STATEMENT OF
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to the SUBCOMMITTEE ON RESEARCH AND TECHNOLOGY & SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT
of the COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
of the UNITED STATES HOUSE OF REPRESENTATIVES

HEARING on
Scientific Integrity in Federal Agencies
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My testimony focuses on the importance of scientific integrity policies within federal agencies that fund, conduct, or oversee research and the current status of these policies. In an appendix I offer specific comments on H.R. 1709, the Scientific Integrity Act.[1] My biography is included at the end of this statement. This testimony is dedicated to the memory of Radford Byerly, Jr., 1936-2016, who was a staff member of the House Committee on Science, Space and Technology from 1978-1987 and from 1991-1993 served as the committee's staff director.

**Four Take-Home Points**

1. Scientific integrity legislation is important and necessary. Careful attention is needed to ensure that such legislation integrates well with existing, related policies;
2. It is essential to distinguish science advice from policy advice, and both types of advice should fall under scientific integrity policies;
3. Individual researchers and studies are essential to the process of science, but science best guides and informs policy when it has been assessed by scientific advisory bodies to characterize the current state of knowledge on a particular topic or to present possible policy options – including perspectives on uncertainties, disagreements, areas of ignorance;
4. Good science and policy advice from experts also results from the upholding of scientific integrity by elected and appointed officials.

**Elaboration of the Four Take-Home Points**

*1. Scientific integrity legislation is important and necessary. Careful attention is needed to ensure that such legislation integrates well with existing, related policies.*

Under the administration of president George H. Bush, controversies involving federal science and scientists prompted broad discussion of scientific integrity in federal agencies, culminating in a short section included in the 2007 America COMPETES Act, Section 1009. Under the Obama Administration, the Office of Science and Technology Policy (OSTP) further developed guidelines

[1] H.R. 1709 seeks to amend the America COMPETES Act to establish certain scientific integrity policies for Federal agencies that fund, conduct, or oversee scientific research, and for other purposes. My comments herein are with respect to the version of the bill introduced 13 March 2019. The America COMPETES Act (P.L 110-69), can be found at: https://www.govinfo.gov/content/pkg/PLAW-110publ69/pdf/PLAW-110publ69.pdf. H.R 1709 seeks to amend section 1009 of P.L. 110-69.

for the implementation of science integrity policies. These worthwhile efforts to develop and implement scientific integrity polices for federal agencies have not been continued under the Trump Administration. Given the critical importance of scientific and technological analyses to matters of public policy, it is important that Congress continue the development and formalization of scientific integrity policies.

Such policies are all the more important because science – and matters of scientific integrity – have become increasingly popular arenas for partisan battles. If there is one topic where bipartisanship should thrive, it is scientific integrity. However, scientific integrity policies remain a work in progress.

In December, 2016 a review of scientific integrity policies in 24 federal agencies conducted for OSTP[2] found inconsistencies in definitions, procedures and implementation across the government. The review found that the concept of "scientific integrity" was undefined by OSTP and in most agency scientific integrity policies. Under agency scientific integrity policies, the review also found inconsistencies in or a lack of direction for:

- the definition of covered individuals;
- what research and communication activities are included under the policies;
- assignment of responsibility for oversight and implementation of scientific integrity policies within the agency;
- the relationship of scientific integrity policies and other relevant policies, "such as data quality, research misconduct, disputes over authorship, protection of human subjects, conflict of interest, or fraud, waste, and abuse";
- the relationship of scientific integrity policies and issues of whistleblower protection;
- implementation of scientific integrity policies in the context of inter-agency research;
- responses to alleged violations of conflict of interest policies.

An April, 2019 GAO review of 9 federal agencies under the Trump Administration similarly found considerable variability in the implementation of scientific integrity policies implemented under the Section 1009 of the America COMPETES act and policy directives of 2010 by the Obama Administrations OSTP. Of note, the directives on scientific integrity promulgated by the Obama Administration no longer appear on the OSTP website and are available only through the archive of the Obama Administration's website.

Specifically, GAO found in its review:

- 7 of the 9 agencies educate staff on matters of scientific integrity;
- 8 of the 9 agencies have a designated official to oversee implementation scientific integrity policies;
- 4 of the 9 agencies monitor and evaluate implementation of their scientific integrity policies;

[2] Institute for Defense Analyses' Science and Technology Policy Institute, Review of Federal Agency Policies on Scientific Integrity (Washington, D.C.: December 2016). https://www.ida.org/-/media/feature/publications/r/re/review-of-federal-agency-policies-on-scientific-integrity/d-8305.ashx

- 7 of the 9 agencies have specific procedures for identifying and addressing alleged violations of their scientific integrity policies;
- In 6 of the 9 agencies employees have reported alleged violations of scientific integrity policies (ranging from 1 at ARS to 70 at EPA, of which 18 were upheld as violations).

