NATIONAL SCIENCE FOUNDATION
OFFICE OF INSPECTOR GENERAL
OFFICE OF INVESTIGATIONS

CLOSEOUT MEMORANDUM

Case Number: A06110054

We investigated an allegation of falsification in research connected with NSF proposals. We concluded, based on a preponderance of the evidence, that the Subjects[1] recklessly falsified research data, and that this act was a significant departure from accepted practices. We recommended NSF take the following actions: make a finding of research misconduct, and send to each of the Subjects a letter of reprimand; require that the Subjects contact the journal in which the falsified data appeared to make a correction; require certifications and assurances for three years; bar the Subjects from serving as a peer reviewer, advisor, or consultant for NSF for three years; and require the Subjects to complete a responsible conduct of research training program.

NSF declined to make a finding of research misconduct. However, NSF concluded that the Subjects' actions were a significant departure from standard research practices. Accordingly, NSF issued a letter of reprimand, and declared the Subjects ineligible for future NSF funding. NSF would reinstate the Subjects' eligibility if the Subjects take specific actions to address issues in the scientific publication containing the misleading results.

This memo, the attached Report of Investigation and the letter from NSF, constitute the case closeout. Accordingly, this case is ***closed***.

[1] [redacted].

National Science Foundation
Office of Inspector General

Report of Investigation
Case Number A06110054

September 24, 2013

Executive Summary

University 1 concluded that:

- the three Subjects published unsupported conclusions in NSF-supported research, constituting falsification;
- Subject 2 bore primary responsibility for the falsification; and
- Subject 2's actions did not rise to a level of reckless intent.

OIG Investigation concludes that:

- **Act:** the Subjects' conclusions in a published paper linked to NSF-supported research were not supported by contemporaneous data.
- **Intent:** All three Subjects acted recklessly.
- **Standard of Proof:** A preponderance of the evidence supports the assessment that the Subjects' acts were falsification and a significant departure from accepted practices and therefore constitute research misconduct.

OIG recommends that NSF:

- Send each Subject a letter of reprimand notifying them of the research misconduct finding.
- Require the Subjects to certify that they have requested a retraction of *Publication 1*, with the specified retraction language.
- Require each Subject to certify to the Assistant Inspector General for Investigations (AIGI) their completion of a responsible conduct of research training program and provide documentation of the program's content within 1 year of NSF's finding. The instruction should be in an interactive format (*e.g.*, an instructor-led course) and specifically address data falsification and fabrication.

And for a period of 3 years as of the date of NSF's finding:

- Bar each Subject from participating as a peer reviewer, advisor, or consultant for NSF.
- Require for each document (proposal, report, etc.) to which each Subject contributes for submission to NSF (directly or through an institution), and for each product which results from an NSF award to which each Subject contributes, that each Subject:
  - submit a contemporaneous certification to the AIGI that the document does not contain plagiarism, falsification, or fabrication.
  - submit contemporaneous assurances from a responsible official of his or her employer to the AIGI that the document does not contain plagiarism, falsification, or fabrication.

OIG Inquiry

We received notice that University 1[1] had started an inquiry into allegations of research misconduct involving three subjects (Subject 1,[2] Subject 2,[3] and Subject 3[4]). The alleged research misconduct at University 1 is related to *Publication 1,*[5] which we found to have a nexus with three NSF proposals.[6,7,8] We concurred an inquiry was warranted at University 1 as the responsible awardee institution;[9] although Subject 1 and Subject 2 had moved to University 2[10] and Subject 3 had moved to a postdoctoral position.

University 1 Inquiry

Before the start of the University 1 inquiry, the Subjects had authored additional related publications (*Publication 2*[11] and *Publication 3*[12]), and Subject 3 had submitted her Ph.D. dissertation and graduated.[13] The University inquiry committee considered these documents as part of its review. We received a copy of University 1's inquiry report, which included an interview with Subject 2 but not Subject 1 or Subject 3.[14] The University 1 inquiry committee addressed the following allegations:

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1 [redacted].

2 [redacted]

3 [redacted]

4 [redacted]

Tab 2, [redacted]". *Publication 1* does not acknowledge NSF support. However, the results are used as support in the project descriptions of [redacted] and [redacted], and this publication is listed as a result from prior NSF support in Tab 3, [redacted], wherein Results from *Publication 1* are described on pages 6-7 of the Project Description. However, the publication is not listed in the references cited. Subject 3 is listed as a participant in all three annual reports and the final report. Also, NSF records include copies of the University 1 news releases that accompanied publication of *Publication 1,* showing that the Program Officer was aware of its relationship to the proposal, prior to recommending [redacted] for funding.

7 Tab 3, [redacted] wherein *Publication 1* is reference 92, with a brief discussion on page 4 of the Project Description.

8 Tab 3, [redacted], wherein *Publication 1* is reference 1 and discussed as "Results from Prior NSF Support [redacted]" on page 1 of the Project Description.

9 Tab 4, Referral of inquiry.

10 [redacted].

11 Tab 5, [redacted]

Tab 5, [redacted]

Tab 6, Subject 3's dissertation.

14 Tab 7, University 1 inquiry report.

Allegation 1: No evidence for [redacted] as described in *Publication 1* (lack of experimental evidence for [redacted]);

Allegation 2: Misleading description of [redacted] conditions in *Publication 1* (misleading [redacted] description); and

Allegation 3: Lack of evidence supporting an assertion in *Publication 1* that [redacted] formed in the described experiment are [redacted] (lack of experimental evidence for [redacted]).[15]

The inquiry committee interpreted the Subjects' claim of [redacted] in *Publication 1* "[redacted]." The committee concluded that some evidence supports [redacted], while other evidence does not,[17] and noted "circular reasoning" by the Subjects in support of the conclusion of [redacted].[18]

The inquiry committee concluded that the description of [redacted] preparation in *Publication 1* (**Allegation 2**) was a "misrepresentation of the experimental facts,"[19] and noted that the Subjects provided "vague"[20] descriptions later in *Publication 2* and *Publication 3*.[21] Subject 1 and Subject 2 characterized the two later papers as corrections when speaking with the inquiry committee, but neither publication explicitly states that it is a correction of *Publication 1*.[22] Subject 3 stated to the inquiry committee that information about the presence or amount of [redacted] used in the [redacted] was not "deemed sufficiently important to warrant detailed explanation." The inquiry committee stated that "while it would have been desirable to fully describe the experimental conditions . . . the details are apparently sufficiently known to specialists . . . to permit replication of the experimental findings."[24]

The inquiry committee found a lack of supporting evidence for the assertion in *Publication 1* that [redacted] formed were [redacted][25] (**Allegation 3**). The committee found that the lack of evidence exceeded the bounds of a scientific dispute, and the assertion may therefore be a falsification.[26]

The Subjects responded to the inquiry report individually.[27] Subject 1's counsel[28] asserted that the inquiry committee misunderstood the level of intent required for a

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15 Tab 7, Inquiry committee report, page 2. University 1 policy is also included at Tab 7.
16 Tab 7, Inquiry committee report, page 7.
17 Tab 7, Inquiry committee report, page 7.
18 Tab 7, Inquiry committee report, page 8.
19 Tab 7, Inquiry committee report, page 8.
20 Tab 7, Inquiry committee report, page 8.
21 Tab 7, Inquiry committee report, page 8.
22 Tab 7, Inquiry committee report, page 8.
23 Tab 7, Inquiry committee report, page 8.
24 Tab 7, Inquiry committee report, page 10.
25 Tab 7, Inquiry committee report, page 9.
26 Tab 7, Inquiry committee report, page 6.
27 Tab 8: The Subjects' responses to the University 1 inquiry report.

finding of scientific misconduct, that the inquiry committee failed to establish a level of intent by the Subjects consistent with a finding, and that the inquiry committee cannot therefore recommend an investigation.[29]

Subject 2 responded to the inquiry committee report:

> We did **not** state that because the [redacted], they have [redacted]. Rather, it was stated matter-of-factly that the [redacted] are [redacted]. That is, they are [redacted]. This is a true statement, based on a conservative reading of our data, and that data supported it. We did not use [redacted] to draw any conclusions other than that the [redacted] We did not use the [redacted] data to conclude anything about the [redacted] of the [redacted] Nowhere in the paper did we state that the [redacted] was consistent with [redacted] In short, we reached no conclusion based on the [redacted] that was not supported by that data.[30]

Subject 2 also stated in his response that "The [redacted] acquired in [redacted] before [*Publication 1*] was published, [redacted]."[31] Subject 2 summarized:

> That conclusion leaves the sole allegation that we did not have enough evidence to conclude [redacted] and that by stating so in [*Publication 1*] we have somehow "fabricated" data. The panel plainly believes that our failure [redacted] prior to publication means we may have falsified our claim of [redacted]. But as I explained above, we did not rely on the [redacted] for this conclusion - which turned out to be correct anyway. This slippery ground cannot support the full weight of a misconduct investigation.[32]

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[28] [redacted]

The purpose of an inquiry is to determine if sufficient substance exists to warrant an investigation (45 C.F.R. § 689.2(b)). This purpose is explicitly delineated in University 1 policy (Tab 7, page 17). A final determination of intent is not necessary to assess sufficiency of substance to move to an investigation.

[30] Tab 8, Subject 2's response to inquiry report, page 2.

[31] Tab 8, Subject 2's response to inquiry report, page 3.

[32] Tab 8, Subject 2's response to inquiry report, page 4.

Subject 3 responded,[33] denying she committed research misconduct, and stating she did not believe there was any basis for investigation.

The University 1 Vice Chancellor[34] concurred with the inquiry committee recommendation for investigation. We concurred that an investigation was warranted and referred an investigation to University 1.[35]

University 1 Investigation

University 1 added two members from outside the university to the inquiry committee to form the investigation committee (IC) to review the allegations *de novo*. We received a copy of the IC report and its supporting documents.[36] The IC interviewed Subject 1 and Subject 3 (twice) via teleconference.[37] Subject 2 declined to be interviewed, but provided written answers to questions.[38]

For **Allegation 1 (**lack of evidence for [redacted]), the IC concluded that the evidence was inconclusive. The IC noted, however, that Subject 2's claims about results of control experiments supporting the claim of [redacted] were potentially "flawed."[39]

For **Allegation 2** (misleading [redacted] description), the IC stated:

[redacted] [*Publication 1*] [redacted] [*Publication 1*], [redacted] [40]

The IC analysis of **Allegation 2** included extensive discussions of later experiments and different conditions for [redacted] preparation. For example, the IC stated:

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[33] Tab 8, Subject 3's response to inquiry report.
[34] At the time, this was [redacted].
[35] Tab 9, OIG investigation referral letter.
[36] Tab 10. The complete supporting record is available for inspection.
[37] Transcripts are included at Tab 10.
[38] Tab 10, Subject 2 answers to IC questions.
[39] Tab 10, IC report, page 7-9. See later discussion of control experiments documented in Subject 3's laboratory notebooks.
[40] Tab 10, IC report, page 10.

