

Scientific Integrity Promotes the Best Science and Informs  
the Public of Regulatory Policy Decisions

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## **Abstract**

Scientific integrity policies and procedures promote academic and institutional environments where high quality and objective science can be conducted and results communicated to the public. Scientific integrity includes best practices for scientists as well as those who supervise, manage, or influence scientific activities and communications. Scientific integrity policies assure that research is objective whether or not it is used in evidence-based policy decisions. These policies remain vulnerable to those who would suppress, manipulate, or discredit scientific evidence to promote their own interests. The public is best served when scientific integrity policies are embraced and when the rationale behind policies and regulations are openly communicated. We summarize scientific integrity principles, document how different administrations have embraced or disregarded them, and illustrate how policies that may not align with scientific evidence should be communicated to the public. We also provide recommendations for how to strengthen scientific integrity practices, thereby securing objectivity and accurately informing the public on the rationale for policy and regulatory decisions.

## **Key Words**

scientific integrity, evidence-based policy, public health, environment, suppression, manipulation, interference

## **Introduction**

Evidence from environmental and public health research remains vulnerable to those who would suppress, manipulate, or discredit it to promote their own interests. As environmental scientists and policy experts, we are all too familiar with organized efforts to discredit scientific evidence or the reputations of scientists when research results threaten someone's bottom line. [1,2] Such attacks may imply, without justification, that a scientist has committed misconduct by intentionally falsifying or fabricating data, claiming another's work as their own, or disregarding ethical regulations that protect animal and human research. While such misconduct does occur, it seems remarkably uncommon. Scientists are well aware that allegations of misconduct lead to rigorous investigations having serious consequences. On the other hand, besmirching scientists or research results have few, if any, consequences. This imbalance favors those who would try to undermine the credibility of scientists or scientific evidence.

We believe that the best available research is conducted within an environment where objectivity is maximized. The scientific method demands that research be conducted in a manner where a hypothesis can be validly tested. While we prefer that environmental and public health policies are based on the best available science, we also recognize that policies may be formulated based on factors other than scientific evidence. Environmental policies are always enhanced when government agencies have access, without constraint, to the best available science. However, scientists and their research results need greater protection. In this paper, we summarize scientific integrity principles and document how administrations have embraced or disregarded such principles. We explore the boundary between scientific evidence and policy formulation, highlighting the fact that policies and regulations may legitimately diverge from available scientific evidence. In such circumstances, we believe it essential to directly communicate the rationale for divergence rather than undermine the science. We provide recommendations for strengthening scientific integrity principles into practice, thereby securing objectivity and protecting the public and the environment from harm.

## **Good Work has Already Begun**

The America Competes Act of 2007 [PL 110-69 Section 109] required the “*issuance of an overarching set of principles to ensure the communication and open exchange of [scientific] data and results ... and to prevent the intentional or unintentional suppression or*

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*distortion of such research findings.”*[3] In response, a 2009 Executive Memorandum was issued declaring that *“science and the scientific process must inform and guide [policy] decisions. ... The public must be able to trust the science and scientific process informing public policy decisions. Political officials should not suppress or alter scientific or technological findings and conclusions.”*[4] The Office of Science, Technology, and Policy (OSTP) issued a memorandum in 2010 providing several principles for strengthening scientific integrity in Federal agencies.[5] Among the foundations of scientific integrity in government were: 1) ensuring a culture that encouraged open, honest investigation and open discussion; 2) shielding of scientific data and analyses from inappropriate political influence, including the suppression or alteration of scientific or technological findings; 3) selecting candidates for scientific positions based primarily on scientific knowledge, credentials, experience, and integrity; 4) requiring that scientific data undergo independent peer review by qualified experts; and 5) setting clear standards for governing conflicts of interest. In addition, the memorandum addressed public communications, use of federal advisory committees, professional development, and implementation. Interestingly, the OSTP Memorandum does not address the 2009 Executive Memorandum language that *“Each agency should have in place procedures to identify and address instances in which the scientific process or the integrity of scientific and technological information may be compromised.”*

### **More Work is Needed**

In 2019 the Government Accountability Office (GAO) recommended agencies *“address specific issues related to educating staff, providing oversight, monitoring and evaluating policy implementation, and developing procedures to identify and address policy violations.”*[6] OSTP has since released two reports. [7,8] The first, *Protecting the Integrity of Government Science*, evaluated current practices and policies across nearly five dozen agencies and proposed needed improvements. The second report established a framework for revised scientific integrity policies and procedures.