GAO offered 10 recommendations to the 9 agencies, all of which were accepted. The GAO review clearly indicates that a high degree of variability exists in the implementation of scientific integrity policies of the federal government and that there exists considerable room for improvement in policy and implementation.

Congressional scientific integrity legislation is presently needed to:

(a) complete the task of developing scientific integrity policies for federal agencies that was initiated more than a decade ago;
(b) to formalize scientific integrity policies in law and place them explicitly under Congressional oversight; and
(c) to standardize definitions, policies and procedures across federal agencies (while recognizing also the need for flexibility in certain agency contexts).

H.R. 1709 offers a good start toward addressing these needs. An appendix to this testimony offers section-by-section comments and recommendations on the proposed bill with a focus on harmonizing the bill's language and directives with existing policies related to scientific integrity.

*2. It is essential to distinguish science advice from policy advice, and both types of advice should fall under scientific integrity policies.*

Science, broadly conceived, refers to the systematic pursuit of knowledge. Such knowledge of direct relevance to policy is typically related to trends (what has happened?), conditions (what is happening now?) and projections (what might happen in the future?). To assess trends, conditions, projections requires use of the tools and techniques of science, including in particular empirical observation and theoretical development, often focused on understanding mechanisms of causality, various sources of uncertainty and areas of ignorance. Science advice is the application of the tools and techniques of science to answer questions relevant to (or perceived to be relevant to) policy.

A policy is simply a decision, a commitment to a course of action. Policy advice seeks to answer the question: What might or should we do? Because decision making is focused on attaining goals, policy is inevitably political because people involved in and affected by decisions often disagree about what goals we should collectively seek to achieve and/or the means through which to employ in seeking to reach goals. Policy advice can take the form of guidance that seeks to limit the scope of options available to decision makers or to clarify or expand that scope of options.[3]

[3] In the jargon of my book, **The Honest Broker: Making Sense of Science in Policy and Politics** (2007, Cambridge), these positions are called "issue advocacy" (which seeks to reduce options, typically to a single preferred course of action) and "honest brokering" which seeks to clarify or to expand the scope of options available to policy makers. In practice, these characterizations are best thought of as end points on a spectrum of policy advice.

Procuring science advice and policy advice requires different processes and different types of expertise (and public engagement), but as both rely on expertise and are legitimized by public trust. Thus both types of advisory processes should be conducted with scientific integrity.

Implementation of scientific integrity policies will be facilitated by explicitly distinguishing science advice from policy advice, and the different processes and expectations for each.[4]

3. *Individual researchers and studies are essential to the process of science, but science best guides and informs policy when it has been assessed by scientific advisory bodies to characterize the current state of knowledge on a particular topic or to present possible policy options – including perspectives on uncertainties, disagreements, areas of ignorance.*

Scientific integrity policies, such as proposed in H.R. 1709 and currently contained in America COMPETES Act are only small parts of a healthy political ecosystem for securing expert advice to inform policy. Research conducted and communicated with integrity is a necessary element of this ecosystem, but it is far from sufficient.

The volume of scientific production requires assessments to inform policy. Consider that according to the National Science Foundation, U.S. federal government scientists across all agencies published almost 20,000 science and engineering articles in 2016.[5] If each publication were to be accompanied by a press release, that implies about 55 releases per day. Consider also that the vast majority of academic research is funded by federal government agencies. In 2016, academic research resulted in more than 307,000 additional publications, or about 840 per day. To communicate all federal and federally-supported research via agency press releases would require a press release every 90 seconds, 24 hours a day, 365 days per year.

Given the wonderful bounty of published research, federal agencies and universities face constant choices about which articles to highlight for the media and public. Of course such choices are influenced by politics, including considerations of what studies are perceived to be timely in the context of daily news, which studies may cast the agency in a favorable light, which studies support the agency's or administration's policy goals, which studies originate in states or districts of influential members of Congress and of course which studies are relevant to the hot politics of the day. The political nature of the communication of research studies is further enhanced by today's partisan media landscape and political advocates looking to advance their causes by promoting favorable research results, and often, attacking those perceived to be unfavorable.

