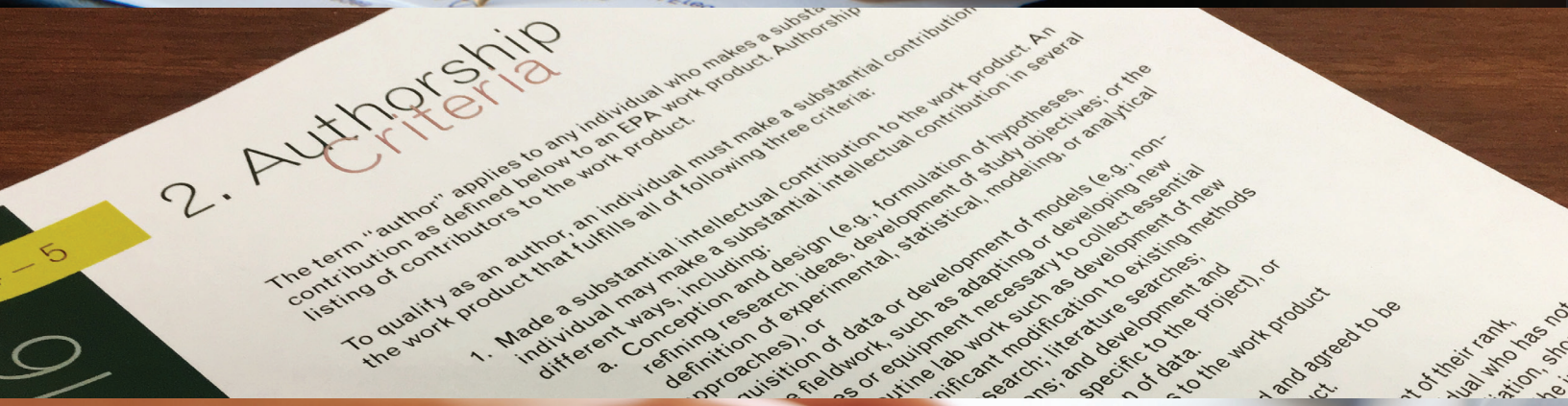
Scientific Integrity

Best Practices for Designating Authorship



EPA

Best Practices for Designating Authorship

Scientific Integrity
US Environmental Protection Agency

The U.S. Environmental Protection Agency is charged by Congress with protecting the Nation's land, air, and water resources. Under a mandate of national environmental laws, the Agency strives to formulate and implement actions leading to a compatible balance between human activities and the ability of natural systems to support and nurture life. To meet this mandate, EPA programs provide data and technical support for solving environmental problems today and building a science knowledge base necessary to manage our ecological resources wisely, understand how pollutants affect our health, and prevent or reduce environmental risks in the future.

EPA's Scientific Integrity Official (ScIO) champions scientific integrity throughout the Agency. The ScIO chairs the Scientific Integrity Committee comprised of Deputy Scientific Integrity Officials who represent each EPA program office and region. Science is the backbone of EPA's decision-making. The Agency's ability to pursue its mission to protect human health and the environment depends upon the integrity of the science on which it relies.

The full text of this document is available on EPA's website at:
https://www.epa.gov/osa/authorship-best-practices

Cover Design by Armando Chagolla, October 2014, & Emily Brantner, July 2016.

EPA Publication number 601K16001

Printed on 100% Postconsumer, Process Chlorine Free Recycled Paper

Contributors & Acknowledgments

Contributors

Francesca T. Grifo
Francesca is the Scientific Integrity Official at the U.S. Environmental Protection Agency. Previously, she was the Director of the Scientific Integrity Program at the Union of Concerned Scientists. In addition, she has 20 years of experience in biodiversity conservation at the United States Agency for International Development, Biodiversity Support Program, National Institutes of Health, the American Museum of Natural History, and Columbia University. She holds a BA in biology from Smith College and a Ph.D. in plant systematics from Cornell University.

Gary S. Russo
Gary is an Environmental Scientist in the Office of Water. Before arriving at EPA, he was an academic biomedical research scientist. He holds a B.A. in biology from the University of California San Diego and a Ph.D. in neuroscience from Yale University.

Martha Otto
Martha is the Scientific Integrity Program lead in the Office of the Science Advisor. Martha has over 25 years of experience in hazardous waste site remediation, innovative treatment technologies, and policy, regulation, and guidance development. She holds a BS in biology and an MS in environmental science and engineering from Virginia Tech.

Acknowledgments

The contributors wish to acknowledge:

The Scientific Integrity Committee for their role in championing Scientific Integrity throughout the Agency and their helpful review and comments.

Armando Valentino Chagolla, for his layout and overall design templates for this report.

Amanda Redfern and Emily Brantner for their assistance in formatting the boxes and text and adapting the design templates for this content.

Melinda Gormley and Tom Sinks for helpful review and comments.

Taylor Cox for photo research.

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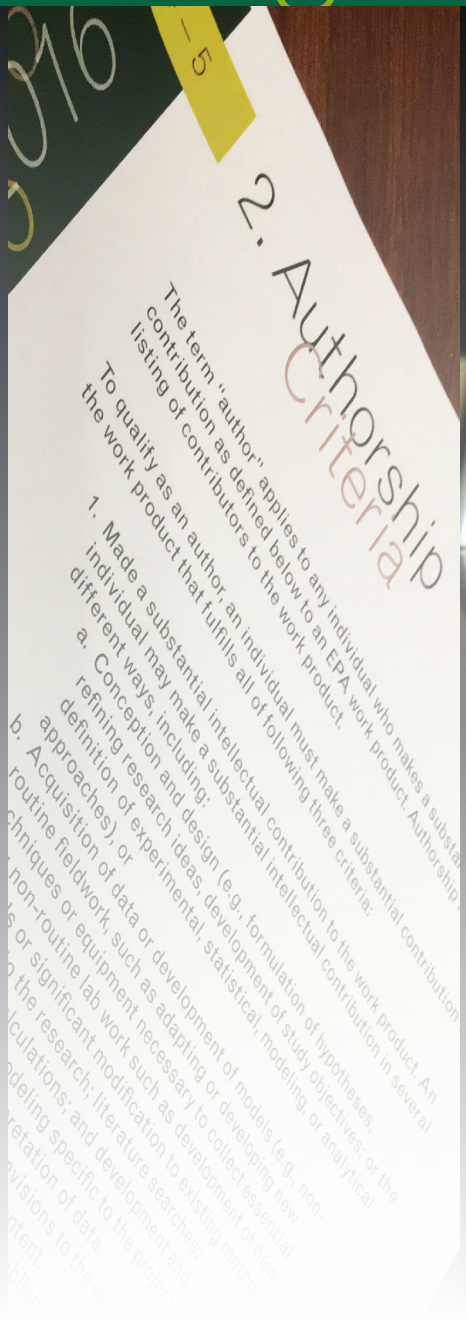

Executive Summary

U.S. EPA is committed to transparency in its interactions with the public. The designation of authorship plays a critical role in transparency by identifying who is responsible for the information and conclusions in EPA work products and how the work products were developed. Identification of the contributors to EPA work products helps to establish public confidence in the scientific integrity of those products. Such recognition can also be an essential measure of job performance and necessary for career advancement. However, the issue of who qualifies as an author can sometimes be contentious. The purpose of the U.S. EPA Authorship Best Practices document is to provide a common understanding across the Agency for attributing credit and accountability to individuals and groups who contribute to those EPA work products that designate authorship.