To date, federal scientific integrity policies and procedures are backed only by Executive Orders that can be modified or eliminated by changing presidential administrations. Congressional efforts to strengthen scientific integrity policies and procedures by amending the America Competes Act have been repeatedly introduced with bipartisan support but have yet to

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pass. Until the principles of scientific integrity become law, the American public must rely on each successive administration to ensure that federal decision-making is based on rigorous and independent research.

### **Scientific Integrity at EPA**

EPA protects people's health and the environment by using its authority conferred by over twenty different environmental protection laws, including the Clean Air Act, the Safe Drinking Water Act, the Clean Water Act, the Comprehensive Environmental Response, Compensation, and Liability Act, the Resource Conservation and Recovery Act, the Federal Insecticide, Fungicide, and Rodenticide Act, and the Toxic Substances Control Act. Regulatory decisions are based on policy considerations and the best scientific information about the risks and costs of exposure to environmental contaminants. The agency's scientific integrity [SI] policy, quality assurance, and independent peer review rank among the best across all federal agencies.[9-11] Both Republican and Democratic EPA administrators have issued memos supporting the agency's SI policy. All employees, including political appointees, are required to follow the SI policy when engaging in, supervising, managing, or communicating scientific information. The policy specifically calls upon political appointees to not suppress or alter scientific findings. At the same time, the policy recognizes a distinction between science information and policy decisions. It recognizes that policy makers weigh the best available science along with additional factors such as practicality, economics, and societal impact.

Violations of scientific integrity provide disturbing examples of what can happen when a commitment to scientific integrity goes seriously awry. Changes in presidential administrations have impacted EPA support of scientific integrity policies and the proposed formulation of science-based regulations that protect the environment and people's health.

### **EPA Scientist Surveys**

We compared the findings of two EPA scientist surveys regarding implementation of EPA's SI policy.<sup>1</sup> The first survey was conducted in 2016 by EPA's Scientific Integrity Official (SIO), documenting employee experiences from 2013-2015.[12] A second survey conducted in

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<sup>1</sup> A third survey was conducted in 2021. It cannot be compared to the two earlier surveys because the answer categories differ, and the employee strata used in that survey are not mutually exclusive from one another.

2018 by Office of the Inspector General (OIG) was undertaken for comparison purposes using identical or similar questions and responses.[13] The OIG survey documented employee experiences reflective of 2017-2018. The 2016 survey focused on employees who self-reported spending at least 25 percent of their time conducting, utilizing, communicating, or managing science. The 2018 survey focused on employees and contractors (not included in the 2016 survey) who self-identified as working in or supervising science. Employees were prompted to identify specific SI failings in the 2018 survey, but not in the 2016 survey. We report differences in the proportions of responses across the 2016 and 2018 surveys and conduct statistical testing using a Chi square calculator for 2x2 tables on the differences.[14]