[redacted][41]

The IC specifically noted an email from the Subjects' coauthor (Witness 2)[42] on a subsequent paper (*Publication 4*)[43] describing [redacted] preparation: we were [redacted][44] Subject 1's explanation differs from Witness 2's email. Subject 1 stated, '[redacted] . . . you've got to get the [redacted] right; you've got to get the [redacted] right. Both those things."[45,46] However, the IC did not probe the contrast further. The IC concluded that the inconsistencies in descriptions of [redacted] preparation are a [redacted] The IC, therefore, found no misconduct by the Subjects with respect to **Allegation 2.**

For **Allegation 3** (lack of evidence for [redacted]), the IC stated:

[redacted]

. . .

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[41] Tab 10, IC report, page 5. See also Tab 10, IC report, page 9.

[42] [redacted]. Tab 17, *Publication 4,* [redacted]

[43] Tab 10, IC report, page 10.

[45] Tab 10, Subject 1 interview transcript, page 28.

[46] In answering questions about [redacted] preparation conditions, Subject 1 described experimental work from colleagues at [redacted] as supportive of the claims in *Publication 1*. Subject 1 declined to identify these colleagues (Tab 10, Subject 1 interview transcript, page 26). Subject 3's laboratory notebooks include the names of [redacted], and reveal that Subject 3 prepared samples shipped to them. An erratum for *Publication 4* was published in the [redacted] issue of the journal, after the IC report was completed, correcting *inter alia* [redacted] preparation conditions published in *Publication 4*.

[47] Tab 10, IC report, page 10.

[The IC]

[Subjects]

. . .

[The statement]

[*sic*]

[*Publication 1*]
[48]

The IC concluded that represent a significant deviation from accepted practices of the relevant research community."[49]

The IC assessed the involvement and responsibility of each of the Subjects in research reported in *Publication 1*. The IC stated:

[Subjects],

[Subject 2 and Subject 3]

[*Publication 1*].

. . .

[Subject 2]

[48] Tab 10, IC report, page 13-15.
[49] Tab 10, IC report, page 14.

[redacted]

. . .

[Subject 2] [redacted]

. . .

[The] [redacted]

The IC therefore concluded that Subject 2 did commit falsification but did not find research misconduct because his actions were not at least reckless.[51] However, the conclusion was not unanimous as one committee member found that Subject 2's actions were reckless.[52]

The Subjects each independently responded to the IC report.[53] Subject 2 responded:

> I disagree, however, that our use of the term [redacted] constitutes falsification of data. . . . In hindsight, the term [redacted] may appear vague. But it was a reasonable and good faith description of the composition that we believed to be present when we published [*Publication 1*].[54]

Subject 2 also interpreted the report to mean that "the committee has concluded that the allegations were unfounded."[55] However, the IC did not find the allegations to be unfounded. Rather the IC confirmed that falsification had occurred, that Subject 2 was primarily responsible for it, but that Subject 2's intent did not rise to the requisite level for a finding of research misconduct.

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50 Tab 10, IC report, page 17-19.
51 Tab 10, IC report, page 19.
52 Tab 10, IC report, page 19.
53 Tab 11, Subjects' responses to the IC report.
54 Tab 11, Subject 2's response, page 1.
55 Tab 11, Subject 2's response, page 1.

Subject 3 responded:

> I disagree, however, with several findings in the report. First and foremost, I strongly disagree that false statements were made. I also object to the characterization of our work as sloppy, and to the notion that any of our publications were not supported by the data we had in hand.[56]

Subject 1 responded through counsel that he "agrees with the comments submitted by [Subject 2 and Subject 3]" and "has no additional comments at this time."[57]

University 1's investigation concluded with a letter to the Subjects from the University 1 Vice Chancellor,[58] which contained the following:

> The report highlights certain portions of the published scientific record that represent misleading data and results. . . . As such, I am compelled to request that you correct the scientific record accordingly. . . . [A] technical comment or erratum clarifying the nature and results of the experiments should be appended to the subject papers.
>
> A prudent and responsible course of action on your part would be to clarify, for the record, that:
>
> (1) The [redacted] described in [*Publication 1*] was not "[redacted] but in fact was "[redacted] comprising both [redacted] and [redacted]. While you rectified your error in the subsequent [*Publication 2*], [*Publication 1*] remains wrong and is regularly cited by other scientists.
>
> (2) You failed to [redacted] your [redacted] and thus it is improperly stated that [redacted] You should correct the scientific record accordingly to remove any and all reference to your reliance upon [redacted] or [redacted] data in concluding [redacted].[59]

The Vice Chancellor subsequently sent a letter directly to the editors of journals in which the Subjects' publications had appeared, summarizing the finding of the IC, stating:

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[56] Tab 11, Subject 3's response, page 1.
[57] Tab 11, Subject 1's response.
[58] The position of Vice Chancellor now filled by [redacted].
[59] Tab 10, University IC Report cover letter and adjudication letter.

[redacted][60]

We are unaware of any actions taken by journal editors in response to this letter. However, Subject 1 and Subject 2 jointly provided unsolicited comments to our office in response to the Vice Chancellor's letter to the journal editors.[61] They asserted that there is nothing in their publications that warrants correction, and state:

> Finally, it is important once again to note that [University 1's] review of our work only found two points ("[redacted] and [redacted]) about which to quibble, and the attacks on our work . . . were motivated by something other than scientific judgment.[62]

OIG Investigation

On receipt of University 1's report, we resumed our investigation and invited the Subjects to comment on University 1's IC report; Subject 1 and Subject 2 responded separately.[63] Subject 3 did not respond to our invitation for comment.

Subject 1 characterized the allegations as "slander," and questioned the decision of the Vice Chancellor for requesting that the Subjects write a clarification letter to the journals.[64] Subject 1 stated that University 1 "has been extremely biased in the way they have treated [University 2] and me."[65] Subject 1 further stated: "I very much appreciate the initiative taken (and scientific skill required by one of the committee members) to actually make the [redacted] that are the subject of allegation 1."[66] Subject 1 referred to an article:

> [W]e recently published . . . a clarifying response as to the current state of our understanding of [redacted] [*Publication 5*[67]]. It should be noted that with regard to point 1 of the [Vice Chancellor's] letter

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60 Tab 12, University letter to the journal editors.
61 Tab 12, Subject 1's and Subject 2's comments on the University letter to the journal editors.
62 Tab 12, Subject 1 and Subject 2 letter, page 3.
63 Subjects' responses, Tab 14.
64 Tab 14, Subject 1 response, page 1.
65 Tab 14, Subject 1 response, page 3.
66 Tab 14, Subject 1 response, page 1.
67 Tab 17, *Publication 5*, [redacted].

> those experienced in this line of research know that it is typical for these [redacted] to use [redacted] that contain [redacted] To make this clear to nonexperts we included these details in two previous publications [*Publication 2* and *Publication 4*].[68]

Subject 2 stated that "I was extremely gratified to learn that [University 1] has concluded that there was no fabrication, falsification, or plagiarism in reporting our work on [redacted]"[69] However, this distorts the IC finding that falsification occurred but without the requisite level of intent for a finding of research misconduct. Subject 2 also asserted:

> I can assure you that I have thought deeply about [the Vice Chancellor's] suggestion that we correct any erroneous remarks that we may have made in our original publication . . . . I can report to you that the only necessary correction to [*Publication 1*] – that our [redacted] contained small amounts of [redacted] – has been made in two separate publications.[70]

However, this statement is misleading. Subject 2 refers in his response to *Publication 2* and *Publication 4*. *Publication 2* does not contain any information about [redacted] preparation that can be identified as a correction. *Publication 4* was later corrected through publication of an erratum (*Publication 4 Erratum*)[71] within a month after our receipt of his comments. *Publication 4 Erratum* specifically addressed [redacted] preparation conditions.

We reviewed the University investigation report and conclude that the University investigation was in accordance with reasonable procedures.[72] However, we found the IC's investigation to be incomplete with respect to a thorough review of the available laboratory notebooks and corroborating interviews with Witness 2 and 3.

In our continued investigation, we reviewed: materials submitted to the journal for *Publication 1*;[73] laboratory notebooks and records at University 1;[74] Subject 3's dissertation;[75] and the Subjects' later publications (*Publications 2* through *6*).[76] We

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68 Tab 14, Subject 1 response, page 1.
69 Tab 14, Subject 2 response, page 1.
70 Tab 14, Subject 2 response, page 1.
71 Tab 17, *Publication 4 Erratum*.
72 45 C.F.R. § 689.9(a).
73 Tab 15. We obtained documents with the cooperation of the journal's editorial staff.
74 Tab 16. These documents were sequestered as part of the University 1 inquiry.
75 Tab 6.
76 Tab 5 (*Publications 2* and *3*), and Tab 17 (*Publications 4, 4 Erratum, 5* and *6*), *Publication 6*: [redacted]

interviewed all Subjects, interviewed their colleagues at University 1, and interviewed (by phone) two of the Subjects' co-authors for *Publication 4*. We received copies of two research misconduct inquiry reports from University 2,[77] and reviewed them for relevance to the allegations of research misconduct against the Subjects in *Publication 1*.[78]

Our assessment of all the evidence consists of two parts: first, the Subjects' support for the disputed conclusions in *Publication 1*; and second, the Subjects' subsequent published explanations regarding the allegations made about *Publication 1*.

A. Manuscripts and Notebooks relevant to *Publication 1*

Publication 1 is central; we therefore obtained copies of the manuscript as submitted, manuscript reviews, the cover letter for the revised manuscript, and the revised manuscript[79] to assess the Subjects' statements in the publication relevant to the three allegations. We have found:

- The experimental section that describes incubation of the [redacted] in an [redacted] without mention of the [redacted] is identical in both versions of the manuscript as well as in Subject 3's dissertation.[80] The [redacted] conditions reported versus the actual conditions used are the basis of **Allegation 2**.
- The sentence "[redacted]" appears without change in both the submitted and revised versions of the manuscript. This statement is the basis of **Allegation 3**.

Therefore, the statements underlying **Allegation 2** and **Allegation 3** are not the result of editorial changes or revisions.