EPA's Scientific Integrity Policy affirms the responsibility of every EPA employee to appropriately characterize, convey, and acknowledge the intellectual contributions of others. An individual who knowingly publishes the intellectual work of another without appropriate credit has committed plagiarism.

Any, all, and only those contributors fulfilling all of the following three criteria should be named as an author:

1. Made a substantial intellectual contribution.
2. Wrote or provided editorial revisions with critical intellectual content.
3. Approved the final version and agreed to be accountable for all aspects of the work.

Authorship also conveys responsibility. Authors must represent their work fairly and accurately, avoid conflicts of interest, and ensure impartiality. All authors are responsible for the overall accuracy and quality of the work product and may be liable for research misconduct associated with its content.

Many authorship disputes arise because project participants have not discussed authorship or have done so late in the project. Contribution statements and authorship agreements can be useful tools that facilitate these discussions and minimize authorship disputes and authorship abuse. The most important best practice to avoid authorship disputes is to discuss project responsibilities and authorship among participating individuals before a project commences and periodically as work progresses. Most authorship disputes can be avoided or resolved by engaging in open and straightforward conversations early and often. This document is intended to provide a set of objective criteria and general standards that can be used to prevent or resolve authorship issues and ensure the appropriate acknowledgment of individual contributions in EPA work products.

1. Introduction

Introduction

EPA's Scientific Integrity Policy encourages the publication and presentation of research findings and the communication of scientific information to the public[1]. EPA's Principles of Scientific Integrity require that EPA employees represent and acknowledge the intellectual contributions of others in published work such as journal articles and technical reports and refrain from taking credit for work with which they were not materially involved[2]. One way that EPA employees receive recognition for their individual contributions to such works is through the designation of authorship. The assignment of authorship on work products, however, can sometimes become contentious. Authorship practices are often guided by the traditions and customs of scientific disciplines, institutions, research groups, and the standards and policies of journals or publishers. This can lead to ambiguity, uncertainty, and inconsistency in how authorship is assigned to EPA work products[3]. This document fulfills the need for a common understanding of the best practices for recognizing the contributions of individuals through authorship of EPA work products.

EPA's Scientific Integrity Policy also affirms the Agency's commitment to transparency in its interactions with the public. The designation of authorship plays a critical role in transparency by identifying who is responsible for the information and conclusions in EPA work products and how they were developed. "When dealing with science, it is the responsibility of every EPA employee to conduct, utilize, and communicate science with honesty, integrity, and transparency, both within and outside the Agency."[4]

The best practices described in this document apply prospectively to any EPA work product where authorship is designated, including but not limited to journal articles, reports, presentations, posters, documentation of models or software, communication products, technical support documents, and guidance documents. These best practices also address situations involving non-EPA employees such as students, fellows, interns, technicians, and contractors, and address issues related to conflicts of interest, bias, plagiarism, and copyright.

This document does not create new rules for designating authorship. The best practices described in this document represent widely accepted approaches derived from the policies written by centers and laboratories of EPA's Office of Research and Development including the National Center for Environmental Assessment, National Exposure Research Laboratory, National Health and Environmental Effects Research Laboratory (NHEERL), and National Risk Management Research Laboratory. These best practices also considered the authorship policies of the Nature journals[5], American Chemical Society[6], the Council of Science Editors[7], the Authorship Policy of the Centers for Disease Control[8], the International Committee of Medical Journal Editors (ICMJE)[9], a review on scientific authorship practices published by Larry Claxton (retired

from EPA's NHEERL)[10], and resources from the Office of Research Integrity in the Department of Health and Human Services[11].

It is unreasonable to expect a single document to settle every potential authorship issue. Instead, this document is intended to provide a set of objective criteria and general standards that can be used to prevent or resolve authorship issues and ensure the appropriate acknowledgment of individual contributions in EPA work products. Authors publishing outside of their EPA duties should consult with the appropriate ethics officials and also refer to the individual publication's policies and instructions to authors. While the Office of General Counsel attorneys may be consulted on intellectual property issues that arise in connection with EPA work products, they do not provide advice to employees engaged in outside writing or publication.

Although this document identifies a variety of best practices related to authorship, the most important best practice is to discuss responsibilities and authorship among participating individuals before a project commences and periodically as work progresses. Most authorship disputes can be avoided or resolved by engaging in open and frank conversations early and often. EPA defines a Quality Management Plan as an organization's quality-related policies and procedures, criteria for application, areas of application, and roles, responsibilities, and authorities. It might be useful to think of this document as a type of Quality Management Plan for determining authorship of EPA work products.

Box 1: Yours, Mine, and Ours

Example: You are assigned the task of completing a work product that was started by another EPA employee a few years ago. The other employee had already designed an approach, researched and compiled information, and developed a rough draft, but was reassigned to more urgent projects and never completed the work product. All you need to do is revise the existing draft. However, you soon realize the draft needs more than revision, and you essentially re-write the entire document. You remove the other employee's name from the author list because you completely reorganized the document, the other employee apparently doesn't care about authorship because he never finished the project, and after all, we are "one EPA." Is this consistent with EPA's Authorship Best Practices?

Answer: No. The previous employee made a substantial intellectual contribution (criterion #1), wrote critical intellectual content (criterion #2), and may be willing to help you finalize the work product if given an opportunity (criterion #3). Substantially revising someone else's work does not discount the significance of the original contribution. You should at least contact the previous employee to discuss and find consensus on the issue of authorship for the final work product.

"The most important best practice is to discuss responsibilities and authorship among participating individuals before a project commences and periodically as work progresses. "

2. Authorship Criteria

The term "author" applies to any individual who makes a substantial contribution, as defined below, to an EPA work product. Authorship refers to the listing of contributors to the work product.

To qualify as an author, an individual must make a substantial contribution to the work product that fulfills all of following three criteria:

1. Made a substantial intellectual contribution to the work product. An individual may make a substantial intellectual contribution in several different ways, including:
    a. Conception and design (e.g., formulation of hypotheses, refining research ideas, development of study objectives; or the definition of experimental, statistical, modeling, or analytical approaches), or
    b. Acquisition of data or development of models (e.g., non-routine fieldwork, such as adapting or developing new techniques or equipment necessary to collect essential data; non-routine lab work such as development of new methods or significant modification to existing methods essential to the research; literature searches; theoretical calculations; and development and application of modeling specific to the project), or
    c. Analysis and interpretation of data.
2. Wrote or provided editorial revisions to the work product containing critical intellectual content[12].
3. Approved the final version to be published and agreed to be accountable for all aspects of the work product.