Response rates for both surveys were low (Table 1). There was a 16% drop in the 2018 survey response rate compared to 2016. A greater percentage of respondents who engaged in science-related activities reported being aware of the SI policy, its contents, and how to report a loss of scientific integrity in the 2018 survey compared to the 2016 survey. Every other comparable element in 2018 demonstrates a drop in employee confidence in leadership and a perceived decrease in support by leadership of SI principles. Scientists reported that management support for their findings decreased from 60% to 53% across administrations. Scientists reported their agreement with characterization of their work in EPA publications dropped from 69% to 58%. Fear of retaliation against scientists climbed from 28% to 43%. The greatest reported changes were seen in scientists' confidence to report a violation of scientific integrity to someone other than their first line supervisor, which fell by ten percent. Confidence in reporting a violation of scientific integrity fell 35% for union officials, 46% for the SIO, 49% for the IG, and 61% for a deputy SIO. All observed differences were unlikely to be the result of chance ( $p < 0.01$ ). The 2018 OIG survey directly asked scientists about concerns that leadership had increasingly undermined SI principles. Scientists and science managers reported interference with science by a manager or senior agency leader (n=251), suppression or delay of release of a scientific report or information (n=175), conflicts of interest (n=106), data quality concerns (n=99), research findings altered or suppressed for other than technical reasons (n=368), and interference, suppression, or censoring the release of scientific information to the public (n > 700).

### Office of the Inspector General Reports

We also reviewed the summaries of all completed OIG investigative reports of events occurring from January 2013 through January 2021 to identify those revealing suppression or manipulation of scientific information. The OIG released five reports verifying scientific integrity violations between January 2013 and January 2021. EPA scientists' concerns about scientific integrity in the 2018 survey were validated by the fact that all five IG reports concerning intentional SI violations took place between 2017 and 2021. The IG findings are described below:

- In 2018, political appointees substantially understated some risks and failed to acknowledge others in extending registrations for three dicamba pesticide products.[15] The IG found that political appointees insisted on using the registrant's data instead of EPA's data, made unjustified changes to the product reviews, and deleted several sections of the benefits and impacts analysis.
- In 2019, EPA undermined transparency and the scientific credibility of the cancer assessment process in unjustifiably downgrading its cancer classification of the pesticide 1,3-Dichloropropene.[16] The IG concluded that *"the EPA's resulting cancer classification downgrade could lead to significant increases in exposure levels to humans and affect the pesticide's application rate and level of personal protective equipment required by applicators."*
- In 2020, the EPA Administrator did not allow the agency's scientists to co-write the Safer Affordable Fuel Efficient (SAFE) Vehicles Rule with the National Highway Traffic Safety Administration (NHTSA), setting fuel economy and carbon dioxide standards for passenger cars and light trucks. [17] The OIG found that the *"... approach bypassed aspects of the EPA's normal rulemaking process ... [and] circumvented Office of Air and Radiation technical personnel feedback prior to the final rule being circulated for interagency review."* EPA's scientists were relegated to the role of after-the-fact reviewers, and their comments identifying errors and inaccuracies were not placed into

the docket.

- In 2020, unjustified changes were made to the Long Chain PFAS Significant New Use Rule after it had been signed by the EPA Administrator but before it was published in the *Federal Register*. [18] An unidentified person in the White House requested that a political appointee at EPA remove specific language. The change was made in the final rule published in the *Federal Register*. The IG concluded that “*the EPA did not meet transparency expectations and risked compromising the public’s trust in the rulemaking process.*”
- In January 2021, EPA released a toxicity assessment for perfluorobutane sulfonic acid (PFBS) that was not based on transparent, objective science. [19] The IG found that during final clearance of the assessment, EPA “... *did not follow the typical intra-agency review and clearance process during the development and publication. ... During final clearance, a political appointee directed that a last-minute review be conducted ... resulting in a scientific disagreement ... and significant changes to the near-final, peer-reviewed work product. ... While EPA staff expressed scientific integrity concerns about the last-minute review and risks to public health, the EPA lacked policies and procedures to address these concerns.*”

### EPA Administrator Actions Undermining Scientific Integrity

Two actions taken in 2017 by the EPA Administrator undermined objective science at the agency. Both actions had previously been introduced in the House of Representatives as proposed laws but were never passed by the Senate. [20,21]