Communication is inherently a political process. Scientific integrity politics can help to ensure that the research underlying a communication process retains its integrity, but they cannot remove the role of political considerations from the overall process of communications.[6]

[4] This is discussed in Improving the Use of Science in Regulatory Policy, Bipartisan Policy Center (2009) https://bipartisanpolicy.org/wp-content/uploads/2019/03/BPC-Science-Report-fnl.pdf

[5] This is the most recent year that data is available. See Table 5-24 in the 2018 NSF Science and Engineering Indicators: https://nsf.gov/statistics/2018/nsb20181/report/sections/academic-research-and-development/outputs-of-s-e-research-publications#publication-output-by-u-s-sector

[6] Indeed, such politics are essential to effective democratic governance.

The massive volume of scientific publication underscores the essential importance of scientific assessments produced by committees of experts to integrate knowledge such that policy making might be grounded in robust evidence. Such committees are typically of the federal government (under the Federal Advisory Committee Act, 41 CFR 101-6 and 102-3), empaneled by the National Academy of Sciences or established by international multilateral organizations, such as the United Nations. Neither policy makers nor the public can obtain an accurate understanding of scientific or policy issues through press releases filtered through the media.

Consequently, it is absolutely essential to uphold the integrity of assessments and advisory bodies, whether focused on science or policy advice. Public trust will be enhanced through attention to the legitimacy, relevance and credibility of advisory bodies. For instance, to foster trust in such bodies, in 2011 GSA published guidelines for ensuring that FACA committees are "balanced" across a number of dimensions. It is not clear that any such guidance is in place or being followed today.[7]

Thus, while the attention being paid to scientific integrity in this hearing and in the legislation proposed to amend the America Competes Act, I strongly encourage members on this committee from both parties to consider directing similar attention to the need to formalize similar policies in support of enhancing scientific integrity in assessment and advisory bodies, including but not limited to those under FACA.

4. *Good science and policy advice from experts also results from the upholding of scientific integrity by elected and appointed officials.*

Often, and rightly so, our attention is focused on the advice given by experts. H.R. 1709 observes, "science and the scientific process should inform and guide public policy decisions." However, in policy settings what often comes first and is just as important is the relationship of policy makers to those experts who are informing the policy process. Through establishing the context within which expert advice is provided, policy makers also have an important role to play in securing scientific integrity

Here I offer five suggestions for how elected and appointed officials can contribute to scientific integrity.

- In cases where science advice is desired, ask clear questions that are answerable using the tools of science. Policy makers (and their staff) and experts should work together to understand what questions may be most relevant and useful to pose;
- In cases where policy advice is desired, clarify requests to experts for support for proposed policies from requests for a discussion of alternative options that might be used to achieve a policy objective;
- For both science advice and policy advice, utilize and defend established, authoritative mechanisms for securing expert advice, such as through FACA committees, the National Academy of Sciences or legislatively mandated assessments;

[7] https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/b_flaak_balance_plan.pdf

- Hold those formal, authoritative advisory bodies to the highest standards of scientific integrity (e.g., in committee balance, management of conflicts of interest, focus on well-defined questions, acknowledgement of diversity of views, etc.);
- Recognize that science does not speak with one voice, differences of opinion are normal and to be expected. Uncertainty, ignorance, and changes in understandings are to be expected. Advisors advise, decision makers decide.

We have considerable experience in science advisory processes that effectively secure expert advice while upholding scientific integrity. However, particularly in recent years, there have been notable deviations from effective practices.

Crucially, elected officials and political appointees should not use their authority and stature to seek to delegitimize individual scientists or academic papers. This has been a problem among Republicans and Democrats, for instance:

- In from 2013-2018 former Chair of this committee Rep. Lamar Smith (R-TX) sought to investigate several peer-reviewed papers and federal government scientists at HHS,[8] EPA[9] and NOAA[10] based on (unsupported) allegations that the research was somehow improperly conducted;
- In 2015, Rep. Raul Grijalva (D-AZ) opened an investigation of seven researchers who had testified before Congress on climate issues, accusing them (falsely) of receiving financial support from fossil fuel companies.[11]

Such behavior, which can politicize research and researchers in destructive ways, also has potential to harm public trust in the integrity of science that informs government policies.

Securing scientific integrity requires a focus not just on those who oversee, produce and communicate research, but also attention to the responsibilities of those who receive and utilize expert advice.

[8] https://www.sciencemag.org/news/2018/01/republicans-house-science-panel-suggest-top-environmental-health-scientist-broke
[9] https://www.sciencemag.org/news/2013/08/house-panel-subpoenas-epa-air-pollution-data
[10] https://www.sciencemag.org/news/2016/02/house-science-committee-demands-noaa-widen-its-internal-search-climate-change-emails
[11] https://www.nature.com/news/gone-fishing-1.17028 (Note: I was one of the subjects of this investigation.)