Any individual who has met these three criteria, independent of their rank, status, or affiliation, should be named as an author. Any individual who has not met these three criteria, independent of their rank, status, or affiliation, should not be named as an author. An individual who knowingly publishes the intellectual work of another without giving appropriate credit has committed plagiarism. Suppressing authorship by unreasonably interfering in the ability of an individual to meet these three criteria is a violation of EPA's Scientific Integrity Policy and should be reported to EPA's Scientific Integrity Official.

Individuals who make a substantial contribution to a work product but do not meet the authorship criteria specified above should be listed in an acknowledgments section in the work product with a brief description of their role, if possible. Many journals allow and even encourage acknowledgment of contributions that do not merit authorship. The ICMJE guidelines recommend

that contributors who do not meet all authorship criteria should not be listed as authors, but they should be acknowledged. Contributions worthy of acknowledgment can include literature searching, contract or project management, supervision, mentorship, statistical consultation, manuscript review, advice, provision of materials or space, routine assistance, financial support, and grammatical or stylistic editing. Individuals listed in the acknowledgments section should be notified before final publication of the work product. Some journals (mainly in the United States) require the signature of those acknowledged.

Decisions about removing the name of a previously listed author or withdrawing a work product after it is submitted for public dissemination should be carefully considered. An individual acknowledged or listed as an author may remove their own name from a work product or voluntarily withdraw their work product if they are the sole author, but an author should not be compelled to remove their name or withdraw their work product unless doing so is necessary to comply with EPA's Authorship Best Practices or EPA's Scientific Integrity Policy.

Box 2: Can We Renegotiate?

Example: You are one of several team members about to begin a project. All of the team members agree on authorship order, with the project leader as primary author. Just as the project begins, the project leader is promoted to branch chief. The new branch chief can no longer lead the day-to-day operation of the project, so she assigns one of the team members as the new project leader. Expecting to assume the role of primary author, the new project leader begins discussing a new authorship order. However, the branch chief says the existing authorship order will remain because it has already been debated and settled. Is this consistent with EPA's Authorship Best Practices?

Answer: It depends. Authorship order does not need to change simply because the status of an author has changed. However, a change in authorship order may be appropriate if an author's responsibilities change. With a promotion to a more "senior" position and reduced day-to-day project responsibilities, the new branch chief may want to suggest taking the role of "senior" author and be listed last, and the new project leader taking the role (and responsibilities) of primary author and be listed first.

3. Authorship
Order

The order authors are listed in a work product can matter greatly, especially for authors who are establishing their careers. However, authorship order can mean different things in different settings. In many scientific disciplines, the position of first author is highly valued because it indicates the primary author who did most of the work and who takes responsibility for the entire work product (see Section 5 for more information about the role of primary author). Because of the way literature is often cited (e.g., "First Author, et al., Year"), the first author's name is often the most visible to readers. When establishing authorship order becomes unmanageable (e.g. when a work product has a large number of authors), authors may be listed in alphabetical order. Because readers may not be able to accurately infer the significance of authorship order, authors may explain the order of authorship and the nature of the contributions of each author in a footnote or acknowledgment (see Section 7 for more information about contribution statements).

> "Most authorship disputes can be avoided or resolved with open and frank discussions about responsibilities and contributions"

A work product with a list of authors typically lists the primary author first, followed by co-authors in descending order of their contribution. Exceptions to this general rule occur when authorship order is determined alphabetically, and in some disciplines where it is customary to list a "senior" author last even though the senior author's level of contribution qualifies the senior author to be listed earlier in the author list (see Section 5 for more information about senior authors). In cases where two or more authors contribute equally to a work product, equal contributorship may be indicated by a footnote or a caption such as, "These authors contributed equally to this work."

Authorship order generally reflects the relative contributions of each author. However, other factors can potentially affect authorship order. Depending on the scope of a particular project, a project could result in several work products, each involving different authors and/or different authorship orders. Changes to authorship order may be necessary if the actual contributions of authors differs significantly from those originally expected, such as when an author accepts increased responsibility or delegates a portion of his or her responsibility to other authors. In such circumstances, the order of authors should reflect the actual contributions of each author (see Section 4 for information about authorship approval and dispute resolution). Again, the best practice is early and frequent conversations about authorship, including author order.

4. Authorship Approval & Dispute Resolution

Authorship and authorship order should be a collective decision by all project contributors under the leadership of the primary author. In general, project contributors should strive for a consensus decision on authorship and authorship order. If a consensus cannot be reached among contributors, the issue(s) should be raised to the primary author's immediate supervisor as the first recourse. The supervisor in the primary author's chain of command who does not have a conflict of interest should facilitate resolution of the issue. Attempts should be made to resolve outstanding issues at the lowest level of authority. Any resolution to an authorship dispute must be consistent with EPA's Scientific Integrity Policy. If attempts to resolve the issue(s) fail, the project contributor may contact EPA's Scientific Integrity Official. Authorship disputes should be resolved before the work product is submitted for EPA clearance.

Most authorship disputes can be avoided or resolved with open and frank discussions about responsibilities and contributions among project participants before a project commences and periodically as work progresses. One important best practice is for collaborators to begin the project by anticipating, discussing, and resolving potential areas of disagreement and define a process for constructively handling disputes should they arise. Discussion of authorship and authorship order will optimally begin at the inception of a research project and involve a purposeful and thoughtful examination of expected contributions of the individuals involved in the project[13]. These discussions should be initiated and led by the primary author of the work product. Key points of agreement should include the expected contributions of each participant, how credit will be attributed to each collaborator's institution, how and by whom public presentations will be made, and when and how to handle intellectual property and patent applications. Many of these issues can be addressed through simple discussions. In some circumstances, authors might want to seek the mediation of a neutral third party with no direct involvement in the project to help facilitate such discussions and maximize their effectiveness.

As discussed previously, a single project may result in more than one work product with different authors and/or different authorship orders. In such circumstances, it is especially important to discuss authorship as soon as possible. It is helpful for all contributors to recognize that authorship and authorship order could change during a project to better reflect the actual contributions of the contributors. Such changes, however, should be a consensus decision after considering each individual's perspective and reviewing each individual's contributions. Such discussions should be open, honest, and conducted in a professional manner.

5. Author Roles

At least one author, usually the primary author, should take responsibility for the integrity of the work product as a whole from inception to publication. It is the responsibility of the primary author to manage and coordinate the development and dissemination of the work product, including drafting, reviewing, revising, clearing, and publishing. The primary author is the author who typically has the greatest understanding of the goals, approaches and findings of the project, the contributions of all participants in the project, and the common practices of the scientific discipline and target audience.

Although the primary author has the greatest responsibility for developing the work product, every individual author should read and approve (preferably in writing) the work product that is submitted to EPA's clearance process and any subsequent versions that are publicly disseminated. Although individual authors may be responsible for developing specific sections of a work product, each individual author should understand and be able to conceptually explain, defend, and endorse the work product as a whole. It is the responsibility of the primary author to ensure that all authors agree to take responsibility for the work product and the validity of its content.

