former EPA Administrator

“The degree of lying, deception, and manipulation of information reported across so many federal agencies would seem to have required in the administration of George W. Bush a combination of callousness, mendacity, and hubris that is rare even in the messy history of American politics.”

Seth Schulman, Author of Undermining Science

University of California at Los Angeles history professor M. Norton Wise characterized the current politicization of science as “arguably unprecedented in history, aside from a few famous and anomalous examples like the Galileo and Lysenko affairs.”⁶⁸ This is quite a claim. If the Bush Administration’s political interference with science stands out so prominently in the history of government - research relations, why has this abuse received so little attention from the media and concerned citizens? The Union of Concerned Scientists (or UCS), an alliance of scientists and citizens which began at the Massachusetts Institute of Technology in 1969 and now has over 200,000 members, is working to give the contemporary abuse of science the attention it deserves.

⁶⁷ Wolpert, p. 178.

⁶⁸ M. Norton Wise, “Thoughts on the Politicization of Science through Commercialization.” *Social Research* 73.4 (2006) p. 1253.

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In 2004, the UCS released a report called *Restoring Scientific Integrity in Policymaking*, which charged the Bush Administration with widespread “manipulation of the process through which science enters into its decisions,”⁶⁹ citing several examples of such manipulation and recommending various actions in hopes of renewing the relationship between scientists and their government. UCS has continued to collect evidence for their claims and lobby for change – the most recent list of over 11,000 signatories to their statement includes 52 Nobel Laureates, 63 National Medal of Science recipients, and 195 members of the National Academies.⁷⁰

Journalists Chris Mooney (in his 2005 book, *The Republican War on Science*) and Seth Schulman⁷¹ (in his 2006 book, *Undermining Science: Suppression and Distortion in the Bush Administration*) have provided extensive documentation of cases in which scientists’ work has been abused, misrepresented, suppressed, altered, or ignored altogether by government officials and interest groups in recent years. Additionally, a 2003 report prepared for Rep. Henry Waxman in the Committee for Government Reform, entitled “Politics and Science in the Bush Administration”, detailed numerous examples of “...misleading statements by the President, inaccurate responses to Congress, altered web sites, suppressed agency reports, erroneous international communications, and the gagging of scientists.”⁷² The body of evidence these authors provide is breathtaking in scope; and the hundreds of case studies and examples contained within their work will not be reproduced here.

Instead, I will focus on climate change as an example of the dynamics between industry, political, and scientific forces. Global warming, because it has become such a public issue and involves so many political and economic interests, has become notorious among scientists for the ideological obstacles in play.⁷³ I will continue my examination of science politicization through analysis of two central components in the “War on Science.” First, I consider legislation enabling industry and political interests to challenge and inhibit federal science (the Data Access and Data Quality Acts passed by Congress in 1999 and 2001, respectively), and second, I trace the increasing influence of industry forces and commercialization on scientific research. An exploration of the politics surrounding climate change, a look into the abuse allowed by well-meaning legislation, and a brief synopsis of the impact of commercial interests in the pursuits of science will provide evidence enough that that state of science policy in the U.S. must improve.

⁶⁹ “Restoring Scientific Integrity in Policy Making.” Union of Concerned Scientists. *Scientists Sign-On Statement*. February 2004. <www.ucsusa.org> p. 5.

⁷⁰ <http://www.ucsusa.org/scientific_integrity/interference/prominent-statement-signatories.html>

⁷¹ Schulman was the lead investigator of the Union of Concerned Scientists 2004 report.

⁷² “Politics and Science in the Bush Administration.” Report prepared for Rep. Henry Waxman. House Committee on Government Reform, Minority Staff – Special Investigations Division, August 2003. p. 3.

⁷³ See my brief treatment of Rep. Dana Rohrabacher on pages 25-26 for one small case in point.

*USC JOURNAL OF LAW AND SOCIETY***Global Warming: Science or “Hoax”?**

In summer 2006, UCS distributed a survey to over 1,600 scientists at seven federal agencies and the National Center for Atmospheric Research (NCAR) in an effort to ascertain the current state of climate research in the U.S. and the extent of political interference occurring therein. Seventy-three percent of all respondents reported perceiving “inappropriate interference with climate science research in the past five years,” 58 percent “personally experienced interference,” (this number increased to 78 percent among those working with controversial topics), and 46 percent perceived or personally experienced pressure to eliminate the words “climate change,” “global warming,” or similar terms from communications or reports.⁷⁴ Significant portions of the survey respondents also reported having their work edited or misrepresented by federal officials as well as imposed limits on external communication. Scientists showed “fear of retaliation for openly expressing concerns about climate change,” suspicion that their findings were being suppressed or ignored, and a general decline in job satisfaction in federal climate science research.⁷⁵

The most widely publicized suppression occurred in January 2006, when NASA publications officer George Deutsch attempted to prevent Director of Space Studies and Columbia University professor James Hansen from speaking to the press about global warming. Deutsch’s tactic was uncovered by *New York Times* reporter Andrew Revkin soon after, however, and the 24 year-old Deutsch, who had lied on his curriculum vitae about graduating college, resigned from NASA, having told his colleagues that his reason for denying the media’s request to speak to Hansen was that it was his job to “make the president look good.”⁷⁶ In a move that helped to assuage the fears of agency scientists, NASA administrator Michael Griffin assured his employees and the public that “[i]t is not the job of public-affairs officers to alter, filter or adjust engineering or scientific material produced by NASA’s technical staff.”⁷⁷ Two years *before* the attempted cover-up, Hansen noted, “In my more than three decades in government, I have never seen anything approaching the degree to which information flow from scientists to the public has been screened and controlled as it is now.”⁷⁸

The responses to the UCS survey of American climate scientists and the Hansen debacle bring to light a disturbing trend – the Bush Administration’s emphasis on maintaining tight control over the views expressed by federal agencies and employees. For the greater part of the Bush presidency, the sense that a great deal of censorship and suppression of contrary ideas was commonly felt throughout Washington, D.C., but a January 2007 directive from the desk of the president solidified into policy what many thought was only an underhanded political practice. Effective immediately by executive order, each federal agency would be required to have a regulatory policy office run by a political appointee, dramatically increasing the power of the executive branch to supervise and shape policy statements and new regulations coming from the formerly independent agencies.⁷⁹

⁷⁴ “Federal Climate Scientists Survey” – Union of Concerned Scientists.

<http://www.ucsusa.org/scientific_integrity/interference/federal-climate-scientists.html>

⁷⁵ *Ibid.*

⁷⁶ Seth Shulman, *Undermining Science: Suppression and Distortion in the Bush Administration*. University of California Press, 2006. p. 26.

⁷⁷ John Horgan, “Dark Days at the White House: Has the George W. Bush administration manipulated science for political ends?” *Nature* 445.7126 (2007) p. 366.

⁷⁸ Chuck Schoffner, “NASA Expert Says Bush Stifles Evidence on Global Warming.” Associated Press, October 26, 2004.