## Appendix - Specific Comments and Recommendations on H.R 1709

- Section 2 lacks a clear definition of "scientific integrity."

  COMMENT: While the concept is complex and nuanced, a definition is needed. Any definition will be broad and general, but is nonetheless important to include in any legislation seeking to address the topic.

  RECOMMENDATION: I propose that scientific integrity be defined as "proper reasoning processes and handling of evidence essential to doing science and a respect for the underlying empirical basis of science."[12]

  Thus, Section 2(3) would instead state: "scientific integrity refers to proper reasoning processes and handling of evidence essential to doing science and a respect for the underlying empirical basis of science."

- Section 3(a)(1) recommends that "no covered individual shall engage in dishonesty, fraud, deceit, misrepresentation, coercive manipulation, or other scientific or research misconduct."

  COMMENT: This language is too ill-defined to be of much use in implementation, and this imprecision is compounded by a non-standard use of the concept "research misconduct." The National Academy of Sciences offers well-defined language that has been long-used in federal science policies that would be more appropriate here.[13]

  > "The integrity of research is based on adherence to core values—objectivity, honesty, openness, fairness, accountability, and stewardship. These core values help to ensure that the research enterprise advances knowledge. Integrity in science means planning, proposing, performing, reporting, and reviewing research in accordance with these values. Participants in the research enterprise stray from the norms and appropriate practices of science when they commit research misconduct or other misconduct or engage in detrimental research practices." (p. 63)
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  > "Research misconduct" has long been a feature of federal policy and is defined as "fabrication, falsification or plagiarism in proposing, performing, or reviewing research, or in reporting research results."

  RECOMMENDATION: I recommend using this language because it already has operational meaning in federal agencies. Thus, Section 3(a)(1) would be revised to read: "no covered individual shall engage in fabrication, falsification or plagiarism in proposing, performing, or reviewing research, or in reporting research results."

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[12] This language is paraphrased from Douglas, H.E. and Bour, E., 2014. Scientific integrity in a politicized world. Logic, methodology, and philosophy of science: proceedings of the fourteenth international congress, 253–268. London: College Publications.

[13] National Academies of Sciences, Engineering, and Medicine 2017. Fostering Integrity in Research. Washington, DC: The National Academies Press. https://doi.org/10.17226/21896.

- Section 3(a)(2) states that "no covered individual shall suppress, alter, interfere with, or otherwise impede the timely release and communication of, scientific or technical findings."

  COMMENT: This too is far too imprecise to guide effective implementation. Rather than seeking to proscribe what covered individuals *should not* be doing in an agency communication process, the proposed legislation will be far more meaningful and effective by outlining what covered individuals *should* be doing.

  RECOMMENDATION: I recommend adopting the language proposed by John Holdren as director of OSTP in a 17 December 2010 memo on public communications by federal agencies,[14] recognizing the caveats and exclusions already included in the America COMPETES legislation.

  Specifically:

  > "Agencies should develop public communications policies that promote and maximize, to the extent practicable, openness and transparency with the media and the American people while ensuring full compliance with limits on disclosure of classified information. Such policies should ensure that:
  >
  > 1. In response to media interview requests about the scientific and technological dimensions of their work, agencies will offer articulate and knowledgeable spokespersons. who can, in an objective and nonpartisan fashion, describe and explain these dimensions to the media and the American people.
  > 2. Federal scientists may speak to the media and the public about scientific and technological matters based on their official work, with appropriate coordination with their immediate supervisor and their public affairs office. In no circumstance may public affairs officers ask or direct Federal scientists to alter scientific findings.
  > 3. Mechanisms are in place to resolve disputes that arise from decisions to proceed or not to proceed with proposed interviews or other public information-related activities."

- Sections 3(a)(3) and (4)

  COMMENT: These sections are similarly imprecise and would likely create challenges to effective implementation of the (worthwhile) intent that lays behind the words. A further problem is that the sections cover only a small part of what the NAS has called "detrimental research practices" which are distinct from research misconduct but involve far more shades of grey and understanding of relevant context. For instance, failure to implement or adhere to conflict of interest policies is a "detrimental research practice" that is discussed in the proposed legislation only in the context of media interviews. It also belongs in this subsection as well. The broad diversity of potential "detrimental research practices" means that this topic will be

[14] https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/scientific-integrity-memo-12172010.pdf

better covered by an agency plan focused on avoiding "detrimental research practices" rather than a Congressional directive.

RECOMMENDATION: It would be more effective to require each federal agency to develop a plan for dealing with "detrimental research practices" that threaten the scientific integrity. Such practices would include, but not be limited to, intimidation or coercion by individuals or the implementation of institutional barriers with the intent to hamper effective communications.