As described in Section 3, some disciplines identify a senior author by listing their name last in the list of authors. A senior author is usually a senior member of the project team who served as the driving force behind the concept, organized the project, and provided guidance throughout execution of the project. A senior author may be the head of a research group, laboratory, or department under which the project was conducted, and/or the mentor or advisor to students or more junior scientists with a more direct role in executing the project.

The position of last author can be highly valued because it often indicates the senior author with the highest level of academic and/or supervisory status among the listed authors. Because of the prestige associated with the designation of senior author, a senior author may be listed last even though he/she had a more significant role in the work product than authors who precede him/her in the author list. Nevertheless, the senior author must fulfill all of the criteria of authorship specified in Section 2.

The corresponding author is responsible for submitting a work product to a journal or other medium for publication, and for communicating with the publisher on issues of publication revision and acceptance. The name and email address of the corresponding author is often noted in the work product, as he or she serves as a point of contact. After publication, the corresponding author manages all communication and correspondence associated with the work product on behalf of the other authors.

6. Shared Authorship

The rising trend in trans-disciplinary research calls for a process to convey shared authorship. If two or more authors contribute equally to a work product, the convention is to list the authors alphabetically with a footnote designating equal contributorship and noting why the order was selected. In such circumstances, all authors are equally responsible for the quality of the work product.

Group authorship may be appropriate for work products developed by a large number of individuals[14]. If each individual in a group has contributed equally, the group name should be listed as the author, with individual author names appearing in a footnote, byline, or elsewhere in the work product for proper indexing of individual authors in publication databases. If only a subgroup of individuals in a group meets the authorship criteria specified in Section 2, the group name should be listed as the author and only the individuals who meet the authorship criteria should be identified as members of the group. Group members who made a contribution to the project but do not meet the authorship criteria should be identified in the acknowledgments.

Box 3: Too Little, Too Late

Example: A colleague in an earlier stage in his career submitted a review article to a journal that was rejected. Your colleague contacts you and asks if you would co-author the article with him because he believes that adding you as an author would increase the chance of acceptance. You have collaborated and published articles together in the past, and you have many years of experience on the subject. You read the manuscript and think that it is fairly good. You accept the offer because you want to help your younger colleague, you believe that you are qualified to be an author (you could have written the review yourself), and you get another publication on your CV. Is this consistent with EPA's Authorship Best Practices?

Answer: No. Authorship is only appropriate when an individual makes a substantial contribution to the work product that fulfills all three criteria specified in Section 2. Helping to reorganize the review to address the editor's previous criticisms, reviewing revisions to help ensure that the review is clear and accurately represents the current science, and accepting responsibility for the integrity of the review may be all that is needed to qualify as an author, and will likely be more helpful to your younger colleague as well.

"At least one author, usually the primary author, should take responsibility for the integrity of the work product as a whole from inception to publication."

7. Contribution Statements & Authorship Agreements

Contribution Statements

A contribution statement can be a useful tool to affirm each author's role in a work product. A contribution statement describes each author's contributions and helps to discern the value of those contributions to the work product, from inception to publication. For example, a contribution statement might describe who developed the idea for the work product, who obtained funding, who performed and/or coordinated data collection, who analyzed the data, who interpreted the data, and who was primarily responsible for writing and/or revising the manuscript. A clear and concise contribution statement helps to ensure that all authors are properly recognized for their work on a project, especially on a large project that has many authors, is multi-disciplinary, and/or is performed at different locations or institutions. A contribution statement can also help readers identify the appropriate individual to contact for specific questions about the work product without the need to obtain assistance from the corresponding author. The use of standardized systems to flag each author's contributions in the author list can also be a useful tool to help ensure more precise recognition of each author's contribution to a work product[15]. One system uses 14 specific categories to describe the contributions of individual authors[16]. In circumstances where a work product includes a contribution statement, all authors of the work product should discuss and agree on the contributions attributed to each author.

A contribution statement reduces the chance of an authorship dispute because it promotes open discussion about who contributed what. A contribution statement also discourages authorship abuse. Finally, a contribution statement provides transparency and accountability for the work product, and is another way of reaffirming each author's responsibility for the published content.

Authorship Agreements

A written authorship agreement can be another useful tool to minimize authorship disputes and authorship abuse. An authorship agreement verifies that each author meets the criteria for authorship, agrees with the contributions attributed to their name, and accepts responsibility for the work product. The National Institutes of Health's Office of the Ombudsman equates a written authorship agreement to a "prenuptial" agreement[17].

If an authorship agreement is used, all authors of the work product should participate in the agreement. An authorship agreement does not need to be formal or complicated. Responses by all authors to a simple email message from the primary author can be sufficient in many circumstances.

8. Authorship Responsibilities

Authorship is both an honor and a responsibility. Authorship confers recognition that can be an essential measure of job performance and necessary for career advancement. However, authorship also denotes responsibility for the accuracy and quality of the work product, as well as liability for misconduct associated with its content.

The third criterion for authorship is for the individual to approve the final version to be published and to agree to be accountable for all aspects of the work product. All authors are responsible for the overall accuracy, editorial quality, and intellectual content of the work product. All authors are responsible for taking appropriate action if they believe any part of the work product involves plagiarism, falsification, or fabrication. Federal employees are also responsible for complying with federal ethics laws and regulations regarding misuse of federal position, loss of impartiality, and conflicts of interest (Section 12). Authors should not use or report information obtained privately though conversation, correspondence, or discussion with third parties without explicit permission from the investigator with whom the information originated. Information obtained in the course of confidential services such as refereeing manuscripts or grant applications should be treated similarly. Authors are responsible for meeting their obligations and commitments in a timely and professional manner, even those authors "buried" between first and last author.

Authors should be aware of any data sharing responsibilities imposed by EPA[18] and the agency or institution of their co-authors. The goal of data sharing is to promote transparency and ensure the integrity and defensibility of EPA's work products. Individuals or groups at EPA who collaborate with individuals or groups at other institutions should consider the data sharing policies of each institution early in the project to avoid conflicts and project delays. Authors should also consider the data sharing policies of the planned publication venues to avoid unexpected conflicts or delays in publishing the work product.

"Authorship confers recognition that can be an essential measure of job performance and necessary for career advancement. However, authorship also denotes responsibility for the accuracy and quality of the work product, as well as liability for misconduct associated with its content."

9. Trainees, Technicians, and Contractors

The prospect of authorship should be extended to more junior members of a research team whenever possible. An important best practice is have early conversations with trainees and technicians to offer opportunities to fulfill the authorship criteria in Section 2.

Trainees

Students, postdoctoral fellows, and interns and other trainees (hereafter referred to as "trainees") can be an important part of a project team. However, having trainees on a project team can also lead to authorship abuse. Because trainees are typically at an early stage in their career and are appointed for a limited period of time, they are sometimes viewed as subordinate by other members of the project team who have more experience and seniority. Nevertheless, the same authorship criteria apply to all members of a project team including trainees. Authorship on any EPA work product should always represent the significance of the individual's contribution to the work product regardless of institutional status.