The conclusions and images in *Publication 1* correspond with entries in Subject 3's notebooks.[82] The images in the publication are taken from a flipbook of images attached to a single page of the notebook,[83] representing results from a single sample. In the notebook, images 3, 4, and 6 show [redacted] while images 5, 7, and 8 of the same sample show [redacted]. Cropped versions of images 4 and 6

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[77] Subject 1 and Subject 2 are now at University 2. At the time of our interview, Subject 1 was the [redacted]. The Subjects have no current NSF funding. The University 1 IC did not consider the inquiry report from University 2 in preparing their report.

[79] Tab 15.

[80] Tab 6, Subject 3's dissertation ([redacted]), Chapter 1, page 8.

[81] Subjects revised the manuscript for *Publication 1* in response to of the reviewer's and the editor's comments

[82] Tab 18, Excerpts from Subject 3's laboratory notebooks. Original notebooks 1-12 are secured at University 1. Subject 1 stated to the IC that he did not examine lab notebooks or supporting material until the University 1 inquiry was underway (Tab 10, Subject 1 transcript, page 72).

[83] Tab 18, Notebook [redacted], sample [redacted]. Images for sample [redacted] are print outs taped one on top of the other on page [redacted] of the notebook. They appear on pages 4-12 of the pdf file.

correspond to Figures [redacted] and [redacted] in *Publication 1*, and as Figure [redacted] and [redacted] in Subject 3's dissertation,[84] corresponding to the [redacted]. There is no concurrent explanation in the notebook as to why the Subjects omitted the observed formation of the [redacted], and instead explicitly claimed exclusive [redacted] in *Publication 1*. There were no full-field images for this sample in the notebook, or referenced in the notebook, and no supporting information for the [redacted] claimed in *Publication 1*.

Subject 3's notebook documents only one control experiment prior to the submission of *Publication 1*.[85] Subject 3 wrote in her lab notebook that the overall process was the same as the process used to produce [redacted] except that there was no [redacted] in the [redacted]. The [redacted] formed included [redacted], as shown in images documenting results from this control experiment. The fact that [redacted] were formed in the [redacted] contradicts the assertion in *Publication 1* that [redacted] were not formed in the absence of [redacted]. Our review of the notebooks is also consistent with Subject 3's admission that [redacted] were formed in this control experiment.[87] Although she made this admission to the University 1 IC, the IC did not review the notebooks.

We examined Subject 3's notebooks covering subsequent work up to the time of her graduation. Subject 3's notebooks show that she prepared samples for Witness 2 and Witness 3 at the [redacted].[88] This work was later published in *Publication 4* . Authors of *Publication 4* later contacted Subject 3 directly for information published as *Publication 4 Erratum*.

Assessment of Evidence from Relevant Documents

Allegation 1 (lack of evidence for [redacted]): The Subjects' assertion of [redacted] in *Publication 1* is not supported by data in Subject 3's lab notebook. The data in the notebook show that [redacted] were formed in the absence of [redacted]. This observation invalidates the assertion of [redacted] in *Publication 1*.

Allegation 2 (misleading [redacted] description): The Subjects' description of [redacted] preparation in *Publication 1* does not reflect the actual conditions used. Subject 3 described preparations of [redacted] in her notebook.[89] The

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[84] Tab 6, page 12.

[85] Tab 16, Notebook [redacted].

[86] Tab 16, Notebook [redacted].

[87] Tab 10, Subject 3 interview transcript, [redacted], page 26.

[88] Preparation of samples is described in Subject 3's notebook [redacted], notebook [redacted] and [redacted]. Subject 1 declined to identify these colleagues in his conversations with the University 1 IC, but pointed to this work as supporting the results in *Publication 1*. Subject 1 did not tell the committee that the samples examined by his colleagues were actually prepared by Subject 3.

[89] Tab 16, Notebook [redacted]. The first entry in the lab notebook describes preparation of a [redacted] by another individual. Based on the notation that [redacted].

notebook entries are explicit in noting that the [redacted] in [redacted] and then a measured portion of this [redacted] is added to an [redacted] containing [redacted]. The Subjects' omission of her use of the [redacted] in *Publication 1* is significant because of the behavior of [redacted] itself in the presence of such [redacted] as noted in the University 1 inquiry report.

Allegation 3 (lack of evidence for [redacted]): The Subjects' assertion of exclusive [redacted] formation in *Publication 1* is not supported by data in Subject 3's lab notebooks. The Subjects' assertion of [redacted] is also not supported by data available to them at the time of publication. The [redacted] the Subjects obtained prior to publication of *Publication 1* prompted multiple questions from both the inquiry committee and the IC, and was at the core of University 1's IC conclusion that the Subjects falsified the assertion in *Publication 1*.

The IC concluded that a properly [redacted] and [redacted] would have been necessary to support the assertion in *Publication 1* that [redacted] University 1's IC established, and the Subjects acknowledged, that [redacted] in hand at the time of the submission of *Publication 1* had not been [redacted]

Subject 3 stated that she attempted to [redacted], but failed to do so, and that Subject 1 and Subject 2 knew of her unsuccessful attempt.[91] To the contrary, Subject 1 asserted that he was unaware of Subject 3's attempts to [redacted][92] and tha[redacted] was unimportant to support the assertion in *Publication 1*.[93] Also, Subject 2 stated that the [redacted] was later [redacted] to what they thought it was, and then published in *Publication 5* a conclusion that the [redacted] do not [redacted] solely to that [redacted]

Our examination of Subject 3's notebooks corroborates the University 1 IC's findings that:

a) A single [redacted] was recorded prior to publication of *Publication 1*, and it was not [redacted] prior to *Publication 1*'s publication. The [redacted] does not appear in *Publication 1* either directly or as supplementary information available to readers.
b) The single [redacted] available to the Subjects prior to publication of *Publication 1* does not appear in Subject 3's dissertation, [redacted] or otherwise.

[90] Tab 7, University 1 inquiry report, page 8.
[91] Tab 9, Subject 3's interview transcript [redacted], pages 9-13.
[92] Tab 9, Subject 1 interview transcript, page 38.
[93] Tab 9, Subject 1 interview transcript, page 36.

c) The Subjects later claimed that the [redacted][94] was consistent with [redacted].

B. Interviews

Witness 1

During our investigation, we interviewed Witness 1,[95] [redacted] at University 1 who had an informal discussion with Subject 2 regarding the submission of *Publication 1*. Witness 1 stated that Subject 2 consulted him in the period between submission of *Publication 1* and its acceptance.[96] Witness 1 stated that he expressed reservations to Subject 2 about the [redacted] as asserted in *Publication 1*, and that after he expressed those reservations, Subject 2 did not discuss the matter with him further.[97]

Witness 2 and Witness 3

We interviewed both Witness 2 and Witness 3,[98] the senior and first authors, respectively, on *Publication 4*. Witness 3 stated that he composed the first draft of the manuscript, and re-used the description of experimental conditions for [redacted] as published in *Publication 1* and *Publication 2*. He also stated that he provided the draft manuscript to Subject 1 and Subject 2, neither of whom made comments or changes to the experimental section describing [redacted].[99]

Witness 3 also stated that he and his colleagues had difficulties reproducing [redacted] using the method reported in *Publication 1* and *Publication 2*, and were generally unable to produce a "good product."[100] Witness 3 visited University 1 to share experiences, and Subject 3 visited the [redacted] during collaborative work that led to *Publication 4*.[101] Despite visits to coordinate methods, Witness 3 stated that they commonly observed [redacted] in the [redacted] prepared with [redacted] using the published procedure.[102] Witness 3 confirmed that [redacted] prepared at the [redacted] were shipped to University 1, where Subject 3 [redacted] on

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[94] Subject 2 asserted that he [redacted] (Tab 10, IC report, Item 16, page 2).

[95] Tab 18, Witness 1 interview notes. Witness 1 is [redacted] with expertise in the relevant area of [redacted] characterization. The University 1 IC did not interview Witness 1.

[96] Witness 1 provided copies of emails that support the claimed time of discussion with Subject 2 (Tab 18).

[97] Witness 1 in a follow-up email stated: "I further noted in our conversation that [redacted] would be an unusual [redacted] since it adopts a [redacted]." (Tab 18, page 2)

[98] Tab 18, Witness 2 and Witness 3 interview notes.

[99] Tab 19, Draft of *Publication 4 Erratum* as returned by Subject 1 (with comments).

[100] Tab 18, Witness 3 interview, page 2.

[101] Tab 18, Witness 3 interview, page 2.

[102] Tab 18, Witness 3 interview, page 2. Procedure as published in *Publication 2*. Subject 1 claims repeatedly in his interview that a properly prepared [redacted] does not contain [redacted] (Tab 10, Subject 1 interview, page 28-34).

them.[103] Witness 3 was unaware of allegations regarding irreproducibility of previous work reported in *Publication 1* and *Publication 2*, or the ongoing investigation thereof.[104]

In his interview, Witness 2 stated that his collaboration with the Subjects began while Subject 1 and Subject 2 were at University 1.[105] Witness 2 confirmed that Subject 3 [redacted] sent to University 1.[106] Witness 2 stated that he was initially unaware of allegations regarding previous work in *Publication 1* and *Publication 2*, and that after *Publication 4*, he received information about potential problems with the published procedures for [redacted].[107] He said he then contacted Subject 3 directly via email,[108] and learned that samples were actually prepared using a 50% [redacted] rather than the procedure reported in *Publication 4*. Witness 2 stated that Subject 1 and Subject 2 received a draft copy of *Publication 4 Erratum* and that they requested only that Witness 2 not state in the erratum that the [redacted] were not [redacted].[109] Finally, Witness 2 confirmed that Figure [redacted] appearing in *Publication 4* was recorded by Subject 3 at University 1.[110]

After the interviews, Witness 2 provided us with a copy of email exchanges between Witness 3 and Subject 3 documenting their communications of results.[111] In writing to Subject 3, Witness 3 references "functional" preparations as those that "make those magical [redacted] in [redacted][112] while other emails document problems encountered by Witness 3 in reproducing [redacted].[113] Another email documents the [redacted] under unexpected conditions, which Subject 3 simply attributes to an undefined cross-contamination.[114]

Subject 3

We asked Subject 3[115] about her control experiments as described in Notebook [redacted] and the relevance of that result to the conflicting assertion in *Publication 1*. Subject 3 stated that other control experiments for which results are not included in her notebooks showed that no [redacted] were formed in the [redacted] control experiments.[116] Subject 3 offered no rationalization for choosing one set of results, rather than the other, to support the assertion in *Publication 1*. Subject 3 indicated that these results would be saved to a CD in University 1's possession.[117] She stated that the CD would also contain

[103] Tab 18, Witness 3 interview, page 1.
[104] Tab 18, Witness 3 interview, page 4.
[105] Tab 18, Witness 2 first interview, page 1.
[106] Tab 18, Witness 2 first interview, page 1.
[107] Tab 18, Witness 2 first interview, page 2.
[108] Tab 21, emails between Witness 2 and Subject 3.
[109] Tab 18, Witness 2 first interview, page 3.
[110] Tab 18, Witness 2 first interview, page 2.
[111] Tab 20. Witness 2 was copied on all of these emails.
[112] Tab 21, Email summary, page 9.
[113] Tab 21, Email summary, pages 12-14.
[114] Tab 20, Email summary, page 5.
[115] Tab 22, Subject 3 interview notes.
[116] Tab 22, page 3.
[117] Tab 22, page 4.

the images that she manually tabulated by visual inspection to conclude that the [redacted] formed were 99% [redacted].[118] We examined CDs in University 1's possession, and found no data for additional control experiments, or any data that supported for the claim of [redacted] reported in *Publication 1*. There is no citation of or description of such data in Subject 3's laboratory notebooks.

