

# Authorship Issues and Conflict in the U.S. Academic Chemical Community

Jeffrey I. Seeman, Ph.D.<sup>1</sup> and Mark C. House, Ph.D.<sup>2</sup>

<sup>1</sup>Department of Chemistry, University of Richmond, Richmond, Virginia, USA

<sup>2</sup>Giant Steps Research, Gainesville, Florida, USA

A survey on credit issues and related “responsible conduct of research” (RCR) behaviors was conducted with academic chemists in Ph.D. granting institutions in the U.S. Six hundred faculty members responded. Fifty percent of the respondents reported *not* receiving appropriate credit for contributions they had made to projects the results of which had been published, including when they themselves were students. Thirty percent of these individuals discussed this lack of credit with the “offending” individual, and as a consequence of those discussions, a small percentage of individuals were provided either co-authorship or an acknowledgment. The majority who did not enter into a discussion with the “offending” individual reported two primary reasons for not doing so: that they “could not imagine any good coming from such a conversation” and “I was afraid of being in a compromised situation.” A discussion of relationship asymmetry in the academic setting is provided. Confronting one’s colleague regarding credit is compared with whistleblowing, and the possible consequences of blacklisting are discussed. A number of recommendations for minimizing authorship disputes are provided.

**Keywords:** authorship, collegiality, conflict resolution, publication, mediation, mentoring, responsible conduct of research (RCR)

## Editor’s Note

*In proposing and then developing the contents of this special issue of Accountability in Research, I promised Adil Shamoo, Editor-in-Chief of the journal, that I would provide a set of papers having a wide diversity of subjects within the broad scope of ethics in science and responsible conduct of research. Our focus*

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Address correspondence to Jeffrey I. Seeman, Department of Chemistry, University of Richmond, Richmond, VA 23173, USA. E-mail: [jseeman@richmond.edu](mailto:jseeman@richmond.edu)

*would be on the experiences and challenges within the chemistry community but would be of interest and value to a much wider range of readers. This article, co-authored by my colleague Mark House—a Ph.D. anthropologist and an expert in surveys and sociology—reports on conflicts that result from authorship disagreements and often, asymmetrical (in terms of power) relationships within the academic chemistry setting in the USA. Doing science is hard work. Thus, failing to be appropriately credited – or perceiving such a failure – can be extraordinarily disruptive to one’s career and emotional sense of wellbeing. We are delighted to present a topic that is among the most personal core issues that practitioners of science can face, whether they be chemists or not.*

Jeffrey I. Seeman

Guest Editor

University of Richmond

Richmond, Virginia 23173, USA

E-mail: [jseeman@richmond.edu](mailto:jseeman@richmond.edu)

## INTRODUCTION

During the past decade, there has been an increasing attention within the scientific community to the subject of responsible conduct of research (RCR). One of the most frequently expressed and contentious issues involves authorship in scientific publications, evidence of which is a vast literature on the subject, only a few of the recent articles being referenced (Clement, 2014; Foo, 2011; Marušić et al., 2011; Zare, 2014). Typically, decisions, conflicts,<sup>1</sup> and problems regarding credit are not considered to fall within the context of the three major categories of scientific misconduct—fabrication, falsification, and plagiarism (Claxton, 2005a,b; Macrina, 2014; Resnik and Shamoo, 2011; Shamoo and Resnik, 2015; Steneck, 2007; White House Office of Science and Technology, 2000). However, it can well be argued that omitting an individual from authorship who deserves to be an author—i.e., ghost authorship (Flanagin et al., 1998; Moffatt, 2013)—may be a form of falsification and plagiarism. It can also be argued that the inclusion of an individual who does not deserve authorship as author [i.e., honorary authorship (Flanagin et al., 1998; Moffatt, 2011)] is falsification.