Trainees often rely on the recommendations of more senior members of the project team for future job opportunities and career advancement. The power disparity between trainees and senior members of a project team can lead to trainee reluctance to dispute authorship assignments the trainee believes are unfair or inconsistent with EPA's Authorship Best Practices or Scientific Integrity Policy. All authors are responsible for taking appropriate action if they believe that they have identified any type of authorship abuse associated with the work product.

> "Authorship on any EPA work product should always represent the significance of the individual's contribution regardless of institutional status."

Technicians

Technicians are subject to the same authorship best practices as all other members of a project team. A technician should be listed as an author if the technician fulfilled all of the authorship criteria described in Section 2. However, simply performing routine tasks does not qualify a technician for authorship.

The possibility of authorship can be a powerful incentive that enhances employee engagement. If a technician and their supervisor agree that the technician is a candidate for authorship on a work product, the supervisor should encourage the technician early in the project to engage in the full spectrum of intellectual activities that result in meeting all authorship criteria.

Contractors

Project contributors who work under an EPA contract and are not federal employees are subject to the same authorship best practices as other members of the project team. Because naming contractors as authors could create the appearance of a contractor performing an inherently governmental function, the EPA Acquisition Regulations[19] require the clauses specified in Appendix 2 to be included in any contract that could result in the publication of work performed under the contract. In addition, the text, "Contractor's role did not include establishing Agency policy," must also be included in any work product that lists authors who worked under an EPA contract.

Box 4: Assuming Authorship

Example: You are a laboratory technician working on a project that requires the use of a highly specialized instrument. You know the instrument very well because you used it for your master's thesis and published your work in a peer reviewed journal. Even though the other members of the project team are senior scientists and you don't know much about the project itself, you are put in charge of collecting the data for the project because of your expertise using the instrument. You finally finish collecting all of the data after many hours of hard work. Because you have already published work using this instrument, and you used the same instrument to collect all of the data for this project, you assume that you will be listed as an author on the publication for this project and begin work on another project. A few months later, you find out that the other members of the project team wrote a manuscript and you were not listed as an author. Is this consistent with EPA's Authorship Best Practices?

Answer: It is complicated. Collecting data by operating an instrument does not alone confer authorship on the resulting work product. Rather than assuming authorship, it would have been wise for you to discuss your expectations of authorship with your supervisor early in the project. Such a discussion may have resulted in an opportunity to work more closely with the project team and fulfill all of the criteria necessary for authorship.

10. Common Authorship Abuses

Honorary, gift, guest, or courtesy authorship, ghost authorship, surprise authorship, duplicate production authorship, and anonymous authorship are common abuses of authorship. All of these types of authorship are unacceptable.

- *Honorary, gift, guest, or courtesy authorship* is authorship given to an individual who does not meet the criteria for authorship. This type of authorship is provided for a variety of reasons. Sometimes authorship is provided to a senior figure who expects or demands it because he/she is in a position of authority (e.g. branch chief, division director, or office director) or controls the project's funding. Authorship is sometimes improperly provided to senior figures to enhance the perceived credibility of the work product or increase the likelihood of acceptance. Honorary, gift, guest, or courtesy authorship also occurs when a legitimate author adds another individual to the author list with the understanding that the additional individual will do the same in the future (or had already done so previously) in order to inflate the publication lists of both individuals.

- *Ghost authorship* is the failure to give authorship to an individual who meets the criteria for authorship. Ghost authorship is also sometimes used to purposefully obfuscate the involvement of an individual or institution in a work product.

> "If a work product contains the same or substantially overlapping material that was previously disseminated, the work product must identify the duplicate material and cite the original source. "

- *Surprise authorship* is when an individual finds that he/she has unknowingly been given authorship for a work product without having contributed to the work or accepted responsibility for the publication's content.

- *Duplicate production authorship* is when material is publicly disseminated that is the same or substantially similar to material previously disseminated without a clear, visible reference to the original material. Duplicate production authorship is a form of self-plagiarism (see Section 11). If a work product contains the same or substantially overlapping material that was previously disseminated, the work product must identify the duplicate material and cite the original source. Publication of material

that was previously published in preliminary form such as an abstract, poster or platform presentation at a scientific meeting, or a letter to the editor, is not considered duplicate production authorship or self-plagiarism. When preliminary work is disseminated, authors of subsequent related work should make the prospective publisher or audience aware of all directly related reports already presented, published, submitted for publication, or in press. Most journals will not accept material for publication if that material has already been published or submitted to another journal for publication. The reuse of significant portions of one's own work without citing the original work is self-plagiarism and is discussed in Section 11.

- *Anonymous authorship*. Normally it is not appropriate to use pseudonyms or to publish scientific or technical reports anonymously. In rare cases when an individual can make a credible claim that revealing his or her name as an author could cause serious hardship (e.g., threat to personal safety or loss of employment), anonymous content might be appropriate. The Scientific Integrity Official is available to help make such determinations.

- *Filial or family authorship* occurs when an EPA author includes a relative (e.g., a child or spouse) as an author without first consulting with an ethics official. Because working as part of one's official duties with a family member raises concerns about loss of impartiality and/or conflicts of interest, employees should consult with their own ethics officials or the Office of General Counsel/Ethics in advance.

Box 5: Spousal Privilege

Example: You and your spouse, who is a scientist for a consulting company, decide to write and publish a review article about a topic in which you both have expertise. Your spouse's employer readily agrees to allow him to write the review with you. You pursue this writing project in your official capacity, but do not mention that your spouse is the co-author. Because you do not share the same surname, no one at EPA notices the connection. Is that a problem?

Answer: Yes, this situation presents an ethical issue because your spouse is working with you under the aegis of his company, and is being paid by his company to do so. His salary is imputed to you under the financial conflict of interest statute, so you would be working in your official capacity on a project that has a direct and predictable financial effect upon your own interests. You need to seek advice from an ethics official before beginning the collaboration with your spouse.

Box 6: All in the Family

Example: Your son is a brilliant high school student who is keenly interested in environmental issues. You realize that he could easily perform fact checking for your EPA work product, thereby gaining some experience and possible authorship. Is this a problem?

Answer: Yes, because you have a "covered" relationship with your son under the impartiality standards, and cannot work with him in your EPA capacity unless you first receive clearance from your Deputy Ethics Official. In addition, there may be anti-deficiency concerns with accepting volunteer services.

11. Plagiariam and Self-Plagiarism

EPA's Policy and Procedures for Addressing Research Misconduct[20] defines plagiarism as "the appropriation of another person's ideas, processes, results, or words without giving appropriate credit." An individual who knowingly publishes the intellectual work of another without appropriate credit has committed plagiarism. The Policy and Procedures for Addressing Research Misconduct requires the reporting of such actions to the Office of Inspector General (OIG). OIG has delegated some of the authority to resolve allegations of plagiarism to the Scientific Integrity Official[21].

Plagiarism can occur in a range of forms. Verbatim, near-verbatim copying, or very close paraphrasing of text or results from another work is more clear-cut than inadequacy in citing relevant works or ideas. When considering whether or not a citation might be needed, questions such as the following can help authors assess whether omission of a citation might constitute plagiarism[22].