⁷⁹ See Robert Pear, “Bush Raises His Sway at U.S. Agencies” *New York Times* 30 January 2007.

<http://www.nytimes.com/2007/01/30/washington/30rules.html?_r=1&pagewanted=all&oref=slogin>

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Recommendations and reports previously published by agency scientists and staff must have to go through the White House policy office before surfacing, almost negating entirely the ability of organizations such as the Environmental Protection Agency or Occupational Safety and Health Administration from providing objective, third-party advice. The order was praised by the White House Office of Management and Budget (OMB) and business groups, which saw the measure as a welcome reigning-in of the burdensome regulations many federal agencies issue. Previously, guidance for agencies was purposefully broad, allowing each to function independently and to serve in the public interest, but the new executive order will lead to, in the words of Columbia law professor Peter Strauss, “a major increase in White House control over domestic government.”⁸⁰

Rep. Henry Waxman, perhaps the most stubborn opponent of the president’s attempts at regulating the scientific advisory community, responded in frustration, explaining, “The executive order allows the political staff at the White House to dictate decisions on health and safety issues, even if the government’s own impartial experts disagree. This is a terrible way to govern, but great news for special interests.”⁸¹ With the interests of public health, consumer, and environmental groups demanding objectivity and independence on one side, and business leaders who see the regulatory process as overly restrictive and bureaucratic on the other, this decision surfaces as somewhat of a microcosm of the larger difficulty of creating policy based on science. Clearly, each side of the debate has an interest in streamlining the policymaking process toward a certain end – scientists who want the freedom to bring potential risks to light, and industry forces who wish to avoid excessive restrictions from federal agencies; when information is prevented from seeing the light of day or deliberately altered to suit political ends, however, all sides involved begin to lose confidence in the ability of federal agencies to function effectively.

For an example of the kind of political interference Waxman warns of, we need look no further than President Bush’s 2001-2005 chief of staff for the White House Council on Environmental Quality (CEQ), Philip Cooney. With a tragic irony not uncommon in this administration’s appointment record, Mr. Cooney had absolutely no experience in environmental science. Having earned an economics degree and a J.D., Cooney had spent his career as the leading lobbyist for the American Petroleum Institute. His last assignment in Washington before taking the White House appointment was to try to prevent the U.S. from agreeing to any international conventions or authoring any domestic legislation that would limit greenhouse gas emissions.⁸² As CEQ chief of staff, Cooney “altered numerous official scientific reports on climate change,” at one point ordering “an estimated 650 changes” to a 2002 Climate Change Science Program strategic plan.⁸³ By deleting entire paragraphs and adding mitigating qualifiers where needed, he was able to neutralize almost entirely scientists’ efforts at bringing the dangers of global warming to light. After four years of such interference, Cooney had angered hundreds of scientists and staffers, causing some to resign in protest. Cooney himself resigned in 2005, ostensibly for personal reasons, and, somewhat unsurprisingly, found a new position quickly thereafter with ExxonMobil.⁸⁴

⁸⁰ Ibid.

⁸¹ Ibid.

⁸² Seth Shulman, p. 18.

⁸³ Ibid.

⁸⁴ Andrew Revkin, “Former Bush Aide Who Edited Reports is Hired by Exxon.” *New York Times*. June 15, 2005.

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The combination of anti-science attitudes and prominent political power in the area of science policy that Cooney exemplified does not even make him the worst of all such offenders. Republican Senator James “Jim” Inhofe of Oklahoma deserves a spot at the top of that list, having served as Chairman of the Senate Environment and Public Works Committee from 2002 to 2006 as Congress’ most vocal opponent of climate change science. Now somewhat infamous among science policy journalists for his 2003 remark on the Senate floor, when he suggested that the notion of global warming caused by human activity might be “the greatest hoax ever perpetrated on the American people”⁸⁵, Inhofe fought continuously on behalf of oil companies, misrepresented the work and views of scientists who repeatedly protested his use of their names, skewed congressional climate panels by stacking global warming contrarians with ties to oil companies and conservative think tanks, and frequently based his arguments on single studies deemed highly questionable by scientific authorities.⁸⁶

The Cooney appointment, Inhofe chairmanship, and subsequent political interference with scientific data would be deleterious enough as isolated incidents, but the efforts of the Bush Administration and its supporters to prevent climate change science from forcing changes in public policy have been widespread and continuous. While defenders of the administration’s careful involvement with agency activity often cite the need for scientists to consider the potential costs and pragmatic ramifications of their proposals,⁸⁷ certainly the alteration of research data by political appointees cannot qualify as mere circumspection or thrift on the part of the executive branch. Next, we will examine the legislation that has allowed a great deal of the aforementioned transgressions to take place.

Data Access and Data Quality

In 2001, industry and anti-regulation interests won a key, albeit little-recognized battle with the passage of the Treasury and General Government Appropriations Bill for that fiscal year. Attached to the bill was the Data Quality Act (or DQA, also known as the Information Quality Act), which, in combination with the Data Access Act (DAA) passed two years before, was designed to strengthen the ability of groups outside of federal agencies to obtain and challenge information previously controlled by the agencies themselves. The DAA, a single-line addendum to the four-thousand-page 1999 Appropriations Bill, required the Office of Management and Budget to “require Federal awarding agencies to ensure that all data produced under an award will be made available to the public through the procedures established under the Freedom of Information Act.”⁸⁸ The DQA required the OMB to give “policy and procedural guidance to Federal agencies for ensuring and maximizing the quality, objectivity, utility, and integrity of information...disseminated by Federal agencies.” Agencies are also required to create their own guidelines and procedures for allowing groups to “seek and obtain correction of information...that does not comply with the guidelines.”⁸⁹

⁸⁵ Chris Mooney, *The Republican War on Science*, p. 79.

⁸⁶ *Ibid.* See Chapter 7: “The Greatest Hoax.”

⁸⁷ See The Hoover Institute’s *Politicizing Science: The Alchemy of Policymaking*, edited by Michael Gough for an alternate take on science politicization. Backed by the conservative Hoover think tank and the George C. Marshall Institute, which has funded countless industry-slanted publications and research, this book describes the excessive fear-mongering of alarmist scientists and activists and calls for greater accountability measures within government to ensure ‘sound science’ informs the policy making process.

⁸⁸ Omnibus Consolidated and Emergency Supplemental Appropriations Act of 1999, Pub. L. No. 105-277, 112 Stat. 2681 (1998); Richard Shelby, “Accountability and Transparency: Public Access to Federally Funded Research Data,” *Harvard Journal on Legislation* 37, no. 2 (2000): 378-9.

⁸⁹ Information Quality Act, Pub. L. No. 106-554 § 515, 114 Stat. 2763A-153-154 (2000).