Getting authorship and credit right is fundamental and critical for many reasons. Recognition of scientific accomplishments serves as a reward and a source of energy for those participating in such mentally, physically, and emotionally demanding pursuits (Merton, 1973). Receipt of tangible rewards—obtaining a position, promotion and tenure, receiving financial support; attracting student interest in joining one’s research group; being given and maintaining laboratory space—all these are a function of one’s reputation. Collectively, the reputation of individual staff members influences the success of the parent institution. Beyond these incentives is another motivation: the

maintenance of an atmosphere of collegiality and mutual trust within the local and broader research communities (Merton, 1969).

In order to help transform the norms of the scientific community from arbitrary and even capricious behavior regarding credit, several organizations and professional societies have developed and published standards and criteria upon which credit determinations can be made (American Chemical Society, 2006; International Committee of Medical Journal Editors, 2010; Macrina, 2007; Resnik et al., 2009; Resnik and Shamoo, 2011), and these have been discussed in many textbooks referenced above. Not unexpectedly, there are no uniformly accepted authorship guidelines across all scientific disciplines (Cohen et al., 2004), though recent evidence suggests that the differences in accepted RCR standards across disciplines are minor (Kalichman et al., 2014b). Unfortunately, there are data indicating that scientists are either largely unaware of these codes or fail to refer to them (Cohen et al., 2004; House and Seeman, 2010). Almost 20 years ago, Resnik, Rennie, Bird and their co-workers (Bird, 1997; Rennie, 1997; Rennie et al., 1997; Resnik, 1997; Yank and Rennie, 1999) proposed that authors' specific contributions should be reported in their publications. Today, this idea is implemented in several journals and recommendation to do so continues to appear in the literature (Zare, 2014).

Given (a) the enormous practical importance of credit and the incentives *to share* and *not to share* credit (Louis et al., 1995); (b) the passions underlying scientists' commitment and pride in their work; (c) the often arbitrariness of credit decisions (House and Seeman, 2010); and (d) the asymmetry in power and position amongst the potential authors (Bird, 2001; Coppola, 2002), it is not surprising that there has been significant conflict regarding authorship issues. This conflict centers on authorship rights, discussed above, as well as author order (Claxton, 2005b; Robinson et al., 1999; Zbar and Frank, 2011) and even timing and content of publications (Mirkin et al., 2001; Ritter, 2001).

To some, sharing credit will dilute the value they will receive. In such instances, competition within a community of collaborators may be considered a form of conflict of interest (CoI) that is not recognized as such in the relevant literature (see, for example: Boyd and Bero, 2007; Claxton, 2007; Gingras and Gosselin, 2008). Conflict around authorship also works against the goal of having collegial working environments (Anderson et al., 2001a; Robinson et al., 1999).

Competitiveness may be a source of energy, but it also has been described as self-destructive and hostile (Davis et al., 2008). The dual roles of tension in research are discussed by Roald Hoffmann in this very issue of *Accountability in Research* (Hoffmann, 2015). Scientists, especially younger scientists, have become more fully aware of these issues and of their rights and responsibilities, both to themselves and to the community as a whole. Furthermore, U.S. Federal government agencies require RCR training in institutions that receive federal grants, though the specifics and curriculum of such training are left

up to the educational institutions [Anonymous, 2011; National Institutes of Health (NIH), 2011; National Science Foundation, 2009a,b], a fact which further highlights the often ambiguous nature and inconsistent treatment of RCR issues.

Koocher and Keith-Spiegel recently performed a survey of researchers funded by the U.S. National Institutes of Health, assessing the extent of their personal interventions when *observing* either research misconduct or irresponsible scientific behavior (Koocher and Keith-Spiegel, 2010). Approximately 60% of those who reported observing one or more incidents also reported intervening; and of those, in less than 30% was the problem corrected. A small but substantial number of individuals reported being “treated with disrespect,” “suffered emotional costs,” and “felt career was jeopardized” as a consequence of their intervention (Koocher and Keith-Spiegel, 2010).

In this article, we provide results from a survey of faculty in chemistry departments in Ph.D. granting institutions in the United States. We focus specifically on differences of opinion if not outright conflict in authorship issues and subsequent conflict resolution behaviors. In our survey, the respondents were personally and professionally involved in the perceived wrongdoing as opposed to merely being an observer of events as in the report of Koocher and Keith-Spiegel (Koocher and Keith-Spiegel, 2010). The respondents provided data regarding their perceptions of failure to receive credit that they deserved and, if so, whether or not they discussed that failure with the “offending” individual or not.