The first action was the Administrator’s rule, *Strengthening Transparency in Pivotal Science Underlying Significant Actions and Influential Scientific Information*. [22] The rule prohibited EPA scientists from using animal toxicity and human epidemiologic studies in environmental rule-makings if the public did not have access to all the raw data, despite existing laws preventing access to participants’ private medical data or confidential business information. The rule blocked EPA scientists from considering key studies that have for decades supported effective regulations protecting the air people breathe and the water people drink. The rule



weakened scientific integrity by removing from consideration the best available science for decision-making. It also encouraged political interference by giving only the EPA Administrator or his/her delegate the authority to exempt scientific studies from the rule. The rule received more than 990,000 mostly negative public comments, indicating that the rule weakened the public's trust in EPA's future science-based policy. Those pressing for this rule asserted, without evidence, that data that were not, or could not be, "released" were "secret" and potentially subject to "inappropriate manipulation." Proponents of the rule argued that reconsenting study participants from historical research could be undertaken in order to release personal medical data, thereby allowing use of prior research, but such arguments were disingenuous at best. Reconsenting participants would be completely impractical; in addition to being unreasonably expensive, it would require new approvals from institutional review boards, and if permitted, cause a change in the study participants due to the loss to follow-up or refusal to consent. EPA finalized the rule on January 6, 2021, without evidence of its need or utility, and with compelling unanswered questions about its implementation. On February 1, 2021, the rule was overturned by the federal district court on the basis of EPA's inappropriate reliance on the legal authority under the Housekeeping Rule. [23]

The second action taken by the EPA Administrator was to increase potential conflicts-of-interest in favor of the regulated community by prohibiting scientists currently in receipt of or directly benefiting from an EPA grant from sitting on EPA's advisory committees [24] This action prevented scientists in academia from providing expertise in an advisory role to EPA. Proponents of this action claimed, without evidence, that scientists having grants were dependent upon EPA and could not provide independent advice to the agency. At the same time, industry scientists were encouraged to become advisory committee members, despite their financial dependence from the regulated community. Lawsuits were filed against this action, and the policy was rejected on appeal, based on the fact that EPA grantees can provide objective and unbiased advice on matters unrelated to their grants.[25]

### **Alternating Support and Disregard for Scientific Integrity at EPA**

The three most recent presidential administrations have alternated between supporting scientific integrity and prohibiting political appointee interference in evidence-based policies to diminishing scientific integrity and allowing political appointee interference in science. While

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violations of scientific integrity have occurred in every Administration, excessive violations occurred from 2017-2020. That administration was unique in political appointee interference, including at EPA, by suppressing the use of best available science from rulemaking and disenfranchising academic scientists from participation on federal advisory committees. Additional violations of scientific integrity were widespread. [26,27]

In contrast, the administrations controlling the executive branch of government during 2012-2016 and 2021-2024 strengthened scientific integrity, blocked political interference with science, and strengthened public trust in science. Restoring scientific integrity became a central theme for the 2021-2024 administration. A Presidential Memorandum issued to all Executive Branch agencies on January 27, 2021 declared that “*evidence-based decisions would be guided by the best available science and data, scientific findings should never be distorted or influenced by political considerations, and that when scientific or technological information is considered in policy decisions, it should be subjected to well-established scientific processes, including peer review.*”[28] The following year, OSTP issued a report adding five new core principles to the concept of scientific integrity: dissent, whole of government, science at the policy table, transparency in sharing science, and accountability.[29] The report recognized that “*violations of scientific integrity undermine science and ultimately harm decision making and public trust in government, distort the science itself, and hamper effective decision-making by ignoring, undervaluing, or misinterpreting relevant scientific findings. While efforts to protect scientific integrity cannot fully address public skepticism about science, they are an essential ingredient in building public trust in Federal science and decisions guided by it.*” Many agencies, including EPA, have updated and published revised SI policies.