Subject 3 admitted that the [redacted] at the time *Publication 1* was submitted and published. We asked about the subsequent statement in *Publication 5*: [redacted] " that implied that it had been. She stated that the statement did not mean that the [redacted] data had been [redacted] prior to *Publication 1*.

Subject 3 confirmed that she had been contacted by Witness 2 about methods used to prepare [redacted].[119] Subject 3 admitted that she provided information to Witness 2, which then appeared in *Publication 4 Erratum*.[120] Subject 3 confirmed that the [redacted] image in Figure [redacted] in *Publication 4* is actually her work completed at University 1. We noted the absence of this data or any reference to it in her lab notebooks;[121] Subject 3 stated that the record would be in someone else's notebook and identified two individuals at University 1 with whom she might have collected the data.[122]

Subject 1 and Subject 2

We jointly interviewed Subject 1 and Subject 2.[123] Subject 1 explained that the [redacted] that they had in hand at the time *Publication 1* was submitted meant one thing to them and something else to critics and to the University 1 IC.[124] Subject 1 stated that his practice was to have students write weekly reports about what they were doing, and that he did not review Subject 3's notebooks for assertions in *Publication 1*.[125] Subject 2 stated that he does not look at the notebooks; noting "I tend to believe my students and postdocs when they tell me something."[126]

With respect to the [redacted] referenced as support for the assertion of [redacted] in *Publication 1,* Subject 2 stated that the paper does not say that the [redacted], but that it states that the [redacted]. He asserted this

[118] Tab 22, page 4.
[119] Tab 22, page 5.
[120] Tab 22, page 4. We note that the information about sample preparation does not conform to the information published in *Publication 1*, or by the Subjects in later publications. We note also that Subject 1 asserts in his later interview with us that no correction to *Publication 4* was needed (Tab 23).
[121] Tab 16, Notebook [redacted] described [redacted] experiments on [redacted] produced in [redacted]. These experiments are described as not successful. No successful [redacted] experiments are documented in Subject 3's lab notebooks.
[122] Tab 22, Subject 3 interview notes, page 1.
[123] Tab 23, Interview with Subject 1 and Subject 2.
[124] Tab 23, page 3.
[125] Tab 23, page 5.
[126] Tab 23, page 5.

conclusion is adequately supported by the [redacted]. However, Subject 2 stated that it is hard to be specific in his recollection on the [redacted].[127]

We asked Subject 1 to explain the collaborative work he presented to the University 1 IC as support for the validity of disputed assertions in *Publication 1*. This work was *Publication 4*. Subject 1 stated to us that Witness 3 composed the manuscript, which he received in draft and returned with minor edits.[128] Subject 1 stated that the [redacted] preparation conditions reported in *Publication 4* were accurate.[129] We asked about Figure [redacted] in *Publication 4*, which also appears in Subject 3's dissertation. Subject 1 asserted that the figure was derived from research completed in Witness 2's laboratory.[130]

Subject 1's assertion to us that [redacted] preparation conditions described in *Publication 4* are accurate contradicts subsequent correction of that description in *Publication 4 Erratum*. Subject 1 stated that Witness 2 was responsible for preparation of *Publication 4 Erratum* and he disagrees with the need for the erratum to correct the use of [redacted] to prepare the samples.[131] Regarding this issue, Subject 2 stated "If my name is on it, I back it or I backed it at the time."[132] With respect to preparation of samples at University 1 by Subject 3, and the omission of that information from *Publication 4*, Subject 1 stated that he does not know who prepared the samples in question: "somebody made the [redacted] and somebody put them on [redacted] – what is the issue?"[133] This statement directly contrasts with Subject 1's own assertion to the University 1 IC that the work had been repeated at the [redacted].[134]

After the interview, Subject 1 sent us an email to restate his understanding that University 1 work had been reproduced by Witness 2 and Witness 3.[135] Later he sent us a copy of a submitted manuscript relevant to the work described in *Publication 1*.[136] This manuscript remains unpublished; however, a similar manuscript appears to have been published later in a different journal.[137]

Assessment of Evidence from Interviews

Interviews with the Subjects confirm that there was only one [redacted] obtained before submission and publication of *Publication 1,* that [redacted] was not

[127] Tab 23, page 6. Subject 2 did not assert inadequate recollection in his responses to the inquiry and investigation of University 1.
[128] Tab 23, page 3.
[129] Tab 23, page 4.
[130] Tab 23, page 4.
[131] Tab 23, page 4.
[132] Tab 23, page 4.
[133] Tab 23, page 4.
[134] Tab 10, Subject 1 interview transcript, page 26.
[135] Tab 24, Subject 1's email, [redacted].
[136] Tab 25, "[redacted]".

[redacted], and that laboratory notebooks with supporting information were not examined by Subject 1 and Subject 2. These interviews also provided information relevant to Subjects' subsequent publications.

C. Examination of Subjects' subsequent publications

We examined the Subjects' subsequent publications because they invoked these publications as part of their defense in the university investigation, and to assess the Subjects' varying explanations of previous and subsequent work.

Publication 4* and *Publication 4 Erratum

Subject 1 stated to the University 1 IC: "we do have collaborators at the [redacted] and at [redacted] and they're going to be publishing papers on how they've reproduced this work."[138] Subject 1 stated that a paper had already been accepted, but he declined to name the coauthors,[139] despite their names appearing in Subject 3's notebooks.[140] This work appeared as *Publication 4*,[141] containing an acknowledgment to Subject 3 for [redacted]." From our interview with Witness 3, we learned that the Subjects did not inform Witness 2 and Witness 3 of the ongoing investigation into the allegation of research misconduct in the related work.[142]

Subject 1 stated to the IC that his colleagues reproduced work from *Publication 1* and subsequent publications. Subject 3's involvement in preparing samples is not specifically described in *Publication 4*. Subject 3's notebook documents[143] sample preparation and the [redacted] prepared by Witness 3 at the [redacted] The notebook states simply that the [redacted] was dissolved in [redacted], and provides no other information. This procedure is distinctly different from earlier described procedures,[144] and it is different from the description contained in *Publication 4*.

Although the erratum corrects the reported [redacted] conditions for preparation of samples for *Publication 4*, the erratum does not point out the difference in conditions from those published by the Subjects in *Publication 2* or in *Publication 1*. *Publication 4 Erratum* does not state that Subject 3 prepared samples for this research, nor does it

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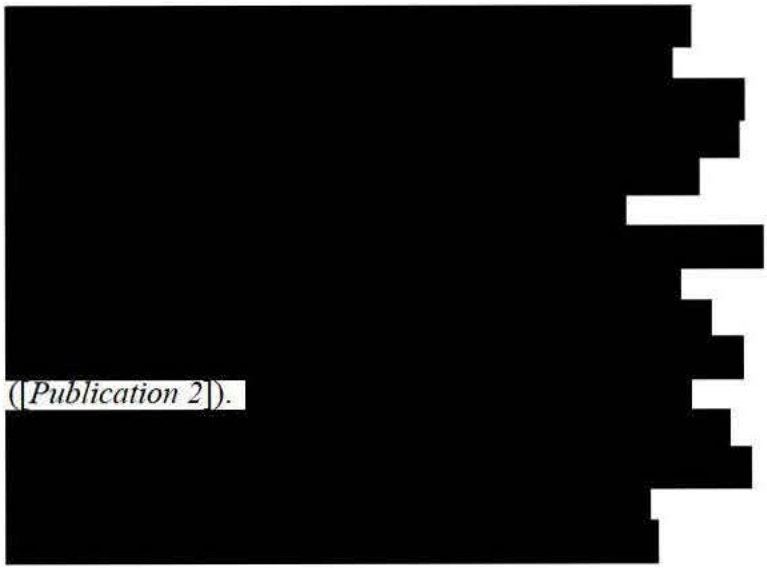
[138] Tab 10, Subject 1 interview transcript, page 26.
[139] Tab 10, Subject 1 interview transcript, page 26.
[140] Tab 16, Notebook 12, page 16.
[141] Tab 17, *Publication 4*. It acknowledges an NSF award to University 1.
[142] Tab 18, Witness 3 interview, page 4.
[143] Tab 16, Notebook [redacted] Witness 2 and Witness 3 confirmed the [redacted] to Subject 3 at University 1, and the return shipment of the [redacted] (Tab 18, Witness 2 first interview, page 1).
Tab 17, *Publication 4 Erratum*. Witness 2 and Witness 3 published *Publication 4 Erratum* to correct, *inter alia*, the research record about the conditions used to prepare the samples (Tab 18, Witness 2 first interview, page 2).

attribute the figure inset to Subject 3's work at University 1. The complete text of *Publication 4 Erratum* is:



([*Publication 2*]).

[145]

In our interview with them, Subject 1 and Subject 2 distanced themselves from involvement in the publication of *Publication 4 Erratum*. Subject 1 stated specifically that he disagrees with publication of the corrected preparation conditions, although these corrected conditions were provided to Witness 2 by Subject 3, and are supported by Subject 3's lab notebooks.[146] Although Subject 1 specifically invoked the work in *Publication 4* to the University 1 IC as support for the validity of *Publication 1, Publication 4* further promulgated the original false experimental descriptions even after substantial concerns about possible falsification arose.[147]

Publication 5

In 2008, the Subjects published a response to public criticism of their work, stating:

[145] Tab 17.
[146] Tab 23, page 4.
[147] An example of promulgation is the appearance of *Publication 4*, which required an erratum to correct the published experimental conditions. The accuracy of the experimental conditions had already been called into question in the University 1 inquiry and investigation.