- Does the omission of a citation give a false or misleading impression that you are the originator of the finding or idea?
- Are you aware of a work that can be cited for the finding or idea?
- Is the finding or idea essential to the work you are presenting?
- Is the finding or idea regarded as common knowledge?

The distinction between plagiarism and an authorship dispute may sometimes be unclear. Circumstances where intellectual property is shared among collaborators who subsequently separate and publish without acknowledging the contribution of their former colleague can be particularly challenging. Authors should arrive at a consensus decision about authorship during the early stages of a project and continue communicating after separation to avoid this type of plagiarism.

Self-plagiarism is the reuse of significant portions of one's own work without citing the original work. There are two distinct forms of self-plagiarism: text recycling and redundant publication[23].

> "Self-plagiarism is the reuse of significant portions of one's own work without citing the original work."

Text Recycling

Text recycling occurs when sections of the same text appear (usually unattributed) in more than one of the author's own work products. In some circumstances, a small amount of text recycling may be unavoidable. For example, the use of similar or identical phrases describing certain methods or techniques that are common to multiple work products may be unavoidable because there are a limited number of ways to describe them. In such circumstances, authors should cite the original work product when using the same or similar text. There is debate about the acceptability of text recycling in the background or introduction section of a work product, for example, when a work product is one of several on a related topic or is an extension of previous related work[24]. Authors should generally avoid text recycling. Where text recycling is unavoidable, however, authors must cite the original source.

Whether a small amount of text recycling is acceptable primarily depends on whether the source of the recycled text is properly cited, whether the work product is original research or a review of existing work, and whether there is a breach of copyright. Text recycling without attribution is unacceptable in the results, discussion, and conclusion sections of papers or presentations, especially if it duplicates previously published data or results. There may occasionally be legitimate reasons to include previously published data and results, such as when reporting on an extension of previous studies. However, such duplication must be clearly reported as previously published material, properly cited, and compliant with all copyright requirements. Although the amount of repetition deemed acceptable is unsettled, authors should always clearly acknowledge the use of text that is identical or similar to the text that the author has used elsewhere.

Box 7: Repeat Review

Example: You are asked to write a review paper on a topic related to your EPA work. Your supervisor agrees that you may do this work as part of your official duties. You write the review using multiple long passages from a previous review article that you wrote as a book chapter. After all, these are your works, so this seems okay. Is this consistent with EPA's Authorship Best Practices?

Answer: No. This is self-plagiarism. You should have told both those who asked you to write the review and your supervisor of the existence of the previous book chapter review. If they still asked for and approved the new review, then you should have either paraphrased or put the passages from your previous review in quotes, and been transparent about where they came from. Attribution is the key to avoiding self-plagiarism.

Redundant Publication

Redundant (or duplicate) publication generally refers to the repeated publication of data or ideas without disclosing earlier publication of the material. Redundant publication of data without attribution is always unacceptable. Redundant publication wastes limited resources because it displaces the publication of novel scientific finding. Presentation of material already published or presented can also impede scientific progress because it prevents or delays the timely dissemination of new and potentially important scientific findings. Redundant publication can also lead to the distortion of

scientific evidence through erroneous meta-analyses. Some professional organizations and scientific journals permit the submission of material that expands on a previously published, brief, preliminary or incomplete account of the same work. However, authors should notify the meeting organizer or journal editor of the earlier publication at the time of submission, and the earlier publication should be cited in the presentation or manuscript.

If the material is copyright protected, the author's permission for reproduction from the copyright holder (if the copyright has been transferred to the publisher) should be obtained, in addition to citing the original material. Although there are no copyright requirements that apply to government publications, authors should nonetheless avoid copying text from government documents without attribution. When a work product includes previously published material, the best practice is transparency – putting editors, meeting organizers, readers, and audiences on notice to exactly which portions of a work product are new and which are restated from elsewhere.

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12. Conflict of Interest & Loss of Impartiality

Conflict of Interest

All EPA employees must comply with federal ethics laws and regulations[25]. One of the basic principles of ethical conduct is the avoidance of actual or apparent conflicts of interest. Conflicts of interest are prohibited by a criminal statute found at Section 208 of Title 18 of the United States Code[26]. A conflict of interest can arise when an individual developing an EPA work product is financially tied to the work product. Financial ties could be direct, or to another individual or to a regulated entity that is directly affected by the work product. You cannot work in your official capacity on any matter that will have a direct and predictable effect upon your own financial interests or the financial interests of your spouse or dependent minor child. This financial conflict of interest prohibition also applies if you know that the work will affect the financial interests of your general partner, or of an organization for which you serve as an officer, director, employee, general partner, or trustee. It even applies when you know that the matter will affect the financial interests of someone with whom you have an arrangement for employment, or with whom you are negotiating for employment.

Authorship establishes accountability as well as credit. Authorship helps establish the identity of those who are responsible for the information and conclusions of EPA work products and helps provide the public with a mechanism to ensure EPA work products are developed without conflicts of interest. By definition, an individual with an actual or apparent conflict of interest cannot author an EPA work product because federal ethics laws and regulations preclude them from working on the project and thus fulfilling the criteria for authorship. Conflict of interest laws and regulations even preclude EPA employees with a conflict of interest from being part of any group authoring an EPA work product or working on any particular assignment that could justify being included in the acknowledgments.

Box 8: Taking Stock

Example: You inherit stock worth $26,000 in a company that manufactures a particular chemical. There are lots of other companies that manufacture this same chemical. You're not sure what to do with the stock, so you just ignore it while working hard on a research paper about the toxicological effects of that same chemical in drinking water. Is this a problem?

Answer: Yes. Even if there are other companies that manufacture this same chemical, your ownership interest is greater than the regulatory de minimis level. You cannot own more than $25,000 in any particular entity and still work on matters of general applicability, which is what this example describes.

Loss of Impartiality

Another basic EPA principle of ethical conduct is remaining impartial when performing Government duties. A loss of impartiality may arise when an individual working on an EPA work product has non-financial ties to another individual or entity that is directly affected by it. Thus, employees cannot as part of their official duties engage in work on specific projects with persons or entities with whom they have a "covered" relationship[27]. Examples of covered relationships include relatives, members of your household, organizations in which they are active participants, and former employers within the last year. They also include the employer of your spouse, parents or dependent children, as well as their potential employers if they are seeking employment with them.

Contributions to Agency work products by individuals or groups with actual or perceived conflicts of interest or loss of impartiality compromise the integrity of those work products. The success of any work product depends upon maintaining the confidence of the public. The public could be concerned that authors of a work product with ethical constraints may be motivated by considerations other than the desire to do what is best for the public as a whole. The ethics rules do not yield to assertions that individuals are certain that they can maintain their objectivity, and neither do the concerns about a loss of scientific integrity. All project contributors must vigilantly avoid conflicts of interest or loss of impartiality in all aspects of a project including the planning, execution, writing, review, and dissemination of the work product. You are advised to consult with an ethics official if you have any questions.

"Contributions to Agency work products by individuals or groups with actual or perceived conflicts of interest or loss of impartiality compromise the integrity of those work products."