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At first glance, the consequences of these acts appear to be relatively insignificant, and the idea of increasing transparency and creating guidelines for challenging information appears to be a no-brainer. Unfortunately, all is not as it seems. The DAA and DQA are dangerous to the integrity of the science policy process for three primary reasons: First, they slow science down to a near halt, burdening the data gathering process with added political checks and demands which may not have any merit at all.⁹⁰ Second, while open access to information rings positive to our ears, it allows non-science groups like the tobacco or oil industries to obtain study data and fight research findings line by line, scientist by scientist, in ways which the research community would find irrelevant and the public might find convincing.⁹¹ Third, these legislative victories were primarily influenced by the tobacco industry, which has spent years and millions of dollars challenging scientific studies condemning their products and lacked the legal wherewithal to truly combat the National Institutes for Health and other science bodies responsible for hurting their business.⁹² This particular origin reveals the Acts for what they truly are – a toolset created for the purpose of politicizing science – in the words of science journalist Chris Mooney, “It is a science abuser’s dream come true.”⁹³

University of Texas law professor Wendy Wagner has argued that “Virtually every request for correction [under the DQA] filed to date involves covert challenges to agency policies disguised as disputes over ‘good science.’”⁹⁴ Filed requests, most often from affected industries and corporations, routinely call into question data emanating from the Environmental Protection Agency or National Oceanic and Atmospheric Administration on the grounds of non-approved research equipment or illegitimate climate models. Needless to say, industry officials are not in the best or most trustworthy position to weigh in on scientific matters which stand to impinge upon their profits. Rather than providing an interested public with tools to maximize the accuracy and integrity of federally supported science, the DAA and DQA have only served to dishearten scientists and limit their effectiveness in producing helpful information. Further, this legislation has ushered federal science into an unlucky new age of ambiguity; policymakers now must receive new bits of information relevant to urgent public health or environmental matters with a myriad of industry complaints and alternate results. By “manufacturing uncertainty” in a process that suggests contentious debate surrounding a particular problem, interest groups now have the power to hold legislators at bay.⁹⁵ Additionally, numerous billion-dollar industries may now act collectively against even a single study, stacking the money and odds well against agency scientists interested in having their results translated into regulatory policy.⁹⁶ The end product is a scientific environment severely weakened by ideological influence, which only fans the flame of relativism already infecting our view of science.

⁹⁰ Linda Rosenstock, “Protecting Special Interests in the Name of ‘Good Science’.” *Journal of the American Medical Association* 295.20 (2006) p. 2407.

⁹¹ Wendy Wagner, “The Perils of Relying on Interested Parties to Evaluate Scientific Quality.” p. S100.

⁹² Chris Mooney, *The Republican War on Science*. p. 104.

⁹³ *Ibid*, p. 103.

⁹⁴ Wendy Wagner, “The Perils of Relying on Interested Parties to Evaluate Scientific Quality.” p. S103.

⁹⁵ Rosenstock, p. 2407

⁹⁶ Wagner, “The Perils...” p. S104.

*USC JOURNAL OF LAW AND SOCIETY***The Commercialization of Science**

I asserted in the introduction that most cases of science politicization have either *morality* or *money* at heart – not a true disagreement with science. The creationism / intelligent design movement and conflicts involving birth control and contraception are clear examples of moral interests interfering with science. Money, however, is just as big an influence as ideology in politics, and we shall observe this reality in the following examination of the growing relationship between industry interests and science policy. Indeed, President George W. Bush has the religious background and constituency (evangelical Christianity) best known for well-organized attacks on science, ranging from anti-abortion campaigns, to gay marriage bans, to the aforementioned evolution debates. The ostensible moral fervor of these value-based stances must not cause us to overlook his financial connections in the energy industry, a corporate player unquestionably active in fights against climate change science and environmental regulation.

This administration has consistently favored industry in matters of regulatory standards, and it has often done so while blatantly deceiving the public about its intentions – whether by scratching emissions standards in the “Clear Skies Initiative” or by allowing more private logging on public lands in the “Healthy Forests Act.” The “Orwellian” tendency to sell policy as scientific and environmentally friendly when in reality loosening standards for industrial benefit is the most problematic aspect of these practices – as Chris Mooney repeatedly urges in *The Republican War on Science*, politicians ought be honest about ignoring or mistrusting scientific data, rather than insulting all involved by either attacking the validity of the research involved or simply masquerading industry-friendly legislation as being scientifically informed. In the interest of illustrating the dangers of intermingling financial power with scientific data in the government context, I will use case studies from the oil, sugar, and health / pharmaceutical industries which aptly demonstrate the weight of money in the world of science policy.

~ Oil ~

Much of Jim Inhofe’s contrarian information with reference to climate science came from the George C. Marshall Institute, a conservative think tank that, along with the Competitive Enterprise Institute, Frontiers of Freedom, the Heartland Institute, and TechCentralStation.com, receives millions of dollars in donations from oil companies like Exxon Mobil.⁹⁷ The two contrarian scientists Inhofe called to testify in front of the Senate Environment and Public Works Committee, Willie Soon and David Legates, both received funding from the American Petroleum Institute and Exxon Mobil.⁹⁸ Research emerging from federal agencies and universities is routinely labeled “junk science” by industry officials and invested politicians, and “sound science” (a term created by the tobacco industry in the early 1990s) manufactured by conservative, corporate-friendly think tanks funded by industry is injected in its place. Entire organizations, such as the Advancement of Sound Science Coalition, exist to counter research data unfavorable to regulated industries with alternative information paid for by private sector dollars.⁹⁹

One example of the oil industry’s efforts in the framing of research comes from the EPA’s National Ambient Air Quality Standards revision in the late 1990s which relied heavily on a six-city epidemiological study of mortality. In an attempt to discredit the study as “junk science,” the American Petroleum Institute, the electric utility industry, and the diesel trucking industry worked together with Citizens for a Sound Economy and the Center for Regulatory Effectiveness to obtain the original data from Harvard’s School of Public Health.

⁹⁷ Chris Mooney, *The Republican War on Science*, p. 82.

⁹⁸ Wise, p. 1260.

⁹⁹ *Ibid.*, p. 1254.

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These organizations even paid actors to dress in white lab coats and picket outside the school's doors, demanding that the research data be released.¹⁰⁰ Since this incident occurred before the passage of the Data Access Act and Data Quality Act, however, the affected industries were not able to obtain the original data and thus could not refute the results effectively. In 2007, such powerful industrial interests would provide a tremendous challenge to federal science which suggests a need for higher emissions standards. A 1998 internal memo from the American Petroleum Institute exposed a clear effort to reframe the public's perception of relevant science, outlining a strategy to "maximize the impact of scientific views consistent with ours with Congress, the media, and other key audiences," and declaring that "Victory will be achieved [when] recognition of uncertainties becomes part of the 'conventional wisdom.'"¹⁰¹

~ Sugar ~

A 2002 United Nations panel on diet, nutrition, and chronic disease prevention in Geneva produced a comprehensive World Health Organization and Food and Agriculture Organization (WHO/FAO) report which recommended seemingly obvious dietary practices – eat less sugar and fat, and eat more fruits and vegetables. Reaction to the report revealed the full extent of some industries' interest in overlooking public health concerns with profit in mind. Early in 2003, the U.S. Sugar Association warned the WHO that it would "exercise every avenue available" in challenging the study, and threatened to ask congressional allies to block U.S. funding of the international health body if it did not revise or retract its findings.¹⁰² Associated sugar manufacturers and politicians with ties to the industry urged Health and Human Services Secretary Tommy Thompson have the WHO report stricken from publication, all the while misrepresenting the report's findings and incorrectly citing previous studies with different results.