[redacted]

The Subjects' chosen wording that the diffraction data [redacted] suggests that [redacted] was accomplished prior to publication of *Publication 1*. However, all Subjects state affirmatively in their interviews with us that the [redacted] was not [redacted] prior to *Publication 1*. The image (reproduced below in Figure 1) from *Publication 5* represents the single [redacted] obtained before publication of *Publication 1*. This figure does not appear in *Publication 1*, or in Subject 3's dissertation.

[redacted]

Figure 1[149]

The Subjects wrote in *Publication 5* that "[redacted]" Subject 3 used only [redacted] as the [redacted] according to her notebooks and dissertation. The terms [redacted]" and "[redacted]" again fail to clarify the actual experimental conditions used. Further, the concentration range cited in *Publication 5* is outside the range Subject 1 described as crucial to success in his interview with the University 1 IC. Finally, the Subjects do not inform the readers of *Publication 5*, although they could have done so, that the conditions described in *Publication 1* for the [redacted] preparation did not accurately reflect what Subject 3 actually did.

Publication 6

Subjects' *Publication 6* appears as an addition and correction to *Publication 2*.[151] In part it is a response to authors of another publication[152] who assert that the [redacted] cannot be prepared as described by the Subjects in *Publication 1* without

[148] Tab 17, *Publication 5*, page 2. [redacted]
Tab 17, *Publication 5*, page 2.
[150] Tab 17, *Publication 5*, page 1. [redacted].
[151] Tab 17, *Publication 6*.
[152] [redacted]

formation of a [redacted]. In *Publication 6*, the Subjects write that [redacted][1] This description of the [redacted] differs from that published in *Publication 1*, *Publication 2*, Subject 3's dissertation, *Publication 4, Publication 4 Erratum,* and *Publication 5*. Subjects do not note in *Publication 6* the incorrect information about [redacted] preparation in *Publication 1*, nor do they reference *Publication 4* and its erratum, which states that the [redacted] may have been as high as [redacted]. Nor do they reference *Publication 5*, which lists other [redacted] purportedly used. Accordingly, readers of *Publication 6* would still be uncertain about what experimental conditions might enable reproduction of the original work.

Assessment of evidence from examination of subsequent publications

Allegation 1: Subject 1 asserted to the University 1 IC that the assertion of [redacted] in *Publication 1* was supported by independent work reported in *Publication 4*. However, Subject 3 prepared samples for research reported in *Publication 4*. Her enabling contribution is not accurately described in *Publication 4* or *Publication 4 Erratum*. Subject 1's invocation of independent support is misleading, and the assertion of [redacted] in *Publication 1* remains unsupported.

Allegation 2: The Subjects' description of [redacted] preparation in *Publication 1* does not accurately reflect the actual conditions used. Varying descriptions appear subsequently in *Publication 2*, *Publication 4, Publication 4 Erratum, and Publication 5, and Publication 6.* The Subjects never specifically acknowledge or correct the initial misrepresentation in *Publication 1*. The Subjects' reckless disregard for accuracy in publication is evident from the need to publish *Publication 4 Erratum,* which corrects the description of [redacted] preparation in *Publication 4*, among other items, but fails to correct *Publication 1*.

Allegation 3: The Subjects had only one [redacted] prior to publication of *Publication 1.* The University 1 IC concluded that [redacted] support the assertion in *Publication 1* that the [redacted]. Even after Witness 1 cautioned Subject 2 about the assertion of [redacted], the Subjects proceeded to publication, and repeatedly cited this assertion in their subsequent publications. As investigations focused on this issue, the Subjects published *Publication 5* containing a statement that implies [redacted] were [redacted] prior to *Publication 1*, [redacted].

D. University 2 inquiries

Subject 1 disclosed to University 2[154] the three allegations of research misconduct at University 1.[155] University 2 conducted an inquiry, and concluded in [redacted]

[153] Tab 17, *Publication 6*.

[154] [redacted].

[155] When Subject 1 did so, the inquiry committee at the University 1 had not yet completed its report. University 2 completed its first inquiry in [redacted], just after University 1 began investigation.

that the issues raised were a scientific disagreement rather than research misconduct.[156] In [redacted], University 2 received a second allegation of research misconduct, and began a second inquiry, which concluded in [redacted]. University 2 provided information to us about its two separate inquiries into allegations of research misconduct by Subject 1 and Subject 2.[157]

The report of the second inquiry subcommittee stated:

> [It] was unanimously agreed that the first two allegations were not substantially different from the allegations already investigated by [University 1]. Given the thorough evaluation completed by [University 1] Investigation Committee and its exoneration of [Subject 1 and Subject 2] of any and all charges, the Inquiry Subcommittee unanimously concluded that these two allegations were unfounded.[158]

This statement is an inaccurate description of the findings of the University 1 IC. The University 1 IC concluded that *Publication 1* contained a falsified conclusion, and that the Subjects' actions in its publication were a serious deviation from accepted practices. The University 1 adjudicator concluded that the distortion of the scientific record was sufficiently great that correction of the record was warranted despite the absence of a finding of research misconduct. Thus, we do not interpret University 1's conclusions as "exoneration" of the Subjects. University 1 interpreted the evidence and reached a non-unanimous determination of insufficient intent.

The second inquiry subcommittee at University 2 considered three allegations; the first two parallel those already considered by the prior University 1 investigation. The third allegation is that the inset Figure [redacted] in *Publication 4* is the same as Figure [redacted] in Subject 3's dissertation.[159] University 2 told us:

> The report, which is enclosed, concluded that two of the three allegations had been fully investigated by [University 1], a copy of whose investigative report the Inquiry Subcommittee had in its possession. Based on the [University 1] investigation, the Inquiry Subcommittee

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Receipt of a second allegation of research misconduct by University 2 in [redacted] prompted its second inquiry.

[156] We did not seek a copy of the first University 2 inquiry report, a list of specific allegations considered in its first inquiry, nor copies of any materials that the Subjects may have provided during that inquiry because the contents of the second inquiry report addressed our needs with respect to the first inquiry.

[157] Tab 26. We note that University 1 provided a copy of its IC report to an inquiry committee at University 2.

[158] Tab 26, Second inquiry subcommittee report, University 2, pages 1-2.

[159] Tab 26, Allegations sent to University 2, page 4. The allegation claims that the dissertation inappropriately used the figure actually produced in the laboratory of Witness 3, said work later published as *Publication 4*.

> concluded that the first two allegations were without substantive basis and recommended that they be dropped. With regard to the third allegation, which was not included in the [University 1] investigation, the Inquiry Subcommittee concluded that while there was a technical error in the figure in question, this represented an honest error rather than research misconduct. It also noted that [Subject 1 and Subject 2] were in the process of submitting a correction to the journal to address this error. As a result, the Inquiry Subcommittee recommended that no additional investigation was warranted, a recommendation that was accepted after discussion . . . by a unanimous vote of 11 in favor.[160]

University 2's second inquiry subcommittee report shows that it did not contact Witness 2, the correspondence author of *Publication 4* which is central to the third allegation. The second inquiry subcommittee simply accepted at face value Subject 1's and Subject 2's assertion that they were in "the process of submitting a correction to the journal to address this error." The second inquiry subcommittee did not examine the proposed correction manuscript. In our interview with Witness 2, he confirmed that the Figure [redacted] inset was indeed data received from Subject 3 and that it was used in *Publication 4*.

When we interviewed Subject 1 and Subject 2, they stated that they did not participate in the preparation of *Publication 4 Erratum*, nor did they see the need for its publication. In direct contradiction, these Subjects told University 2's second inquiry subcommittee that publication of the erratum would appropriately resolve the "technical error."[161]

Assessment of the University 2 inquiries

The University 2 inquires did not delve into allegations previously considered by the University 1 IC. The inquiry appeared to rely only on the assurances of Subject 1 and Subject 2 with respect to the need for the correction of "technical error[s]" in *Publication 4,* without direct examination of *Publication 4 Erratum* or speaking to the other authors of that publication. Those assurances provided in the University 2 inquiries by Subject 1 and Subject 2 stand in direct contrast to their statements to us that they were not involved with and disagreed with the need for *Publication 4 Erratum*.

[160] Tab 26, Cover letter, [redacted].
[161] Tab 26, Cover letter, [redacted].

E. Summary of facts

The following facts are established by a preponderance of the evidence:

- **Allegation 1:** The Subjects' assertions in *Publication 1* of [redacted] and [redacted] in [redacted] are not supported by data recorded in laboratory notebooks of Subject 3, who performed the experiments. Subject 3's notebooks directly contradict these assertions. This is evidence supporting a finding of falsification.

- **Allegation 2:** The Subjects published a description of the preparation of the [redacted] in *Publication 1* that does not reflect the actual preparation of the samples. The Subjects later published different descriptions (*Publication 2*) that they did not identify as corrections to the earlier work. The Subjects later published other preparations in *Publication 4* that were again incorrect , as revealed in *Publication 4 Erratum*. On the one hand, the Subjects assert in the University 1 investigation that [redacted] conditions must be followed exactly as described,[162] and at other times, that the precise conditions do *not* matter.[163] Even as an investigation into allegations of incorrect descriptions was underway, the Subjects continued to publish incorrect information, and by direct statements of Subject 1 and Subject 2, did not examine laboratory records to corroborate the published conclusions. The assertion that the [redacted] were formed under the experimental conditions described in *Publication 1* do not reflect the actual conditions, and therefore support a finding of falsification.

- **Allegation 3:** The Subjects' assertion in *Publication 1* that [redacted] data in hand at the time they submitted *Publication 1* and revised it for publication. The Subjects obscure this fact in a subsequent publication (*Publication 5*). As noted in the University 1 IC report, and confirmed in our investigation, members of the relevant research community would reasonably expect this assertion in *Publication 1* to be supported by [redacted]. The absence of an [redacted] supports a finding of falsification.

OIG's Assessment

A finding of research misconduct by NSF requires that 1) there be a significant departure from accepted practices of the relevant research community; that 2) the research misconduct be committed intentionally, or knowingly, or recklessly; and that 3) the allegation be proved by a preponderance of the evidence.[164]

[162] Tab 10, Subject 1 interview transcript, page 28.
[163] Tab 17, *Publication 5*.
[164] 45 C.F.R. §689.2(c).

A. The Subjects' Acts

A cornerstone of responsible conduct of research is the integrity of data and the adequacy of records to support and document research described to the larger community through presentations and publications. The authorship policy of the journal where *Publication 1* appeared is characteristic of the expected standards of the community:

[165] [*emphasis added*]

These specific expectations are directly applicable to *Publication 1*. The Subjects' actions in preparing *Publication 1* demonstrate a failure of meet those expectations. Subject 3's laboratory notebooks directly contradict assertions in *Publication 1*. Subject 1 and Subject 2 admitted that they did not even examine the laboratory notebooks. Failure to adhere to the standard explicitly stated by the journal is a significant departure from the accepted practices of the relevant research community and therefore implicates them in the three allegations considered here.