The politicization of science is not limited to the federal government. It has also been documented in state and local governments with multiple examples of suppression and distortion of research and data, intimidation and censorship of experts, and sidelining and falsification of science in decision-making.[30]

### **On the Horizon**

Scientific integrity across the federal landscape could be tested under the new administration. The Heritage Foundation’s most recent “Mandate for Leadership” (Mandate) provides a roadmap for a future administration that chooses to undermine scientific integrity.[31]

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Its recommendations discredit government scientists and promote political interference in science. Career public servants, including scientists, are blamed for the policymaking work done by the bureaucracies of all federal departments, agencies, and millions of employees. It would elevate the Director of OSTP, a political appointee, to a position that would “*balance out agencies like ... the Environmental Protection Agency.*” Its recommendations use the same language previously used to rationalize the removal of academic scientists from EPA’s Federal Advisory Committees and to justify the rule to Strengthen Transparency in Pivotal Science. In a stunning break from advocating for science, the Mandate calls upon the next EPA Administrator to appoint and empower a Science Adviser along with no fewer than six senior political appointees, with expertise in management, oversight, and executive skills, as opposed to personal scientific credentials, to oversee and reform EPA research and science activities. The Mandate also calls for diminishing the role of EPA’s Office of Scientific Integrity and controlling independent peer reviews by scientific experts by placing a prohibition on peer review activities by objective third parties, including the National Academy of Sciences, Engineering, and Medicine.

On November 14, 2024, Representative James Comer, Chair of the Committee on Oversight and Accountability of the House of Representatives sent letters to the Secretary of Health and Human Services and the Administrator of the Environmental Protection Agency.[32,33] He questioned if scientific integrity efforts were, contrary to their stated purpose of promoting the best available and objective science, nothing less than a conspiracy between the far-left and the administrative state to interfere with executive authority of future presidential administrations and enhancements of the power of unelected Federal officials to influence or stymie policy decisions.

Government and academic institutions, along with professional societies, need to develop a culture that promotes and protects scientific integrity. Research should be conducted in an environment free from intimidation or insistence on findings that only support a predetermined outcome. Public access to research findings and data sets is another essential element for building and restoring people’s trust in government research. To accomplish these goals scientific integrity policies must:

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- Recognize an appropriate balance between science assessments and other factors that influence policy development. Establish criteria for policies and/or regulations that are evidence-based or based upon other factors, such as cost or societal values.
- Inform the public of how science and other factors are used in establishing policies and regulations.
- Maintain and promote independent peer review and quality assurance, engaging qualified, objective, technical experts who embrace transparency and consistency, using publicly available policies and procedures for collecting, analyzing, and clearing scientific information for public release.
- Prevent political appointees and others from suppressing scientific products or intimidating scientists. Create effective mechanisms that enable political appointees to become familiar with the science yet insulate scientific evidence from political interference.
- Create and maintain records to track compliance of scientific integrity policies.
- Assure appropriate public access to the results of federally funded scientific research. Protect scientific and ethical standards in conducting, supervising, utilizing, and communicating science.
- Define *best available science* as science that is reliable and unbiased and data accessibility determined by federal agency guidelines at the time of data collection and limitations based on privacy, ethical, intellectual property, data use agreements, and Institutional Review Board stipulations.
- Assure that research grants do not automatically qualify as a financial *conflict of interest*.
- Appoint science advisors and senior science executives on the basis of their scientific and leadership credentials with term limits that do not correspond with the election cycle.
- Require that research grants, contracts, and cooperative agreements be awarded to institutions with robust scientific integrity policies.

Scientists in every discipline should conduct their work without fear of retaliation, manipulation, or suppression. Otherwise, scientists will be driven away from public service, causing a loss of institutional knowledge and disruption of research and scientific leadership. While the consequences for scientists who knowingly commit scientific misconduct (e.g.,

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falsification, fabrication, and plagiarism) are well-established, no parallel consequences currently exist for individuals who interfere with scientific integrity.