13. Bias

Bias, although not a federal ethics issue, is nonetheless an important scientific integrity issue that should be considered when developing any EPA work product. Bias is any tendency that prevents unprejudiced consideration of a question. Bias can occur at any stage of a project. In research, bias occurs when "systematic error [is] introduced into sampling or testing by selecting or encouraging one outcome or answer over others."[28] Although an exhaustive discussion of research bias is beyond the scope of these best practices, all authors should strive to be aware of their own biases and the biases of their co-authors. Authors can reduce the impact of bias by collaborating with and seeking review from individuals not intimately involved with the project, and/or with a broad spectrum of knowledge, beliefs, and experiences[29]. Bias compromises the integrity of the work product. It is the responsibility of all authors to minimize the impact of bias.

Box 9: Diverse Points of View

Example: You and your research team study a topic that is not well-known or widely studied within EPA. Over the past few years, your team has sent research papers to the same core group of experts for review and edits. Last month, you sent your most recent research paper to this group of experts for review. Today, you received their notes and there are very minimal changes and comments. The group of experts stated that once these minor edits are addressed, the paper is ready for publication. Is this consistent with EPA's Authorship Best Practices?

Answer: No. By sending your papers to the same limited group of reviewers every time, you are preventing the detection of possible bias in your research. You should seek a diverse group of reviewers to examine your findings. Experts with a broad spectrum of knowledge, beliefs and experiences are more likely to suggest new ways of looking at the data. It is the responsibility of all authors to minimize bias.

"Bias is any tendency that prevents unprejudiced consideration of a question"

14. Copyright Issues

Authors frequently desire to reuse previously published images and other copyrighted material. It is the author's responsibility to follow journal or publisher guidelines on the reuse and attribution of copyrighted material. This includes the author's own work if the copyright was transferred to a publisher or journal[30]. Authors should contact the journal or publisher of the source material or consult the "permissions" information that can be found on many of their web sites. Permission should be obtained in writing and the authors should retain this documentation. The publisher of the reused material may request a copy of this notification as well.

Works created by federal employees as part of their official duties cannot be copyrighted in the United States. Upon acceptance of information for publication and receipt of a copyright transfer form from a publisher, federal authors should sign the form where it specifies that they were a federal employee when the work was prepared and thus there is no copyright to transfer. When both federal and nonfederal employees are authors of the same work product, each author should sign the appropriate section of the copyright transfer form.

> "Works created by federal employees as part of their official duties cannot be copyrighted in the United States."

Although the content of a publication authored by federal employees may not be copyrighted, some publications (e.g., journals) may copyright the format in which the information is published. The copyright on format may inhibit EPA's ability to freely copy the published information. If the publication is of such a nature that wide distribution is desirable, the authors should seek a license from the publication to freely copy and distribute the information as it was published. This license should be negotiated prior to publication. EPA's Office of General Counsel Intellectual Property Law Practice Group is available to assist in this process.

For further information on copyright related issues, please consult the Publication Agreement Frequently Asked Questions[31] from the Office of General Counsel webpage.

Notes

Appendix 1

Office of the Science Advisor

Coordination Procedures between the Scientific Integrity Official and the Office of Inspector General regarding Research Misconduct Allegations

March 30, 2015

Introduction and Purpose

The Scientific Integrity Official and the OIG will rely on the following authorities in interpreting the division of responsibilities and actions in these procedures:

- EPA Order 3120.5 Policy and Procedures for Addressing Research Misconduct.
- Section 7 of the EPA Order 3120.5 outlines the circumstances when the OIG must be notified immediately.
- Section 9 A of EPA Order 3120.5 requires EPA employees to promptly report allegations of research misconduct by EPA personnel.

For the purposes of this document, the term Research Misconduct Allegation is defined, according to EPA Order 3120.5, "Policy and Procedures for Addressing Research Misconduct,"[32] as, "fabrication, falsification, or plagiarism in proposing, performing or reviewing research, or in reporting research results, or ordering, advising or suggesting that subordinates engage in research misconduct." Research misconduct does not include honest error or differences of opinion.

I. Notification Upon Receipt of an Allegation of Research Misconduct

1. Upon receipt of a research misconduct[33] allegation, the Scientific Integrity Official will, within seven calendar days: a) refer the allegation to the Office of Inspector General (OIG) Hotline.
2. If the OIG or the OIG Hotline receives an allegation of research misconduct, within 7 days, the allegation will be forwarded to the OIG Hotline which will contact the Scientific Integrity Official to discuss the allegation, as appropriate.

II. Determining Which Office Will Address the Allegation of Research Misconduct

1. The OIG agrees that the U.S. EPA Scientific Integrity Official will evaluate allegations of plagiarism (except in the circumstances listed in EPA Order 3120.5, Section 7), including making inquiries and writing reports summarizing the findings of those inquiries. The Scientific Integrity Official will then share the report with the OIG and take actions necessary to secure the science. If during an inquiry into a plagiarism allegation, the Scientific Integrity Official discovers there is a potential criminal aspect to the allegation (false statement,

fraud or theft) to the allegation which was not apparent during initial screening, then the Scientific Integrity Official will stop its inquiry and consult with the OIG, which will address the matter in accordance with OIG Hotline procedures.

2. The OIG through the OIG Hotline will inform the Scientific Integrity Official about its decision regarding disposition of research misconduct allegations. The OIG disposition will consist of one of the three following options:
    a. There is no further OIG interest in the allegation. The OIG Hotline will send a referral memorandum to the Scientific Integrity Official within 5 business days of this decision. The Scientific Integrity Official will conduct its inquiry in accordance with its policy for resolving allegations of loss of scientific integrity. The Scientific Integrity Official will respond to the complainant for these allegations. The OIG Hotline will be closed.
    b. OIG needs to gather additional information prior to making a determination regarding the disposition of the allegation, or
    c. OIG will start an audit, evaluation, investigation, or other action and will contact the Scientific Integrity Official for assistance as needed. The OIG or the OIG Hotline will send a notice to the Scientific Integrity Official within 5 business days of its decision to take action on the allegation. The notice to the SIO may be a courtesy copy of a Hotline Referral, OIG Assignment Notification Memorandum, or electronic message.

III. <u>Communications between the OIG and the Scientific Integrity Official</u>

1. For allegations retained by the OIG, within 30 days of the receipt of the referral, and quarterly thereafter, the OIG will inform the Scientific Integrity Official of the status of any OIG action on the referral.
2. For allegations addressed by the Scientific Integrity Official, the Scientific Integrity Official will report on the status quarterly and final documentation of the resolution of the allegation will be sent to the OIG Hotline Coordinator.

Appendix 2

Contract Publication Review Procedures (APR 1984)

(a) Material generated under this contract intended for release to the public is subject to the Agency's publication review process in accordance with the EPA Order on this subject and the following.

(b) Except as indicated in paragraph (c) of this contract, the Contractor shall not independently publish or print material generated under this contract until after completion of the EPA review process. The Contracting Officer's Representative will notify the Contractor of review completion within __ calendar days after the Contractor's transmittal to the Contracting Officer's Representative of material generated under this contract. If the Contractor does not receive Contracting Officer's Representative notification within this period, the Contractor shall immediately notify the Contracting Officer in writing.