Allegation 1 (lack of evidence for): Subject 3 admits and her notebook entries show that are formed in the . The Subjects' collective assertion of in *Publication 1* is therefore not supported by data, and is a falsification.

Allegation 2 (misleading description): The Subjects' description of preparation in *Publication 1* does not reflect the experiment performed, and this is characterized by the Subjects as an "omission." However, the Subjects' repeated "omission" in descriptions in subsequent publications and their contradictory statements in inquiries and investigations support finding that the description in *Publication 1* is a falsification.

Allegation 3 (lack of evidence for): The Subjects' asserted in *Publication 1*: "

[165] Tab 28

[redacted] The assertion was not supported by [redacted] data in the Subjects' possession at the time of publication. Further, the Subjects' assertion of [redacted] in *Publication 1* is not supported by the data. The evidence supports a finding of falsification.

We find that the Subjects' actions in submitting and publishing *Publication 1* constitute falsification and are a significant departure from the accepted practices of the relevant research community.

B. The Subjects' Intent

We conclude that the Subjects were reckless in falsifying the [redacted], the [redacted] descriptions, and the evidence of [redacted] in *Publication 1*. The Subjects jointly composed *Publication 1*, and cited it frequently in subsequent joint publications to further their assertions about [redacted]. Even after investigations commenced, none of the Subjects reviewed laboratory records, but perpetuated inaccurate statements in subsequent publications. In particular, Subject 1 and Subject 2 responded to a University 2 inquiry committee, claiming then that publication of *Publication 4 Erratum* would appropriately correct a "technical error" in *Publication 4*.[166] Subject 1's later assertion to us that publication of *Publication 4 Erratum* was not necessary[167] contradicted his statement to the University 2 committee. This demonstrates his reckless disregard for correcting the literature to reflect accurately the experimental procedures reported in *Publication 1* and subsequent work.

We conclude a reckless level of intent for all three subjects, in contrast to the University 1 IC's conclusion of carelessness by Subject 2 alone. The University 1 IC concluded that Subject 2 was careless in that he failed to consult experts on [redacted] and relevant data interpretation with regard to the assertion of [redacted].[168] Our investigation showed (but University 1 was unaware) that Subject 2 did consult with such an expert (Witness 1). Witness 1 told Subject 2 that the asserted [redacted] was unlikely, warranting further care before asserting that the [redacted] were [redacted]. Despite this caution, which Subject 2 did not relay to his coauthors, the Subjects proceeded to publication.

We conclude that all three subjects share responsibility for the falsifications in *Publication 1*. As the hands-on experimentalist, Subject 3 more likely than not was aware that the assertion of [redacted] was not supported. Her notebooks in fact contradicted the assertion of [redacted] Furthermore, she was more likely than not aware that the published [redacted] preparation was incorrect, as evidenced by her own laboratory notebooks. The same problem recurs in Subject 3's dissertation.

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[166] Tab 26, Cover letter, [redacted].
[167] Tab 23, page 4.
[168] Tab 10, IC report, page 19.

Further, Subject 1 and Subject 2, in failing to examine the documentary record in the notebooks, did not meet their obligation as coauthors and as research mentors. Subject 1 was Subject 3's dissertation advisor, and Subject 2 was Subject 3's supervisor after Subject 1 moved to University 2. Both admitted directly that they never reviewed the laboratory notebooks. Thus, Subject 1 and Subject 2 did not demonstrate the care of reasonable mentors in the review of their graduate student's work, which they submitted as coauthors with her. As such they disregarded the consequences and potential harm of unsupported and therefore falsified conclusions.

C. The Standard of Proof

Direct examination of laboratory notebooks and other documents show, by a preponderance of the evidence, that the Subjects recklessly falsified statements in *Publication 1*: 1) the assertion of [redacted]; 2) the assertion of [redacted] preparation; 3) the assertion of [redacted].

OIG's Recommended Disposition

When deciding what appropriate action to take upon a finding of misconduct, NSF must consider: (1) how serious the misconduct was; (2) the degree to which the misconduct was knowing, intentional, or reckless; (3) whether it was an isolated event or part of a pattern; (4) whether it had a significant impact on the research record, research subjects, other researchers, institutions or the public welfare; and (5) other relevant circumstances.[169]

A. Seriousness

The allegations of research misconduct are directed to the Subjects' assertions in *Publication 1*, and specifically whether they were supported by the experimental evidence available at the time. The assertions were not supported by the research record.

The Subjects composed, submitted, revised, and published *Publication 1*, and in the accompanying news release, claim to [redacted] that [redacted]" The laboratory record directly contradicts these assertions. The scientific community's trust in the integrity of the research as described in *Publication 1* is not justified.

We concur with the University 1 IC that the uncorrected *Publication 1* is and remains a distortion of the research record. We conclude that the Subjects' apparent and continued unwillingness to correct the original research record, and willingness to take actions that added confusion and obfuscated their misconduct, exacerbates the seriousness of the distortion of the research record.

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[169] 45 C.F.R. § 689.3(b).
[170] Tab 2, [redacted].

B. Degree to which the Act was Reckless

The Subjects collectively exhibited a reckless disregard of their responsibility for veracity of *Publication 1*.

C. Pattern

The Subjects falsified assertions in *Publication 1*. Subject 1 and Subject 2 engaged in a pattern of reckless perpetuation of those assertions in collaborative work reported in *Publication 4* and during the investigative activities at two universities. Even when the work was called into question, the Subjects did not review the supporting data to confirm or refute the allegations which would have been a reasonable course of action. For Subject 1 and Subject 2 this reflected their continued failure to review the data initially collected by Subject 3.

D. Impact on the research record

Other researchers have cited *Publication 1* in approximately 116 publications, including review articles.[171] The Subjects' conflicting assertions regarding the necessity for specific [redacted] conditions has muddied the literature. Further, the Subjects' repetitive publication of incomplete statements magnifies the original impact of the falsifications in *Publication 1*. Subsequent publications may properly develop the overall level of understanding for the broader scientific community, but the appearance of these subsequent studies cannot absolve the Subjects from responsibility for their reckless actions in *Publication 1*.

Although the Subjects' subsequent publications in this field are also concurrently cited by others, the related subsequent additions, corrections, and erratum do not receive equivalent attention.

A clear statement in the literature regarding the experimental support available to the Subjects at the time they submitted and finalized *Publication 1* is warranted.

E. Recommended Actions

Based on the evidence, OIG recommends that NSF:

- Send each Subject a letter of reprimand notifying them that NSF has made a finding of research misconduct.[172]
- Require the Subjects to certify that they have requested a retraction of *Publication 1*, with the retraction to state: [redacted]"

[171] Tab 27.
[172] A Group I action 45 C.F.R. 689.3(a)(1)(i).

- Require each Subject to certify to the Assistant Inspector General for Investigations (AIGI) their completion of a responsible conduct of research training program and provide documentation of the program's content within 1 year of NSF's finding.[173] The instruction should be in an interactive format (*e.g.*, an instructor-led course) and specifically address data falsification and fabrication.

For a period of 3 years as of the date of NSF's finding:

- Bar each Subject from participating as a peer reviewer, advisor, or consultant for NSF.[174]
- Require for each document (proposal, report, etc.) to which each Subject contributes for submission to NSF (directly or through an institution), and for each product which results from an NSF award to which each Subject contributes, that each Subject:
  - submit a contemporaneous certification to the AIGI that the document does not contain plagiarism, falsification, or fabrication.[175]
  - submit contemporaneous assurances from a responsible official of his or her employer to the AIGI that the document does not contain plagiarism, falsification, or fabrication.[176]

The Subjects' Responses to OIG's Draft Investigation Report[177]

We provided draft copies of this report of investigation to all three Subjects. Subject 1 and Subject 2 provided responses; we received no response from Subject 3. We have corrected typographical errors in the report and Tab 1. We have also clarified appropriate sections of the report to distinguish [redacted] and [redacted] in response to their comments. We address their other relevant comments below.

Both responses generally overstate our assessment of the degree of intent. Subject 2 specifically remarked that raising "this allegation to the level of an intentional, misleading, or reckless falsification . . . is unwarranted and unfair."[178] Our assessment supports a finding of recklessness, and we have made no recommendations for a finding of knowing or intentional (purposeful). Reckless intent is not a "vague and undefined label" as Subject 2 asserts,[179] but rather a well-established legal standard akin to gross-negligence. Our analysis of the evidence shows that collectively the Subjects consciously did not demonstrate the care a reasonable person similarly situated would about the consequences of his actions and the potential resulting harm[180] to the research community through *Publication 1*. The potential harm results from the scientific communities

[173] This action is similar to Group I actions 45 C.F.R. 689.3(a)(1).
[174] A Group III action 45 C.F.R. 689.3(a)(3)(ii).
[175] This action is similar to 45 C.F.R. 689.3(a)(1)(iii).
[176] A Group I action 45 C.F.R. 689.3(a)(1)(iii).
[177] Tab 29.
[178] Tab 29, Subject 2's comments, page 2.
[179] Tab 29, Subject 2's comments, page 8.
[180] *Black's Law Dictionary*, 7th edition.

reliance on the Subjects' publishing assertions of [redacted] without retaining the raw data to support the assertions of [redacted], reporting incomplete methods that would enable others to reproduce the work, and leading the reader to assume that the [redacted] had been [redacted] when it had not at the time of publication.

Part of our assessment of intent involves an analysis of a subject's pattern of conduct both before and after the act of research misconduct. Thus, we include analysis of their subsequent publications on this topic, some of which Subject 1 and Subject 2 raised as defenses in the University 1 investigation and University 2 inquiries. This is distinguished from our analysis of the act of falsification, wherein we do not use past or subsequent actions to prove the act.

Our analysis of the act addresses the evidence in terms of the questioned data and conclusions as the Subjects presented them at the time of the alleged acts. Subsequent results either confirming or countering the data and conclusions have limited relevance, if any, to the assessment of act. Confirmation, at best, may mitigate against a finding of wrongdoing but generally is not solely dispositive of an allegation. A subsequent demonstration of improbability may favor a finding of wrongdoing but generally is not solely dispositive of an allegation. Thus, we evaluate the subsequent confirmatory research within the context of the *totality* of the evidence in the case. Subject 1 and Subject 2 assert their agreement with this approach but at the same time argue that their later confirmatory experiments show that they had the correct scientific conclusion, thereby negating a finding of falsification. We have afforded their subsequent publications, to the extent that they demonstrate [redacted] under different conditions and characterization of those [redacted], the appropriate weight in crafting our recommendations.