Leaders of the sugar industry have contributed heavily to the ascendancy of George W. Bush – sugar magnate Pepe Fanjul raised over \$200,000 for Bush's 2004 reelection effort, along with other executives from Coca Cola and Nestle USA, and U.S. Sugar Corporation Senior VP Robert Coker raised over \$100,000.¹⁰³ Higher-ups in fast food and sugar interest groups continually ignore the overwhelming scientific consensus that sugar and high-fat 'junk foods' contribute heavily to obesity and chronic disease, maintaining, as one American Beverage Association (formerly the National Soft Drink Association) executive has, that "Obesity is a complex problem with many causes and no single, easy solution."¹⁰⁴ Because of the extent of corporate influence on political campaigns and legislation in this country, the food and restaurant lobby holds a great deal of power in determining how the U.S. government frames dietary health issues. And because said industries make billions of dollars each year in revenue from foods and beverages deemed dangerous by decades of scientific study, the corporations involved could not afford for the results of research like the WHO/FAO report to become widely accepted. The public relies on federally funded science and health agencies for accurate information regarding diet, however, and the intermingling of industry influence with scientific advice regarding public health is a threat to our wellbeing.

¹⁰⁰ Devra Lee Davis, When Smoke Ran Like Water: Tales of Environmental Deception and the Battle against Pollution. Philadelphia: Basic Books, 2002. p. 151-154.

¹⁰¹ Mooney, The Republican War on Science. p. 82.

¹⁰² *Ibid*, p. 122.

¹⁰³ *Ibid*, p. 128.

¹⁰⁴ *Ibid.*, p. 126.

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~ Health / Pharmaceutical ~

Much of the government's role in dealing with public health issues revolves around the regulation of drugs and the funding of research relating to drug treatment. Unfortunately, much of the research surrounding drugs is heavily influenced by industry pressure and often weakened by "rivaling results" from studies financed by opposing companies. An excellent case in point is aspirin. In recent years, numerous studies have surfaced claiming either that aspirin resistance is common among the U.S. population, raising concern among users and medical professionals and heightening the demand for alternatives, or that aspirin resistance is an unsubstantiated myth and warrants no serious medical or public reaction. Not surprisingly, most of the funding for research detailing the prevalence of resistance to aspirin has come from Accumetrics (the manufacturer of the most popular test for resistance) and marketers of Plavix, the most popular aspirin alternative available. Funding for pro-aspirin research has been dominated by Bayer, the most powerful manufacturer of aspirin on the market.¹⁰⁵ Like many of the unhealthy scientific practices described in this thesis, the financing of drug research by invested drug companies is not limited to only a few fringe instances. Numerous other drugs creating controversy, such as Vioxx, have been reviewed extensively in medical journals by authors with corporate connections to the makers. This phenomenon creates a harmful situation for the medical science landscape, as the National Institute of Environmental Health Sciences' James Huff notes: "There is little satisfaction to be found with the science of occupational and environmental medicine, toxicology, and epidemiology so long as much of it is funded and manipulated by industry sponsors and published in journals that do not require disclosures of conflicts of interest."¹⁰⁶

An additional problem with respect to drug research is the confidentiality allowed to drug manufacturers and pharmaceuticals; restrictions on the publication and public discussion of data involved in drug studies endanger public health in the name of protecting product information. In 2005, evidence began to emerge that antidepressants such as Paxil, Zoloft and Prozac were associated with increased risk of suicide in young children¹⁰⁷; instead of alerting the Food and Drug Administration about these findings, scientists were prevented from releasing this information, making it difficult to conduct an investigation into the matter. Once again, good news for the drug companies, but alarming news for public health, which depends on the science surrounding medicine to be as objective and accurate as possible.

¹⁰⁵ Wise, p. 1258.

¹⁰⁶ James Huff, "Industry Influence on Occupational and Environmental Public Health." *International Journal of Occupational and Environmental Public Health* 13.1 (2007) p. 107.

¹⁰⁷ Barry Meier, "Contracts Keep Drug Research Out of Reach." *New York Times*. Nov. 29, 2004.

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The Bayh-Dole Act of 1980 ushered in a new era of commercial influence on federal and university research by granting exclusive licensing and patent rights to the developers of new technologies. While patents and profits have markedly increased, some argue that the traditional values of science – integrity, free exchange of information, transparency, and service toward the public good – have been compromised as a result of commodification in research.¹⁰⁸ Further, it is ever more difficult to rely on the results of research in an era of rampant and often undisclosed commercial financing. To use a legal metaphor, the scientific community surrounding industry regulation has become like a jury composed entirely of the involved parties' family members. Conflicts of interest skew the data produced by researchers, and industry influence taken as a broad phenomenon steers science away from dispassionate exploration and toward the promotion or criticism of particular products and technologies. We are fast approaching a state in which "research for profit will make universities look increasingly like think tanks funded by private interests."¹⁰⁹

Is Science Abuse New?

This question is answered most effectively in two general parts: First, the circumstances characterizing the politicization of science are in no way new; efforts by particular interest groups to distort scientific data and conflicts between various religious / moral groups and scientific findings are themes to be found even at the beginnings of science. Second, it must also be noted that the extent of institutional distortion of data and the tremendous loss of confidence on both the part of policymakers and citizens in the scientific institution and on the part of scientists in the competence of government is unique to the present era.

After the publication of *Science: The Endless Frontier* by Vannevar Bush in 1945, the relationship between science and government proceeded, for the most part, according to plan – legislators were generally happy to provide open-ended funds for university science, which operated without a great deal of regulation or oversight. Science and politics were seen as separate but complementary spheres on practice. Between 1945 and 1955, federal support of science generally increased each year, only dipping with the end of the Korean War, during which budgetary exhaustion forced slight cutbacks in R&D and social project spending. The launch of Sputnik I and II in 1957 caused a tremendous surge in science spending (although much of it was centered on space and military technology), as well as a renewed emphasis on math and science in all levels of education.¹¹⁰ Science at the height of the Cold War was viewed as an instrument of limitless potential and as a necessary component of international competition. New developments in the 1970s began to weaken these assumptions, however.

As federal spending in agency research and regulation of health, environment, and commerce reached a peak, growing skepticism and distrust among policymakers created the backdrop for curtailing the generous, "no strings attached" support of science. President Reagan viewed the state structures supporting research as excessive bureaucracies and faulted them for the flagging U.S. economy of the late 1970s and early 1980s. Allegations of malpractice plagued the Environmental Protection Agency, the Occupational Safety and Health Administration, and the Industrial Bio-Test Laboratories, prompting a shift in public perception of unregulated science.¹¹¹

¹⁰⁸ Wise, p. 1257.