Executive orders can be discarded from one administration to the next. Actions are needed to assure that robust SI policies and procedures are institutionalized and enforced across agencies and institutions receiving public funding for research. Scientific professional societies should establish SI policies that are embraced by their members. Until the principles of scientific integrity become law, the American public must rely on each successive administration to ensure that federal decision-making is based on rigorous and independent research. Systematic attacks of federal science and scientists will continue until Congress amends the America Competes Act requiring SI policies be established, implemented, and enforced at all federal agencies. A novel approach, worthy of consideration and evaluation, is the one recently taken by the American Federation of Government Employees Council 238.[34] Members of the union voted to approve a four-year contract that includes a scientific integrity clause.[35]

The public is only protected when government agencies have access, without constraint, to the best available science, and the public will only trust government action when it is confident regulations and policies are based on a rigorous scientific process that includes quality assurance, independent peer review, and scientific integrity. Actions taken now to restore public confidence in government science and strengthen science infrastructure will protect people's health and the environment, and the scientific soundness of tomorrow's actions.

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All authors are retired senior scientists/executives of the U.S. EPA. All authors worked exclusively for the federal government across different administrations for thirty or more years conducting research, developing policies and guidelines, or promoting evidence-based regulations. All authors currently volunteer with the Environmental Protection Network. The manuscript reflects the authors' opinions.

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- 33) HHS-Scientific-Integrity-Letter-1114243.pdf  
<https://oversight.house.gov/wp-content/uploads/2024/11/HHS-Scientific-Integrity-Letter-1114243.pdf>
- 34) E. Wagner, EPA Union Ratifies contract to protect employees’ scientific integrity. Government Executive – Workforce. June 4, 2024
- 35) American Federation of Government Employees Council 238.  
[https://afge238.org/wp-content/uploads/sites/46/Scientific-Integrity-TA\\_fully-signed.pdf](https://afge238.org/wp-content/uploads/sites/46/Scientific-Integrity-TA_fully-signed.pdf)

Table 1: Scientist responses to the 2016 Scientific Integrity Official (SIO) and 2018 Inspector General (IG) Scientific Integrity Surveys, EPA<sup>2</sup>

Question	2016 SIO	2018 IG	chi square <sup>3</sup>
Overall response rate	39% (5763 of 14906)	23% (4320 of 18377)	895
Respondents involved in science	65% (3793 of 5763)	71% (3083 of 4320)	35
SI Policy awareness	90% (3409 of 3791)	93% (3987 of 4265)	34
SI Policy content awareness	55% (2095 of 3791)	68% (2892 of 4265)	134
Management support of defensible but controversial scientific findings	60% (yes) (1974 of 3311)	53% (agree) (1377 of 2590)	24
Openly express scientific opinions without fear of retaliation	72% (yes) (2513 of 3489)	57% (agree) (1541 of 2720)	159
Scientist-author's review, correct, and approve Agency document before public release	69% (yes) (1938 of 2816)	58% (agree) (1190 of 2069)	66
Clearance procedures are consistent	59% (1145 of 1927)	54% (975 of 1797)	10
Clearance process is transparent	53% (1069 of 2005)	43% (818 of 1902)	42
Timely release of scientific documents	53% (1536 of 2923)	44% (816 of 1850)	32
Knows how to report allegations of a loss of SI	41% (1559 of 3772)	50% (1385 of 2798)	43
With whom are you likely to discuss a concern about a loss of scientific integrity	Yes/No %	Yes/No %	
1st line supervisor	3338/439 88%	2179/609 78%	124
SIO	2921/758 79%	940/1848 33%	1375
Deputy SIO	2783/875 76%	431/2357 15%	2325
IG	2440/1217 66%	485/2303 17%	1552
Union	1988 1690 54%	531/2257 19%	817

<sup>2</sup> In the 2016 survey, scientists include those who self-reported spending at least 25 percent of their time conducting, utilizing, communicating, or managing science. In the 2018 survey, scientists include those who self-identified working in or supervising science.

<sup>3</sup> Chi Square Calculator for 2x2. Social Science Statistics.  $p < 0.01$