We focus on both asymmetric relationships (e.g., professor and student) and on relationships that may be, in fact, asymmetric but primarily to the participants and not to a casual observer (e.g., between two tenured professors, one being more senior than the other, for example). Poor student-faculty relationships “jeopardizes the mission of entire institutions” (MacDonald and Williams-Jones, 2009) and can cause irreparable rifts between faculty and students—and may affect success rate in subscription of future students. In contrast, there has been little discussion about faculty–faculty relationship authorship conflict issues. The survey then queried as to the results of the authorship-conflict discussion, if there was such a discussion; and if there was not a discussion, why not. We then provide an analysis of the data, a discussion of the unique environment of academic research as it relates to credit issues, and provide suggestions for improving conflict resolution in the academic chemical community in the United States.

## MATERIALS AND METHODS: THE SURVEY

A full description of the survey is found in Part I of this series (Seeman and House, 2010b). Two other original research articles (House and Seeman, 2010;

Seeman and House, 2010b) and one mini-review (Seeman and House, 2011) discussing the results presented in the previous three articles have been published based on these survey data. The survey was performed following the policies of and after receiving approval from the University of Richmond Institutional Review Board (IRB). The survey respondents were all chemistry faculty members in Ph.D. granting institutions in the United States. The survey was programmed in the Survey Crafter software and administered via the internet. The data were recorded in a simple tab delimited file that was downloaded periodically. In accord with the University of Richmond IRB guidelines and our representation to the respondents and the IRB, all identifying information was deleted from the database.

The survey consisted of 50 questions (referred to herein as Q1, Q2, etc.), some of which contained multiple sub-questions (referred to herein as Q5a, Q5b, etc., for sub-questions “a,” “b,” etc.). The survey was conducted by email to 3,990 faculty or emeritus faculty members of chemistry departments granting Ph.D. degrees in the United States. Faculty from institutions in all 50 states were contacted. Six hundred complete responses were obtained (a 14% response rate, taking into consideration undeliverable emails). A 14% response rate raises the issue of nonresponse bias, an important concern which was evaluated and discounted as discussed previously (House and Seeman, 2010). Importantly, 366 valid responses would have been required to generate statistically sufficient findings at a confidence level of  $\alpha = .05$  (Yamane, 1973). Analyses were performed using Statistical Package for the Social Sciences (SPSS) and UCINET (Borgatti et al., 1999).

## PREVIOUS CONCLUSIONS FROM SURVEY DATA

It is important that a critical caveat be discussed at the outset, that of perception. A number of questions in the survey deal with the *perception* of whether a sufficient, appropriate credit was given. In point of fact, it may well be that despite a perception to the contrary, appropriate credit was adequately given, if the crediting were judged by an independent expert panel. That is, if an appropriate investigation of an ethics committee were to examine the facts, interview those involved, review the standards of RCR, and adjudicate the matter, a decision might be made that appropriate credit was given—though one or more of the participants may disagree with such a decision. However, in many cases of differing opinions of events, it is perceptions that reach the surface first and may maintain—for many years (Seeman and House, 2010b). In this study, in all instances, the adjectives “perceived” or “believed” or “alleged” or synonyms thereof should be assumed. Similarly, the term “offending” will be used to describe the individual who allegedly did not give appropriate credit. This caveat does not detract from the validity and meaningfulness of the study.

Rather, the study actually reflects the real world situation. The survey points to the consequences of ambiguous standards or, more likely, behaviors inconsistent with codes of conduct that are either not generally accepted or not generally known.