¹⁰⁹ Ibid, p. 1259.

¹¹⁰ James A. Shannon, (Ed.) *Science and the Evolution of Public Policy*. NY: The Rockefeller University Press, 1973. p. viii.

¹¹¹ Jasanoff, *The Fifth Branch*.

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Developments in academia (described in detail in Part II) reframed the way we viewed the work of scientists, and the notion that research worked effectively without significant accountability measures became obsolete. Scholars called for greater transparency and oversight in the science policy process, observing a need for organizational safeguards designed to “keep scientists honest.” Thus, science policy grew out of Vannevar Bush’s “government as patron” model and into what David Guston calls the “social contract for science” model¹¹², which treats researchers as contractors for public and private clientele.

By the early 1990s, the rift that presently divides the science and political communities had begun to take shape. Complaints about university scientists increasingly surfaced from federal officials, involving cases of alleged fraud, wasting of federal funds, and allegations that the acceptance of foreign students and researchers was allowing economic competitors to steal technological secrets and innovations. Those interested in curtailing such abuse of state-supported research routinely portrayed scientists as greedy, self-interested, and arrogant. Meanwhile, scientists were increasingly complaining of excessive government interference in their research, micromanagement, and over-constraint in mandated guidelines and funding restrictions.¹¹³

The election of George W. Bush was distinctive in marking the beginning of what so many scholars, journalists and scientists have deemed an “unprecedented” era of science politicization because of the synthesis of concurrent complicating factors in science policy – the ever-expanding role of science and technology in our lives, the increasing assignment of regulatory oversight to bureaucratic bodies in Washington, rising media coverage and public interest in scientific controversies ranging from climate change to stem cell research to intelligent design, and the combination of religious fervor and business-friendly ideology held as central to the new administration’s political approach.

Is Science Abuse Unique to the U.S.?

The answer to this question is much the same as the answer to “Is science abuse new?” addressed above. Again, the circumstances contributing to an environment in which political interests abuse scientific data and in which the interests of money and morality are in conflict with the progression of scientific knowledge are not unique to American culture; they occur wherever the research and educational establishments interact with governance and economics. However, the special situation of the U.S. as the world leader in science, industry, and political power places us in a far more treacherous situation than other nations in terms of science politicization. Additionally, our unique blend of technological and educational advancement with cultural conservatism lends itself toward conflict. It must also be understood that although I have treated the U.S. as a singular entity with respect to pro- or anti-scientific tendencies, this nation is by no means homogeneous with respect to attitudes toward science; coastal, Ivy-league research universities which account for a large percentage of innovation, for example, often encounter resentment and suspicion from anti-intellectual and blue-collar constituencies throughout the country.

¹¹² See the introduction to David H. Guston, and Kenneth Keniston. (Ed.) The Fragile Contract: University Science and the Federal Government.

¹¹³ *Ibid*, p. 2-3.

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Cases of science abuse are beginning to surface in other nations, which illustrates the reality that controversy surrounding the use of science transcends national boundaries. The most similar case of abuse to the allegations found in the U.S. comes from the United Kingdom: a 2006 Parliamentary Report on the politicization of science found numerous instances of government officials either ignoring or misrepresenting scientific data for political ends, including cases of commissioned research going unpublished when it had not met with the original ideological intent of its financiers in Parliament.¹¹⁴ The House of Commons Select Committee on Science and Technology recommended later in 2006 that Parliament establish a new government scientific service, grant more power to science advisors, and improve long term science policy planning by strengthening lines of communication between scientists and Members of Parliament.¹¹⁵ The reputation of science among British citizens has declined since 2005, as David Ball and Keith Baverstock argue in the journal *Nuclear Engineering International*; public confidence in science was dealt a devastating blow when a landmark paper published in *Science* on the creation of embryonic stem cells was shown to be reliant on shaky data.¹¹⁶

In Germany, a great deal of controversy surrounds a ban on stem cells created after 2002, a policy clearly motivated by moral concerns rather than scientific advice¹¹⁷, and the lack of a national science advisory organization, such as the U.S. National Academy of Sciences, has slowed the science policy process. The Chirac regime in France, which is currently on its way out, has been largely unsupportive of science and has alienated researchers.¹¹⁸ On a more international level, the European Union has been criticized for its lack of a centralized science institution and program – a step, it is said, that will lead to greater capacity for cooperation and innovation on the continent, once implemented. Japan offers positive news for science, however, characterized by a culture widely supportive of science and technology.¹¹⁹

The clearest conclusion one might glean from cross-cultural analysis in this case is that complex dynamics between political interests and scientific data are not unique to any country or situation, and are not only present with religious or anti-science attitudes. The tendency of particular ideological interests and industry forces to manipulate data for their own ends is an international problem. Limitations in one country adversely affect the progress of science across the globe, because science relies on open exchange of information. A responsible global scientific community must demand high scientific standards, transparency in the research, publication, and advisement processes, and oversight mechanisms that ensure integrity on both the research and political sides of the equation.

¹¹⁴ Jim Giles, "UK civil servants accused of warping science." *Nature*. 444.7117 (2006) p. 252.

¹¹⁵ Roger Dobson, "Government needs better scientific advice, MPs say." *British Medical Journal*. 333.7576 (2006) p. 986.

¹¹⁶ David Ball and Keith Baverstock. "A bad year for science." *Nuclear Engineering International*. 51.619 (2006) p. 44.

¹¹⁷ German cultural opposition to embryonic stem cell science has its origins in harmful memories of the eugenics movements of the 30s and 40s under Hitler and corresponding practices involving abortion, gender selection and human testing, rather than in the religious concerns that characterize US stem cell policy. See Angela Campbell, "Ethos and Economics: Examining the Rationale Underlying Stem Cell and Cloning Research Policies in the United States, Germany, and Japan." *American Journal of Law and Medicine*. 31.1 (2005) p. 47-87.

¹¹⁸ "French science after Chirac." *Nature*. 444.7118 (2006) p. 401.

¹¹⁹ Angela Campbell, "Ethos and Economics: Examining the Rationale Underlying Stem Cell and Cloning Research Policies in the United States, Germany, and Japan." *American Journal of Law and Medicine*. 31.1 (2005) p. 47-87.

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FORGING A NEW PATH: INSTITUTIONAL AND CULTURAL REFORM

Given the established level of impropriety in U.S. science policy, what lies ahead? How can we institute changes, both institutional and cultural, that will lead to less distortion, mistrust, and deception in American science policy? Scholars respond to these questions in various ways, but nearly all are in general agreement on several key recommendations. First, greater transparency is needed at all levels of the science policy process. We ought to know where research funding comes from, how research is conducted, who advises policymakers on key scientific questions, and most importantly, scientific opinion / consensus must be accurately represented in all instances of government inquiry. Second, politicians and citizens alike must recognize the centrality of scientific advice to their lives, in matters ranging from prescription drugs to environmental protection. An increased awareness of the importance of science combined with a heightened level of respect for the scientific enterprise will lead to a more effective advisory process. Third, good faith must be restored in the relationship between federal researchers and government officials responsible for funding them and holding them accountable. Scientists must strive to meet public expectations in an efficient manner, and bureaucrats must respect the independent culture of scientific institutions.