- Section 3(b)(2)(A) and (B)

  COMMENT: This section outlines a required review process for scientific or technical agency publications. However, the legislation is silent on how this process should take place or be developed.

  RECOMMENDATION: The legislation should require each federal agency to put forward publicly its internal peer review process, to include process and criteria for the selection of peer reviewers and timeline for completion of the internal review (the legislation proposes 30 days, which may or may not be appropriate for certain types of research). Different agencies will no doubt have different requirements and processes for review.

- Section 3(e)(4)

  COMMENT: All covered individuals should be required to disclose conflicts of interest independent of this provision.

  RECOMMENDATION: The 2009 Bipartisan Policy Council report recommended: "Federal agencies need to consider promulgating rules that would sanction scientists who run afoul of federal, university or journal requirements concerning disclosure, conflict of interest or ultimate sponsor control."[15] At present, agencies are uneven in their treatment of actual or perceived conflicts of interest. Upholding scientific integrity necessitates effective policies to manage conflicts of interest.

- Section 3(e)(5)

  COMMENT: This is unclear.

- Section 3(h)(1) states that scientific integrity policies "ensure that scientific conclusions are not made based on political considerations."

  COMMENT: While the intent here is clear, as a policy this is unenforceable and imprecise. For instance, what is a "political consideration"?

[15] Improving the Use of Science in Regulatory Policy, Bipartisan Policy Center (2009) https://bipartisanpolicy.org/wp-content/uploads/2019/03/BPC-Science-Report-fnl.pdf

RECOMMENDATION: Instead, this section should be framed in the positive, specifically, that scientific integrity policies should ensure "that research and communication under covered agencies is conducted in accordance with the guidelines of the agencies scientific integrity policies."

- Section 3(m)(2) requires that agencies produce and post inline an annual scientific integrity report.

  COMMENT: Good.

  RECOMMENDATION: Add a date to the requirement, such as March 31 of the year following the year covered by the report.

- Section 3(o)(2) and (3) defines covered agency and covered individual extremely broadly.

  COMMENT: More attention is needed to these definitions. Certain agencies engage in scientific research and communication for which this policy would not apply, including defense and national security agencies, agencies that produce statistics and indicators which are embargoed and released on a fixed schedule and agencies and scientists who work on proprietary research with commercial implications.

  RECOMMENDATION: This section would benefit by simply listing the covered agencies explicitly.

- Section 3(o)(4) defines public statements.

  COMMENT: Not included here is congressional testimony. Given occasional conflict between agency researchers and OMB (for instance) this legislation may wish to address this topic.

  RECOMMENDATION: As with the internal peer review process for agency research discussed above, it may make sense to ask each agency to formally describe and share its process for review and approval of congressional testimony by agency employees.

**Biography of Roger Pielke Jr.**

Roger Pielke, Jr. has been on the faculty of the University of Colorado since 2001. Currently, he is a professor of environmental studies and faculty affiliate of the Center for Science and Technology Policy Research. From 2001-2016 he was a Fellow of the Cooperative Institute for Research in Environmental Sciences. Roger served several terms as the founding director of the university's Center for Science and Technology Policy Research and served as the founding director of the university's Sports Governance Center. Roger's research focuses on science, innovation and politics, which he has explored in many topical areas over recent decades, including: space policy, natural disasters, energy policy, climate policy and more recently, in sports governance.

Roger holds degrees in mathematics, public policy and political science, all from the University of Colorado. In 2012 Roger was awarded an honorary doctorate from Linköping University in Sweden and he was also awarded the Public Service Award of the Geological Society of America. Roger also received the Eduard Brückner Prize in Munich, Germany in 2006 for outstanding achievement in interdisciplinary climate research. Before joining the faculty of the University of Colorado, from 1993-2001 Roger was a Scientist at the National Center for Atmospheric Research. Roger is a Senior Fellow of the Breakthrough Institute, and has held academic appointments at Macquarie University in Sydney, Australia, Oxford University and the London School of Economics.

Roger has hundreds of peer-reviewed publications and, for those who consider such things, he has an H-Index of 58 (Google). He is also author, co-author or co-editor of eight books, including **The Honest Broker: Making Sense of Science in Policy and Politics** published by Cambridge University Press (2007), **The Climate Fix: What Scientists and Politicians Won't Tell you About Global Warming** (2011, Basic Books), and **The Edge: The War Against Cheating and Corruption in the Cutthroat World of Elite Sports** (Roaring Forties Press, 2016), and **The Rightful Place of Science: Disasters and Climate Change** (CSPO: ASU, 2018 – first edition 2014)**.**