Subject 1 asserted that there are "several incorrect statements in the report that are not supported by the facts," but referred to Subject 2's response letter for rebuttal to those facts.[181] Subject 1 discussed "contradictions in the report,"[182] organizing his response by allegation. Subject 2 provided a response to "clarify what I believe are significant errors contained in the report."[183] His responses are also organized according to the three allegations in the draft report of investigation.

Allegation 1: Subject 1 stated that "from time to time I would look at the notebooks, but I never intended to rely on them to defend myself against a misconduct allegation."[184] Subject 1 stated that the data reviewed with him supported the conclusions in *Publication 1* and asserted that he properly reviewed the primary data supporting *Publication 1*. He stated that he reviewed results regularly in meetings, and reviewed written monthly reports from his students as an "additional record."[185] This contrasts with Subject 1's previous statements to us that he did not review Subject 3's lab

[181] Tab 29, Subject 1 comments, page 1.
[182] Tab 29, Subject 1 comments, page 1.
[183] Tab 29, Subject 2 comments, page 1.
[184] Tab 29, Subject 1 comments, page 1.
[185] Tab 29, Subject 1 comments, page 2.

notebooks. Subject 1 provided no additional supporting data to us to support his assertion.

Subject 2 stated: "If it is true that [Subject 3] did not include the results of all of her experiments in her notebooks, then that is unfortunate."[186] He stated further that "I believe the [redacted] shown in Figure [redacted] of Publication 1 were constructed from raw data," but he does not address the absence of that raw data in Subject 3's laboratory notebooks. Subject 2 asserted that this allegation is false, in part, because he has seen raw data from other experiments performed by Subject 3 and others that confirm conclusions in *Publication 1*.[188]

Good data management and mentoring practices should not be practiced strictly to provide a defense to research misconduct allegations. These practices have long been the expectations of NSF and are the accepted practice of the general research community. The material quoted from the instructions to authors to which Subject 2 voices objection is evidence of this community standard. The Subjects had several additional compelling reasons to maintain the data and oversee Subject 3's role in doing so. The NSF grant terms require records for the award, which includes the supporting data for *Publication 1* claimed as a product in the final report, be maintained for three years after the award. The grant conditions also require the supporting data be shared with members of the community on request, thereby requiring that the data be maintained. The investigation commenced before the three-year retention period expired. Subject 3's notebooks and her dissertation constitute the research record available to support *Publication 1*. Subject 1 asserts that "to rely only on notebooks is also inadequate" and "[r]elying on notebooks provides no assurance that the data is correct." However, we can only rely on what is available to correlate with *Publication 1* and assess it against the preponderance of the evidence standard (*i.e.*, more likely than not). Moreover, there is no reasonable explanation for the notebooks to at the same time contain non-supporting data and not contain supporting data. Subject 3's notebooks in appearance are meticulous and account for details such as source of [redacted] the details of the materials provided to Witness 2 and Witness 3, etc.

Allegation 2: Subject 1 stated that *Publication 5* serves as a correction to the missing [redacted] information in *Publication 1*. *Publication 5* appeared as an [redacted] to an accompanying article on [redacted], and is described in the report of investigation. Subject 1 raises no factual dispute with the descriptions of publications and their associated corrections in the report.

Subject 2 stated: "genuine attempts were made in future papers – including one that referred directly to Publication 5—to clarify this point (*e.g.*, that a range of [redacted] percentages may be used, and that when working with [redacted] in general a range of [redacted] may be used such as [redacted])."[187] Subject 2 further asserted,

[186] Tab 29, Subject 2 comments, page 1.
[187] Tab 29, Subject 2 comments, page 2.
[188] Tab 29, Subject 2 comments, page 2.
[189] Tab 29, Subject 2 comments, page 2.

"minor omissions such as this are common in the literature";[190] however, he offers no specific examples.

We have followed the sequence of publications and found no statement that explicitly corrects *Publication 1*'s [redacted] conditions or that purports to correct the literature as they asserted to the University 2 inquiry committees. The publications identified by Subject 2 as corrections are in fact reports of alternate reaction conditions that produce the products reported in *Publication 1* (*i.e.*, they tend to prove the science). They do not address the reaction conditions reported in *Publication 1* and the conclusions at that time as supported by the research records maintained.

Allegation 3: Subject 1 stated: "The real issue here is can [OIG] find the primary data not is the science correct."[191] We agree that the issue involves the existence of the primary data. The statement in *Publication 1* that "[redacted] is unsupported by the records maintained for the project. The supporting data is absent ([redacted]) and the existing data is not [redacted]), which they admit. Subject 2 stated that he examined Subject 3's [redacted] and discussed the result in *Publication 5*. However, the [redacted] that appears in *Publication 5* does not appear in any of Subject 3's lab notebooks, nor does it appear in her dissertation, nor is it linked to *Publication 1* and the conclusions therein.

Subject 2 stated: "It is now clear that [redacted], and at the time I never thought that the [redacted] could be anything other than ones [redacted]."[192] Subject 2 stated that the same [redacted] molecule was used to prepare [redacted] with such [redacted][193] References to such previous work do not appear in *Publication 1* nor has he provided them in his response. Subject 2 stated: "It thus appears that our conclusion is not a significant departure from common practice. Two university committees have agreed, having exonerated us of misconduct." As we noted in the draft report, this is a mischaracterization of the conclusions of both universities. University 2 did not fully investigate the allegations at issue here because the work in contention was performed at University 1. University 1 concluded that the practices evident in Publication 1 were a significant departure from the standards of the community, and concluded that the act of falsification had occurred. It failed to make a finding of research misconduct based on its assessment of intent. Facts revealed in our additional investigation support a finding of reckless intent.

Additional Comments: Subject 2 "fundamentally disagree[s] with NSF OIG . . . that I am obligated to seek "expert" opinions."[194] There is no imposed or suggested obligation in the report. University 1, a relevant research community in this case,

[190] Tab 29, Subject 2 comments, pages 2-3.
[191] Tab 29, Subject 1 comments, page 4.
[192] Tab 29, Subject 2 comments, page 3.
[193] Tab 29, Subject 2 comments, page 4.
[194] Tab 29, Subject 2 comments, page 5.

concluded that Subject 2 should have availed himself of such an opportunity. Subject 2 did not object to this conclusion in University 1's report. Our investigation identified such an expert, Witness 1, who had a conversation with Subject 2 about the [redacted] in *Publication 1*. Our report describes Witness 1's interview in which he recounts a conversation with Subject 2. [redacted] However, because of an inconsistency in our witness numbering scheme in the draft, Subject 2 erroneously inferred the identity of Witness 1 despite our correct reference to the attachment chronicling our interview.

Subject 2 asserted in his response that he took action in response to a letter written by the Vice Chancellor of University 1, and *Publication 5* is that response.[195] A follow-up letter from the Vice Chancellor to the journal editor was sent on [redacted],[196] dealing with the same issues as the original letter. Subject 2 stated "The report's conclusion that it was reckless to exclude the word 'misleading' in Publication 5 concerning the [redacted] is unwarranted."[197] The report does not draw this conclusion.

Subject 1 expresses concern for the damage that the retraction of *Publication 1* may have on his career and states a willingness to accept other actions while maintaining that this is not a case of research misconduct. Specifically, Subject 1 is concerned that retraction will "disrupt the balance of published work in this field."[198] However, we note that *Publication 4 Erratum* has not done this, nor is there any evidence to support that this will occur with the retraction of *Publication 1*. *Publication 1* appeared in [redacted] and received notable publicity for its claims. It was challenged in an exchange of [redacted] (*Publication 5*) in that [redacted], wherein, Subject 1 and Subject 2 assert to us they appropriately corrected *Publication 1*. However, *Publication 1* and *Publication 5* when read together do not accurately reflect what was done at the time to produce the data and conclusions in *Publication 1*.

[195] Tab 29, Subject 2 comments, page 7.
[196] Tab 12.
[197] Tab 29, Subject 2 comments, page 7.
[198] Tab 29, Subject 1 comments, pages 5-6.

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

MAY 14 2015

OFFICE OF THE
DIRECTOR

[redacted]

[redacted]

[redacted]

CERTIFIED MAIL–RETURN RECEIPT REQUESTED

Re: Letter of Reprimand and Notice of Proposed Ineligibility Action

Dear Drs. [redacted]:

It is alleged that you committed research misconduct in connection with National Science Foundation (NSF) supported research. Research misconduct, as defined by the NSF's regulations, includes "manipulating research materials, equipment, or processes, or changing or omitting data or results such that the research is not accurately represented in the research record."[1] The specific research misconduct allegations against you, involving published research results, are as follows:[2]

[1] 45 CFR sec. 689.1(a)(2).

[2] These allegations are as framed by the NSF Office of Inspector General in its report of September 25, 2013. They are consistent with those cited in the [redacted]

Allegation #1: There is no evidence of [redacted] formation as described in [redacted] (Publication # 1).

Allegation #2: Publication #1 contained misleading descriptions of experimental conditions, specifically with respect to the description of the [redacted] preparation.

Allegation #3: There is no evidence to support the claim made in Publication #1 that [redacted] formed were [redacted].

As a general rule, the awardee or proposing institution, in this case [redacted] (your employing university at the time the allegations were raised) bears primary responsibility for prevention and detection of research misconduct and for its investigation and adjudication.[3] [redacted] undertook two investigations with respect to the allegations against you, one by an inquiry committee and a second investigation by an independent investigation committee charged with reviewing the case *de novo* (the [redacted] independent investigation). NSF's Office of the Inspector General (OIG) conducted a subsequent investigation of its own, and the OIG Report of Investigation (Case Number A06110054) is attached to this letter.[4]

Summary of Findings from the [redacted] and OIG Investigations

Allegation #1

As documented in the narrative of the OIG Report, the OIG investigation included a review of the lab notebooks that were maintained by [redacted], then a doctoral student, which include images from the only control experiment undertaken prior to Publication #1. The control experiment used the same overall process that was reported in Publication #1, except the [redacted] did not contain [redacted]. The pictures of the control experiment, as documented in the lab notebook, show that [redacted] were formed in the absence of [redacted]. In a statement made by [redacted] to the [redacted] investigation committee, she admitted that the control experiment showed the formation of [redacted] [redacted] subsequently claimed that other control experiments were conducted that showed no formation of [redacted] and stated that those experiments were maintained on a CD in the possession of [redacted]. However, when the OIG examined the CD, there was no data showing additional control experiments.