Some scholars and journalists have called for the resurrection of the Office of Technology Assessment (OTA), a federal agency dismantled by the Gingrich Congress in 1994 which advised Congress and the executive branch on scientific and technical matters. In 2007, the White House Office of Science and Technology Policy (OSTP) performs many of the same roles, but on a much smaller scale and with less power and prestige than the OTA. President Bush made matters worse for science advisory when he removed the privileged title of “Assistant to the President” from the OSTP Director John Marburger’s credentials, forcing him to communicate with the president through White House staff rather than on a regular, personal basis. Recreating the OTA is unnecessary and would be too costly; the OSTP must instead regain its previous strength as a principal advisory body to both Congress and the executive branch, and the OSTP Director must become a permanent fixture in the president’s cabinet.¹²⁰ Additional advice can be provided by the prestigious National Academy of Sciences and federal science agencies, provided they are properly funded and staffed.

¹²⁰ A recommendation made by Chris Mooney in [The Republican War on Science](#).

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As I have argued earlier, the Data Access Act and Data Quality Act have proven detrimental to science policy by encouraging industry groups to challenge too easily scientific data and misrepresent findings, thereby creating a false sense of uncertainty. Legal scholar Thomas McGarity makes a convincing argument for repealing the DQA, noting that “The statute’s suspicious origins, the lack of any demonstrated need for its requirements, and numerous examples of its misuse all justify its repeal.”¹²¹ The DAA may be kept intact, as it has the potential to serve as valuable tool for mandating transparency in agency research, but it must be applied to privately funded research as well; adopting this policy will not only level the playing field between private and public science, it will also help to curb the power of commercially-influenced studies by forcing full disclosure of connections in academic publications.¹²²

Wendy Wagner and Rena Steinzor, editors of *Rescuing Science from Politics: Regulation and the Distortion of Scientific Research* also make several useful recommendations. Scientists should be consulted before initiating institutional or legal changes to the science advisory and policy processes; having been ignored during the demise of the OTA and the passage of the DAA and DQA, members of the scientific community now must demand a place at the table if they are expected to perform their roles effectively. Scientists doing federally funded research should also be protected in “safety zone,” similar to whistleblower protection statutes, to harbor them from industry pressure, financial strain and political considerations. In light of the substantial suppression and distortion of data in the Bush Administration, it is likely that many scientists have engaged in self-censorship, afraid of the consequences dissenting opinions or data might bring. This situation is far from ideal. Lastly, federal support (both financial and ideological) of science must be increased. The demand for research in almost all fields, from medicine to agriculture, is consistently increasing, but federal funding for such work is dwindling with the exception of military research and development. The recent passage of the American Competitiveness Initiative (ACI) must apply not only to the technical, energy, and military-industrial sectors, but to university science and basic research as well.

In her book, *The Fifth Branch*, as well as in various journal articles, Harvard’s Sheila Jasanoff makes a number of convincing arguments for revitalizing the political culture of scientific advice. Jasanoff claims that scientific issues are more easily resolved when politics and science *are not* strictly separated, but rather dealt with collectively in an open, inclusive process.¹²³ The relationship between science and the state is best mediated by federal agencies, “boundary organizations” as Guston calls them, and such agencies should remain central in negotiating communication and compromise between political and scientific interests. In order to restore trust between the two sides, Jasanoff insists that interaction between researchers and federal agencies should be regular and consistent, rather than dependent on the agencies’ discretion. Without regular input from scientists in the field, agencies become overly politicized and may drift too far from the restraints of empirical data.¹²⁴

¹²¹ Thomas O. McGarity, “Defending Clean Science from Dirty Attacks by Special Interests.” In Rena Steinzor and Wendy Wagner. (Ed.) *Rescuing Science from Politics: Regulation and the Distortion of Scientific Research*. Cambridge: Cambridge University Press, 2006. p. 43.

¹²² Recommended by Wendy Wagner in *Rescuing Science from Politics: Regulation and the Distortion of Scientific Research*.

¹²³ Jasanoff, *The Fifth Branch*. p. 237.

¹²⁴ *Ibid*, p. 242.

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Science advisors must display breadth and balance; policymakers should not appoint narrowly focused specialists with little understanding of the social implications of their work or of its interconnectedness with other disciplines.¹²⁵ Jasanoff's slight bias comes through with this recommendation, which perhaps alleges a greater amount of irrelevance and ignorance among science advisors than is warranted; a greater concern regarding committee membership is the appointment of non-scientists and former industry lobbyists. Lastly, Jasanoff wisely argues against engaging science issues in an adversarial manner, as has been done in congressional showdowns disputing climate science. Confrontation between overly politicized interests in matters of science rarely leads to a positive resolution or the adoption of a consensus.¹²⁶

On the topic of "democratizing science," some scholars have urged greater public participation in science policy, while others have emphasized the importance of science literacy and interest in creating a healthy environment for federal science. David Guston of Arizona State University uses both lines of argument. In "Forget Politicizing Science; Let's Democratize Science!," Guston argues that debates on the politicization of science are impractical since, in his view, science is always characterized by political interests, and that we should instead focus our attention on maximizing accountability, transparency, and accessibility in science policy.¹²⁷ In *The Fragile Contract: University Science and the Federal Government*, Guston and colleague Kenneth Keniston add that "democratizing science" also means a renewed commitment on the part of scientists to promote and explain their work. Scientists must learn to "play the public's game" by engaging in public intellectualism and outreach, and expect to explain their work to citizens and policymakers. Further, scientists should not expect their position in society to be guaranteed – they must prove the worth of their work to taxpayers, who then may decide what direction research should head. The authors are well aware of the slippery slope here, and summarize their view of democratizing science thusly: "The attempt to run science on democratic principles would destroy science; but that does not mean that the existing institutions and processes of science are responsive enough to democracy. The attempt to run government on scientific principles would destroy democracy; but that does not mean that our current politics is sufficiently informed or advised by science."¹²⁸

A few other notable recommendations are worth mentioning. Carnegie Corporation President David Hamburg asks that scientists heed the words of their critics, for there lies a "kernel of truth" in each critique. After echoing the words of other scholars in proposing increased involvement of scientists in policymaking and public outreach, Hamburg renews the request of William McElroy and Vannevar Bush of increased funding for fundamental, open-ended research. Lastly, Hamburg wisely calls on universities and their faculty to aim their work toward "community problems" and synthesize research data in interdisciplinary work, increasing the social impact of their research and gaining the trust of taxpayers.¹²⁹ Gillian Andres calls on states to appoint science advisors to their executive cabinets, as contracts for research and technology development are increasingly granted to communities and state universities.¹³⁰ Lastly, James Huff passionately argues that scientists stand their ground on the validity and reliability of research and insist that the public recognize the capacity for objectivity and progress that brought science into its current position of privilege. Huff's thesis brings us to the final area in need of improvement in these matters – cultural perception of science.