Three previous publications in this journal reported on three topics: receiving credit, giving credit, and the educational and other bases for those behaviors. The key findings were as follows: From Seeman and House (Seeman and House, 2010b): When asked “Did you ever feel that you ought to have been either a co-author of a paper or acknowledged in a paper and were not given that recognition?” (Q1), exactly 300 of the 600 respondents replied in the affirmative (Table 1) (Seeman and House, 2010a). Thirty-five percent who reported that they had not received the credit they felt they deserved identified their professor or another teacher as the individual who failed to adequately acknowledge “one of their suggestions which was essential for the successful completion of the project.” Forty-one percent identified a colleague in their own institution as the offending individual, and 42% identified a colleague in another institution as that person. Many respondents reported numerous instances of such infractions. Thirty-three percent of those reporting this type of infraction reported that two or all three of the classes of individuals had withheld appropriate credit. The youngest of the respondents reported the highest incidences of not receiving appropriate credit from their professor or teacher; in contrast, the eldest of the respondents reported the highest percentage of problems with a colleague in another institution. These two results may be related to time-in-position of the respondents, i.e., the youngest cohorts had much less time to have interacted with faculty members outside their own institutions. “There is broad negative experience and perception within the academic chemistry community regarding fair treatment in receiving or not receiving authorship credit.” Small but meaningful percentages (15–25%) of the respondents reported that they had discovered that they were listed as a co-author of a paper that “after the paper was submitted but not accepted” (20%), “after the paper was accepted but not yet published” (15%), or “only after the paper was in print” (20%). Nearly 50% of the respondents reported that they had, at least once, asked that their name be deleted as a co-author because they felt that they did not deserve to be a co-author. Interestingly, those who reported asking to be deleted as a co-author were also the individuals who were most likely to give authors or an acknowledgment to others; they were also the respondents who had published the largest numbers of papers and were also the eldest of the cohorts.

From Seeman and House (Seeman and House, 2010a): When the senior investigator is assigning credit, a significant context-dependency was reported. To wit, the respondents were more likely to give credit to their own students than to the students of another professor *for exactly the same intellectual contributions*. The senior authors were somewhat more likely to give credit to a

colleague in their department than to a colleague in another department, again for exactly the same intellectual contributions. The survey data also demonstrated that the most generous faculty, in terms of giving credit, are those who received their Ph.D. degrees in the 1940s–1960s while those who received their Ph.D. in the 1990s–2000s were far less likely to give any credit. This result seems related to the need for the youngest cohorts—many of whom still do not have tenure—to demonstrate hyper-protectiveness of their own promotability by being unwilling to share credit. Giving substantive and consequential suggestions at a lecture or seminar is the least likely mode of intellectual contribution to receive credit, most likely because ideas expressed at such open fora are considered—incorrectly, according to the definition of plagiarism—as freely given without strings. Also, as discussed below, symmetry of relationships, conferring substantial power to the individuals of rank, can result in unilateral decisions and abuses regarding credit issues, as has been discussed numerous times in the literature (Bird, 2001; Coppola, 2002; MacDonald and Williams-Jones, 2009).

From House and Seeman (House and Seeman, 2010): Chemistry faculty in Ph.D. granting institutions in the United States do not directly rely on—and perhaps, are even unaware of—published guidelines for authorship and other credit issues. Rather, their authorship decisions are based on what “seems to be the right thing.” However, they do use criteria that are consistent with guidelines issued by the American Chemical Society even though the respondents reported not referring to such guidelines in making their decisions. Criteria that were rated as important included making substantial contributions to the analysis and interpretation of data and to the conception and design of the study, and making substantive intellectual contributions to the study. Interestingly, “making a single suggestion that was essential to the successful completion of the project” was ranked relatively *unimportant* regarding authorship credit. Thus, making several types of contributions seemed essential for authorship. Criteria ranked as unimportant included general supervision, acquiring funding, and taking “public responsibility for portions of the content.” The latter criterion is found as an essential component for authorship in several published guidelines (American Chemical Society, 2006; Clement, 2014; International Committee of Medical Journal Editors, 2010; Resnik and Shamoo, 2011).

It is fair to say that there are potential conflicts in authorship at all stages of the publishing process, and there is much arbitrariness and ambiguity involved in assigning co-authorship.