(c) The Contractor may publish, in a scientific journal, material resulting directly or indirectly from work performed under this contract, subject to the following:

(1) The Contractor shall submit to the Contracting Officer and the Contracting Officer's Representative, at least 30 days prior to publication, a copy of any paper, article, or other dissemination of information intended for publication.

(2) The Contractor shall include the following statement in a journal article which has not been subjected to EPA review:

"Although the research described in this article has been funded wholly or in part by the United States Environmental Protection Agency contract (number) to (Name of Contractor), it has not been subject to the Agency's review and therefore does not necessarily reflect the views of the Agency, and no official endorsement should be inferred."

(3) Following publication of the journal article, the Contractor shall submit five copies of the journal article to the Contracting Officer's Representative, and one copy to the Contracting Officer.

(d) If the Government has completed the review process and agreed that the contract material may be attributed to EPA, the Contractor shall include the following statement in the document:

This material has been funded wholly or in part by the United States Environmental Protection Agency under contract (number) to (name). It

has been subject to the Agency's review, and it has been approved for publication as an EPA document. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

(e) If the Government has completed the review process, but decides not to publish the material, the Contractor may independently publish and distribute the material for its own use and its own expense, and shall include the following statement in any independent publication:

Although the information described in this article has been funded wholly or in part by the United States Environmental Protection Agency under contract (number) to (name), it does not necessarily reflect the views of the Agency and no official endorsement should be inferred.[34]

End Notes

1. U.S. Environmental Protection Agency Scientific Integrity Policy: https://www.epa.gov/scientific-integrity/epas-scientific-integrity-policy
2. National Partnership Council, US EPA (1999) Principles of Scientific Integrity: https://www.epa.gov/scientific-integrity/scientific-integrity-epa#History%20of%20the%20Development%20of%20EPA's%20Scientific%20Integrity%20Policy
3. An "EPA work product" is defined here as any deliverable or material outcome of any activity undertaken by EPA employees in their official capacities or by any contractor, student or other individual under the direction and auspices of EPA.
4. U.S. Environmental Protection Agency Scientific Integrity Policy, section II, paragraph 1: https://www.epa.gov/scientific-integrity/epas-scientific-integrity-policy
5. Nature Journal Authorship Policy: https://rdcu.be/d2h2s
6. ACS Publications Ethical Guidelines to Publications of Chemical Research: https://pubs.acs.org/doi/10.1021/ar00042a600
7. Council of Science Editors Authorship and Authorship Responsibilities: https://www.councilscienceeditors.org/resource-library/editorial-policies/%20white-paper-on-publication-ethics/2-2-authorship-and-authorshipresponsibilities/
8. CDC Authorship Policy: https://www.cdc.gov/os/policies/docs/policy333.pdf
9. Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals: https://www.icmje.org/about-icmje/faqs/icmje-recommendations/
10. Claxton, Larry D. Scientific Authorship Part 2. History, recurring issues, practices, and guidelines. Reviews in Mutation Research 589 (2005) 31-45.
11. ORI Publications/Authorship: https://ori.hhs.gov/publicationsauthorship
12. An author, as described here, is not the same as an author under copyright law. The term "author" is not defined in the U.S. Copyright Act, but is commonly considered to be one who "translates an idea into a fixed, tangible expression eligible for copyright protection." CCN v. Reid, 490 U.S. 730 (1989).
13. Winston, Roger B. "A suggested procedure for determining order of authorship in research publications." Journal of Counseling & Development 63.8 (1985): 515-518.
14. Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals: https://www.icmje.org/about-icmje/faqs/icmje-recommendations/

15. Singh, Chawla D. “Digital badges aim to clear up politics of authorship.” Nature 526.7571 (2015): 145-146.

16. Allen, Liz, et al. “Credit where credit is due.” Nature 508.7496 (2014): 312-313.

17. Preempting Discord: Prenuptial Agreements for Scientists By Howard Gadlin, NIH Ombudsman, and Kevin Jessar, NIH Associate Ombudsman

18. EPA Website: https://www.epa.gov/data

19. United States EPA Acquisition Regulation: https://www.federalregister.gov/documents/2020/10/19/2020-20665/environmental-protection-agency-acquisition-regulation-epaar-scientific-integrity

20. Policies and Procedures for Addressing Research Misconduct. EPA Order 3120.5: https://www.epa.gov/scientific-leadership/epa-order-31205-policy-and-procedures-addressing-research-misconduct

21. Coordination Procedures between the Scientific Integrity Official and the Office of Inspector General regarding Scientific Misconduct Allegations: https://www.epa.gov/scientific-integrity/coordination-procedures-between-scientific-integrity-official-and-office

22. Adapted from: SIAM: Authorial integrity in scientific publication. (n.d.): http://www.siam.org/books/plagiarism.php. **Link no longer accessible**.

23. Committee on Publication Ethics: Text Recycling Guidelines: http://publicationethics.org/text-recycling-guidelines

24. How to deal with text recycling. (n.d.): http://media.biomedcentral.com/content/editorial/BMC-text-recycling-editorial_guidelines.pdf. **Link no longer accessible.**

25. The Ethics Program: https://work.epa.gov/ethics

26. Bribery, Graft, and Conflict of Interest: https://uscode.house.gov/view.xhtml?path=/prelim@title18/part1/chapter11&edition=prelim

27. See 5 C.F.R. Section 2635.502(b)

28. Definition of Bias: http://www.merriam-webster.com/dictionary/bias

29. Claxton, L.D. A Review of Conflict of Interest, Competing Interest, and Bias for Toxicologists. Toxicology and Industrial Health 2007; 23:557-571.

30. Unless the work was a U.S. government work, in which case there would not have been a U.S. copyright to transfer.

31. Frequently Asked Questions about Publication Agreements: https://work.epa.gov/sites/default/files/2024-06/Frequently%20Asked%20Questions%20About%20Publication%20Agreements.pdf

32. EPA Order on Policy and Procedures for Addressing Research Misconduct: https://intranet.epa.gov/ohr/rmpolicy/ads/orders/3120-5.pdf

33. As defined by EPA Order 3120.5

34. CFR 1552.237-70

Notes

Scientific Integrity Website

http://www.epa.gov/scientific-integrity

To report allegations or concerns:

Deputy Scientific Integrity Officials

https://www.epa.gov/scientific-integrity/scientific-integrity-committee

Scientific Integrity Official

Francesca T. Grifo, PhD
Grifo.francesca@epa.gov
(202) 564-1687

Scientific Integrity Program

Scientific_Integrity@epa.gov

To report fraud, waste or abuse, contact the hotline (Office of Inspector General):

E-mail: OIG_Hotline@epa.gov
Phone: 1-888-546-8740
Fax: 202-566-2599
Online: http://www.epa.gov/oig/hotline.htm

Write:
EPA Inspector General Hotline
1200 Pennsylvania Avenue
NW Mailcode 2431T
Washington, DC 20460