¹²⁵ Ibid, p. 243.

¹²⁶ Ibid, p. 246.

¹²⁷ David Guston, "Forget Politicizing Science; Let's Democratize Science!" *Issues in Science and Technology*, 21.1 (2004) p. 25-28.

¹²⁸ Guston and Keniston, p. 32.

¹²⁹ Hamburg, p. 224-233.

¹³⁰ Gillian Andres, "Where are all the State Science Advisors?" *Bioscience* 56.9 (2006) p. 722.

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A 1990 survey showed that only about 3% of American adults were both attentive to science policy issues and sufficiently literate scientifically to understand the arguments underlying policy disputes.¹³¹ In a world where science and technology pervade our daily lives to an extent never before seen, a declining understanding of the issues involved can only lead to bad decisions and bad policy. How poor is the state of scientific knowledge in the U.S.? Some recent Gallup Poll results offer a bleak picture: Twenty percent of the respondents in one poll claimed that the sun in fact revolves around the Earth. Forty-two percent in another poll indicated that they believed in demonic possession, and felt that it is actually a regular occurrence. When faced with an illness, twice as many people said they use prayer as means of healing than said that they relied on medical care only. In reference to the evolution debate, a September 2005 poll showed that 53% of the respondents felt that God created Man exactly as the Bible describes it, and only 12% believed that Man evolved without any help from the Almighty. Only 35% in another poll felt that Darwin's theory of evolution was supported by evidence. But two other polls may give us hope: 75% of the respondents in one questionnaire felt that more science should be taught in schools, and 88% felt that high-schoolers had the capacity to learn more science than they are currently taught.

These polls suggest that the public is willing to learn more science, but also that the current level of interest and education in science is dangerously low. Science policy battles, since they are so often infused with confusion about the reliability and accuracy of data, must be fought in the sphere of public awareness in addition to labs and courtrooms. Basic literacy in science is a key component in this effort; exposure to scientific concepts can create interest in and support for research. It is difficult for the public to push for the advancement of basic science when most are generally ignorant of what they are supporting. If the U.S. is to create an environment which encourages innovation by supporting scientific endeavors, our culture must make a new commitment to science education – not motivated by economic or military competition, but by a genuine dedication to furthering knowledge and using it to better ourselves and the world around us.

¹³¹ J. Miller, *The Public Understanding of Science and Technology in the United States*. Washington, DC: National Science Foundation, 1990.

*USC JOURNAL OF LAW AND SOCIETY***CONCLUSION**

The politicization of science is a pervasive trend in the U.S., and it is a trend that deserves the attention of policymakers, scientists, and citizens alike. In this thesis, I have described numerous cases of “fact abuse,” ranging from ideological committee appointments to the incessant editing of research data at various government agencies. I have examined the harmful effects of the Data Access Act and Data Quality Act on the integrity of scientific work. By following the efforts of oil, sugar, and healthcare corporations to interfere with research, I have shown how the commercialization of science is a dangerous trend worth curtailing. And I have put forward comprehensive arguments about the broader origins and cultural context of such abuse, by discussing the philosophical underpinnings of anti-science sentiment in our communities, at our universities, and among our nation’s leaders.

Withstanding all the blame I have placed on various sources, we must realize that the recent political rifts in science policy are not necessarily the fault of politicians, ignorant taxpayers, or institutional barriers - the primary force at work behind all of this is the ever-expanding presence of science and technology in society, and our increased reliance on scientific data to proceed in policymaking. The intermingling of research with policy, properly arranged and governed, is something to be optimistic about. It is also relatively novel, so no argument recalling the “good old days” of science - government relations stands ground.

The most frightening and yet exciting thing about science is that we can gain little guidance from the past – our knowledge of the universe surrounding us seems to burst forth from labs and classrooms around the world each day, challenging our preconceptions and self-imposed limitations. We can scarcely predict what the state of science will be in even as short a time span as 10 years – our progression from a small projectile launched into the upper atmosphere (Explorer I, 1958) to completing a manned mission to the moon (Apollo 11, 1969) in a little over a decade demonstrates this fact. It is with this spirit of innovation in mind that we must commit ourselves to maintaining the integrity of science – once again, in our classrooms, at our universities, and among our nation’s leaders. Our health, our safety, our environment, and our future depend on it.

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THE PROHIBITIVE COST OF PRIVACY IN THE
WAR ON TERROR: ILLUSION OR NECESSITY?

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Since the beginning of the “War on Terror,” a controversy has erupted over privacy protection. Even though America has historically experienced wartime restrictions on freedom, the threat to the long term sanctity of privacy posed by the new operational ethos of our government’s anti-terrorism strategy is problematic. The arguments for what is essentially an authoritarian agenda are compelling because of the preventive requirement of anti-terrorism, which is different from the traditional arrest-incarcerate law enforcement response. However, society must recognize that historically governments fail to wield their new found authoritarian capabilities legitimately.

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Balancing law enforcement's legitimate need for less restriction on information access with the American society's expectation of privacy is a formidable mission. The war on terror is a uniquely unconventional conflict that America is fighting with very limited effective resource and cooperation. The harsh reality of this unconventional war requires our intelligence, law enforcement, and military personnel to employ methods of acquiring information that have an unparalleled ability to compromise individual liberty. Liberty is a fragile commodity that is most vulnerable during times of immense national fear. However precious liberty may be, the fact that it means nothing to the dead victim of a terrorist attack firmly bolsters the argument for decreased law enforcement restriction. Society must prioritize the freedoms guaranteed by the constitution over law enforcement's dubious claim that it cannot do its job without breaking the law. The integrity of laws and the stability of the justice system become irreparably compromised when citizens allow their government to treat them as negotiable or extenuating. If the government could somehow limit its encroachment on individual liberties by preventing modest instances of privacy violation from snowballing into severely authoritarian surveillance, then the policy could be justified by the circumstance. Unfortunately, history has proven that it is unrealistic and naive to expect government to respect the limits of invasive privileges. Society can not afford to mutate the natural evolution of justice by setting the precedent of ignoring provisions of the Bill of Rights, however dire the necessity may appear.

America is not unfamiliar with wartime curtailment of freedom. Presidents Lincoln, Roosevelt, Truman, Wilson, and Adams all championed restrictions ranging from suspending habeas corpus and other specific first amendment provisions to interning thousands of innocent American citizens. The difference was that these "restrictions have been understood to be temporary" responses to ephemeral threats whereas the war on terror is a permanent conflict (Smith 3). Biased and overtly patriotic logic that asks "why should we allow enemies to annihilate us simply because we lack the clarity or resolve to strike a reasonable balance between a healthy skepticism of government power and the need to take proactive measures to protect ourselves from terrorism," lacks both a mature understanding of how fragile freedom is historically and that the precedent the outcome will set has the potential to alter the landscape of freedom indefinitely (Burlingame 3). The government's willingness to push the limits of its authority, and its subsequent reliance on accusing pro-liberty critics of being an unpatriotic hindrance to the national security effort should alarm the public. John Aschcroft's statement "to those who scare peace-loving people with phantoms of lost liberty, my message is this: Your tactics only aid terrorists — for they erode our national unity," exemplifies the indoctrination tactics employed by the advocates of authoritarianism (Masci 2). A government policy that is just shouldn't rely on undisguised guilt-tripping to convince the public of its legitimacy.