The formation of the [redacted] in the control experiment was not addressed in Publication #1. In an interview with the OIG, [redacted] claimed that his practice was to have students write weekly reports about what they were doing, but that he did not review [redacted] notebooks to ensure the integrity of the assertions in Publication #1.

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[3] 45 CFR 689.4(a).

[4] The [redacted], the current home institution of [redacted] [redacted] carried out two separate inquiries. The conclusion of the first inquiry, according to the NSF OIG, was that the matter involved a scientific disagreement rather than research misconduct. The report of the second inquiry deferred to the evaluation completed by [redacted] and, with regard to new allegations, concluded that "no additional investigation was warranted."

Both the [redacted] inquiry committee and the [redacted] independent investigation found evidence of [redacted] to be inconclusive. The OIG conducted a separate, additional review of [redacted] lab notebooks, which included a close look at the images and descriptions of the control experiment, as well as a search for the alleged additional control experiments, and concluded that there was no evidence of [redacted] as described in Publication #1.

Allegation #2

Publication #1 is alleged to inaccurately describe the incubation of the [redacted] in an [redacted] As recognized by the [redacted] independent investigation, the term [redacted] is generally accepted in the field to mean that the [redacted] is comprised [redacted]. In this case, the [redacted] contained both [redacted] and [redacted].

The [redacted] independent investigation found that the term [redacted] was inappropriately used to describe a [redacted] that contains an [redacted]. The [redacted] independent investigation concluded that the description of the [redacted] as "[redacted] constituted falsification, albeit without the requisite level of intent to constitute research misconduct.

As explained above, the OIG's review included a detailed review of [redacted] lab notebooks. According to the OIG, the notebooks contained descriptions of the [redacted] used in the experiments described in Publication #1. The descriptions of the [redacted] note that the [redacted] is dissolved in [redacted] and then a measured portion of the [redacted] is added to an [redacted] containing [redacted]

In a letter dated [redacted] to the OIG, [redacted] stated that the presence of an [redacted] in the [redacted] was addressed in Publication #2[5] and Publication #4.[6] However, Publication #2 does not contain any description of the [redacted] that clarifies the record with regard to Publication #1. Publication #4 did not address the issue, since it had to be corrected within a month of the receipt of your letter with an *Erratum* regarding an incorrect description of the [redacted] composition. The [redacted] preparation as described in Publication #2, the Publication #4 *Erratum*, and subsequent related publications, all differed from what was described in [redacted] lab notebooks as being the basis for Publication #1. Yet, none of these publications identifies and addresses the incorrect information (i.e., the [redacted] was "[redacted] when in fact it contained [redacted] about the [redacted] preparation in Publication #1.

In yet another paper, Publication #5[7], the statement [redacted] However, in a discussion with a collaborator at the time of Publication #4, [redacted] indicated that the [redacted] contained up to 50% [redacted][8]

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[5] [redacted]

[6] [redacted]

[7] [redacted]

[8] OIG Investigative Report, p. 17, Tab 21.

All of these contradictory descriptions of the preparation of the [redacted] created meaningful confusion about the conditions that existed in Publication #1.

Allegation #3

The following statement was made in Publication #1: [redacted][9] The [redacted] independent investigation and the OIG concluded that [redacted] would have been necessary to support this assertion. Only a single [redacted] however, was recorded by [redacted] prior to the publication of Publication #1, and it was not [redacted] Further, the [redacted] was not referenced in Publication #1.

The [redacted] inquiry committee determined that the lack of evidence for the assertion in Publication #1, that [redacted] formed were [redacted]."[10] The [redacted] independent investigation reached a similar conclusion stating in its report that "[redacted]" and constitute falsification.[11] Despite these determinations, both the [redacted] inquiry and independent investigation committees ultimately did not find intent consistent with research misconduct.

[redacted] stated in an interview that she attempted to [redacted] in [redacted], but failed to do so, and that [redacted] was aware of her attempt. [redacted] contradicted this statement and claimed in his own interview that he was not aware of this attempt. While the issue is not clear in the text of Publication #1, no statements made by you dispute that [redacted] was not conducted prior to Publication #1. However, in Publication #5, the following statement [redacted] was made.[12] As laid out in the OIG Report, this language is misleading because it suggests that [redacted] was accomplished prior to Publication #1, thus further confusing the research record.

NSF Determination Regarding Research Misconduct Allegations

The scientific enterprise is based on trust: "society trusts that scientific research results are an honest and accurate reflection of a researcher's work" and "researchers equally trust that their colleagues have gathered data carefully, have used appropriate analytic and statistical techniques, have reported their results accurately, and have treated the work of other researchers with respect."[13] If this inherent trust is broken, the entire enterprise is undermined, to the detriment of U.S. science. NSF accordingly takes allegations of research misconduct extremely seriously and spends significant time in thoroughly considering all aspects of the cases before us.

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[9] [redacted]

[10] [redacted] Inquiry Report; Tab 7, p. 6 of the OIG Report.

[11] [redacted] Investigation Report; Tab 10, p. 14 of the OIG Report.

[12] Publication 5; Tab 17, pages 21-22 of the OIG Report.

[13] Ralph J. Cicerone, Charles M. Vest, Harvey V. Fineberg, "Preface to On Being a Scientist -- A Guide to Responsible Conduct in Research." The National Academies Press, Washington, D.C. (2009).

This was a difficult and extremely complex matter to investigate and consider. One dismissive view of the case is that it was merely an academic dust-up or debate. As NSF's regulations make clear, research misconduct does not include "differences of opinion,"[14] and we appreciate that the investigating authorities, both at [redacted] and OIG, approached the case without preconception, focusing on the facts and not convenient characterizations.

For our part, in evaluating the allegations, responses and administrative record, we continually consulted the research misconduct standard which requires that all three prongs must be satisfied before a finding of research misconduct is made: [15]

1) There is a significant departure from accepted practices of the relevant research community;
2) The research misconduct is committed intentionally, or knowingly, or recklessly; and
3) The allegation is proven by a preponderance of evidence.

With respect to the accepted research practices, what the investigative authorities found as a matter of fact was an avoidance of protocols, a failure to meet expected scientific standards, a lack of expertise or training in the field of inquiry, poor oversight of less experienced scientific team members, and the misrepresentation of data on which a conclusion was based. In short, they uncovered what most in the scientific populace would deem an absence of care, if not sloppiness, and most certainly a departure from accepted practices of the relevant research community.

Nonetheless, a finding of research misconduct requires there to be a preponderance of evidence in the record of a requisite state of mind.[16] The [redacted] investigation concluded that your actions did "not rise to the level of recklessness." The OIG, in contrast, determined that you all acted recklessly. Black's Law dictionary defines recklessness as "conduct whereby the actor does not desire harmful consequence but...foresees the possibility and consciously takes the risk." After reviewing the evidence presented in the [redacted] report, the OIG report, and [redacted] and [redacted] rebuttal letter, we find that, while there are certain facts arguably supportive of recklessness, the record overall fails to provide the preponderance of evidence necessary for a determination that your actions associated with the research at issue were intentional, knowing or sufficiently reckless to rise to the level of research misconduct. As such, NSF concurs with the finding of the [redacted] independent investigation that the evidence does not support a finding of research misconduct because the requisite mental state was not established by a preponderance of the evidence. Accordingly, NSF has determined that you did not commit research misconduct, as defined by 45 CFR 689, in this case.

NSF Proposed Action

While your conduct may not support a finding of research misconduct, it does violate the NSF Act of 1950 (the NSF Act), as amended.[17] Specifically, section 1862o-3 of the NSF Act states:

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[14] 45 CFR 689.1(b).
[15] 45 CFR 689.2(c).
[16] NSF research misconduct regulations require that "[t]he research misconduct be committed intentionally, or knowingly, or recklessly..." 45 C.F.R. § 689.2(c)(2).
[17] 42 USC 1861 *et seq.*

> *An investigator supported under a Foundation award, whom the Director determines has failed to comply with the provisions of section 734 of the Foundation Grant Policy Manual, shall be ineligible for a future award under any Foundation supported program or activity. The Director may restore the eligibility of such an investigator on the basis of the investigator's subsequent compliance with the provisions of section 734 of the Foundation Grant Policy Manual and with such other terms and conditions as the Director may impose.*

Section 734(a) of the Grant Policy Manual, explains that "[i]nvestigators are expected to promptly prepare and submit for publication…all significant findings from work conducted under NSF grants."

In this case, NSF has identified significant findings that you and your co-authors failed to disclose including: 1) a clear and consistent description of the composition of the [redacted] used in Publication #1; and 2) the fact that [redacted] data was not properly [redacted] prior to Publication #1. These omissions were as significant to the published research record in question as the significant findings that you did prepare and submit for publication.

Accordingly, consistent with §1862o-3 of the NSF Act, I have determined that from the date that this action becomes final you shall be ineligible for a future award under any NSF supporting program or activity.

Further consistent with section 1862o-3 of the NSF Act, in order to restore your eligibility to receive any future NSF support, you must clarify the scientific publication record. The [redacted] independent investigation committee was likewise concerned about clarifying the scientific record and recommended that:[18]

(1) [redacted]

(2) [redacted]

You chose not to follow the actions recommended by the [redacted] investigation and failed to clarify fully the record. Taking into consideration the impact on the scientific record of ambiguous justifications and misleading terms, NSF now imposes that same requirement on you. If you wish to restore your eligibility for NSF support, you must submit a statement to [redacted] addressing the issues described in the two paragraphs above as you were previously asked to do

[18] See Letter of [redacted] from [redacted]

by [redacted]. NSF will only consider restoration of your eligibility when you provide adequate assurances to NSF that you have submitted this clarification to [redacted] for publication.

Opportunity To Respond To This Proposed Action

Through your counsel, you have requested an opportunity to respond to the allegations made in this matter prior to a final decision being made by NSF. NSF has already given careful consideration to the rebuttal that you submitted in response to the draft OIG report. In addition, because NSF has not made a finding of research misconduct in this case, the appeal rights laid out in 45 CFR § 689.10(a) are not applicable. However, NSF will provide you with 30 days to respond to NSF's proposed action in this matter before it becomes a final agency decision. Any response should be sent to Lawrence Rudolph, General Counsel, at the National Science Foundation, 4201 Wilson Boulevard, Arlington, Virginia 22230. If NSF does not receive a response from you within the 30-day period, the proposed action will become final.

Should you have any questions about the foregoing, please contact Lawrence Rudolph, General Counsel, at (703) 292-8060.

Sincerely,

Richard O. Buckius
Chief Operating Officer

cc: James Scarboro (via e-mail James.Scarboro@aporter.com)

Enclosures:

42 U.S.C. §1862o-3
Section 734(a) of the NSF Grant Policy Manual
NSF OIG Report