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The assertion that the only way to preserve freedom is by violating it is inherently illegitimate and paradoxical. Despite the government's claim otherwise, the anti-terror measures enacted and practiced since 9/11 essentially "abridge fundamental constitutional rights ranging from due process to the attorney-client privilege," (Masci 2). The early Anti-Federalist opposition to the Constitution argued that the proposed document provided too much potential for the federal government to abuse its power. Federalists compromised by accommodating the Bill of Rights. It is difficult for modern society to imagine life without the protections of the Bill of Rights because they are so vital and fundamental to the function of democratic government. Society takes for granted that "the Constitution does not need protection when its guarantees are popular, but it very much needs our protection when events tempt us to, 'just this once,' abridge its guarantees of our freedom," (Masci 1). Fighting terrorism cannot be effectively accomplished through the democratic process. It requires the need to make real-time decisions to defuse volatile situations that would be crippled by the delay inherent to the democratic process. This fact should only support decreasing the amount of red tape that prevents swift law enforcement action, (which has been accomplished by creating the Homeland Security Department), not increasing the capabilities and decreasing the oversight of invasive practices. Today's level of technological advancement has provided the government an unparalleled ability to use technology against its citizens in a devastatingly effective and practically unlimited way. The government didn't benefit from the ability to see all the violations of the Alien and Sedition Acts that took place daily during interpersonal communication. This can hardly be said about today's age of digital satellite surveillance. The authorities do not need to put "bugs" into the wall behind the picture hanging on Winston Smith's wall; they only need to point a satellite at his house. It is no illusion that "under U.S. Signals Directive 18-the rule book that governs the NSA's intercept practices-both the NSA director and the attorney general have considerable latitude for warrantless surveillance... after Sept. 11, the 2001 Patriot Act made certain FISA sections even more expansive," (Vest 4). The public stands to lose more today than it ever has because our government has never been more powerful, capable, and alarmingly eager to chip away at freedom.

The argument that drastic circumstances call for drastic measures is not illegitimate. Both proponents of civil liberties and their pro-authority counterparts have the public's best interest in mind, and this fact makes determining which side is right very ambiguous. Despite this fact, there is "a certain instinctive reluctance in man to accept the idea that liberty and authority can be reconciled," because finding and upholding that balance is a veritable political high-wire exercise (Carr 5). Periods of peace and relief that lacked such an imminent threat found it easier to reach and maintain that equilibrium, but the status quo today could not be further from that scenario. Certain restrictions on behavior don't truly restrict an absolutely imperative human need or right. Privacy, however, is not included among those. This is understandable given that the liberty in question is as fundamental as the expectation and right to privacy. Life in democratic society requires an individual sacrifice of absolute freedom and consent to authority for the purpose of civil order. "From the time of the caveman to the civilized man of the twentieth century, it has been clear that authority can be used to foster liberty," a potentially very dangerous idea because of the implicit potential for authoritarian excess (Carr 5). The right to privacy does not exist as an object that can be traded in varying doses and degrees. It must remain an absolute freedom because it is recognized by the constitution as imperative to free life under democratic government. "In our own country today there is good reason to see in extreme forms of loyalty-testing a real threat to personal freedom that cannot possibly be justified as part of a normal, necessary equilibrium between authority and liberty," and the precedent for further Orwellian authoritarianism set by "loyalty-testing" policies such as domestic surveillance should be reason enough to oppose any such program (Carr 11). It is true that "liberty in the modern state is dependent upon authority for its existence," but society must be unflinchingly insistent and unified in declaring and enforcing the limits of that authority (Carr 9).

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It's impossible to predict whether a domestic spying program that in all likelihood really is preventing terrorism could spiral out of control into the type of Orwellian authoritarianism that some people fear is inevitable. Deciding between potentially sacrificing the lives of people who will be killed by terrorists by not wire-tapping or desecrating the ideal of freedom by illegally eavesdropping on Americans and preventing terrorism is an uninviting prospect. Society's laws are supposed to deter behavior, but in reality all they do is punish. The government doesn't need to eavesdrop on drug dealers or bank robbers in order to prevent them from committing crimes because the overall effect of their actions isn't significant enough to warrant it. If a bank robber or drug dealer breaks the law, society doesn't really lose on a grand scale because the criminal goes to jail and the case is closed. The goal of laws against terrorism is to deter, not to punish – and this places a much higher burden of responsibility on law enforcement because terrorists are highly motivated and determined people. The American people believe that it is not enough to merely bring the perpetrators of terrorism to justice after they have killed thousands of innocent people; they demand that the government prevent terrorism. The government's response that it cannot meet that demand without recalibrating the balance between security and freedom is compelling. However compelling it may be, there is no way to predict how the tactics the terrorists use will change and require law enforcement to violate more freedoms more frequently. There is no doubt that "new terrorist attacks would make Americans even more supportive of tough, new measures to fight terrorism because there's always this great push for new authority when something dramatic happens," (Masci 5). If the government could prevent terrorism indefinitely and maintain the current level of freedom intrusion, society would really not lose too much. The reality is that something indefinite will inevitably change, evolve, and require a more comprehensive law enforcement response (i.e. more spying).

America has come to a grand impasse in domestic policy. We must decide between a dangerous precedent of hypocrisy that will guarantee safety from terror, or unadulterated freedom that will guarantee vulnerability. Perhaps terrorism really is so anomalously capable of undermining our way of life that we have no choice but to contradict our Constitution by violating the same freedoms that we stand for. In the real world of counter-terrorism, it is irrational and unacceptable to completely ban certain practices in moments of irrefutably dire need. Situations in which people are spied on or tortured must happen to prevent awful things from happening, but these actions should never be *in policy*. Acknowledging that some of our freedoms are ideals that we were lucky enough to have enjoyed the full extent of for as long as we did, and now have be curtailed may be the only way to guarantee safety. Ben Franklin's immortally famous quote "those who should sacrifice liberty for security deserve neither," is too inherently simple to lend appropriate advice on how to navigate this complex situation. Americans deserve both liberty and security. Any attempt to convince us that the freedoms we've enjoyed as the citizens of this country are now too unaffordable and too much of an inconvenience for our government is an attempt to capitalize on our sense of vulnerability, and advance a duplicitous agenda. The dictates of the Bill of Rights are neither divinely enforced nor self-enforcing, and for this reason alone we must not consent to the degradation of the most comprehensive and enlightened protection of individual freedom ever constructed.

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