## RESULTS

The 300 respondents who reported that they did not receive the credit they deserved were then asked the following question:



Thinking about the **last** time that this event occurred—did you discuss this matter with this professor? (Q4, Q11, Q18)

As shown in [Table 2](#), only a small percent (18–31%) of those who perceived a credit injustice approached the offending individual while the vast majority (69–82%) did not. If the perceived infraction was performed by a colleague at another institution, the percent who discussed the matter with the offending individual dropped to less than 20%. As shown in the footnote to [Table 2](#), individuals seem either to be willing to contact anyone regarding credit issues or not contact anyone at all. There were several significant differences between discussing and not discussing these issues and other factors accessed in the survey ([Table 3](#)), but demographic variables were not correlated. These respondents were then asked either (a) to describe the results of their inquiry, if they indeed sought out the offending individual to discuss the matter ([Tables 4](#) and [5](#)); or (b) to explain why they did not approach the offending individual ([Tables 6](#) and [7](#)). Detailed review and analysis of the survey results are presented in the section immediately below.

## DISCUSSION

### Analysis of the Survey Results

The major objective of this portion of our study was to obtain information about the actions academic chemical professionals take, or do not take, when they feel that they have not been treated fairly regarding receipt of credit. We also wanted to understand the motivations for their behavior, whether proactive or not.

As shown in [Table 1](#), 300 of the 600 respondents (50%) of the survey reported their perception that they had experienced not receiving adequate credit for their contributions to a research project. These respondents were then asked who it was that failed to give them adequate credit: their professor or another teacher, a colleague in their own institution, and/or a colleague in another institution. There was a rather uniform response of 35–42% for these three relationships. As discussed in our previous publication, “neither the number of years after receiving the Ph.D., their fields of expertise, their total number of publications, nor their total number of single-author publications showed any significant relationship with the perception of not receiving appropriate credit” (Seeman and House, 2010b).

Only 23–35% of the individuals who perceived that they had not received the credit due to them brought this issue to the attention of the offending person, the statistically-significant ranges reflecting the relationship between the two individuals ([Table 2](#)). The lowest percentage (18%) involved the offending colleague who was physically located in another institution. These results



**Table 1:** Data describing the extent to which the 600 respondents reported that they did not receive adequate credit for their contributions to a research project<sup>a,b</sup>

	Yes n (%)
Did you ever feel that you ought to have been either a co-author of a paper or acknowledged in a paper and were not given that recognition? (Q1)	300 (50%)
Who was it that failed to adequately acknowledge one of your suggestions that was essential for the successful completion of his/her project?	
Your professor or another teacher (Q2)	105 (35%)
A colleague in your own institution (Q9)	122 (41%)
A colleague in another institution (Q16)	125 (42%)

<sup>a</sup>The numbers in the column add up to more than 300 (or 100% of those respondents who said that they had failed to receive appropriate credit) because some individuals reported that several categories of individuals failed to provide them with appropriate credit for their contributions. <sup>b</sup>Reported previously in Seeman and House (Seeman and House, 2010a).

**Table 2:** For those individuals who reported not receiving adequate credit for their contributions to a research project (see Table 1), this table summarizes whether or not they discussed the matter with the perceived offending individual<sup>a</sup>

<b>The last time this event occurred (not receiving adequate credit for a suggestion made, see Table 1), did you discuss this matter with the offending individual?</b>				
Offending individual	Action, or inaction, by respondent			
	Yes		No	
	Number <sup>a</sup>	Percent	Number	Percent
Your professor or teacher (Q4)	32 <sup>x,y</sup>	31%	73	69%
Your colleague from your department (Q11)	35 <sup>x,z</sup>	29%	87	71%
A colleague from another institution (Q18)	23 <sup>y,z</sup>	18%	102	82%

<sup>a</sup>For correlations between the pair of responses Q4 and Q11, Q4 and Q18, and Q11 and Q18, the Pearson Correlation values (significance, 2-tailed; n) are as follows: <sup>x</sup>.441 (.002, n = 48); <sup>y</sup>.321 (.049, n = 38); <sup>z</sup>.417 (.003, n = 50).

are consistent with a recent, though much smaller survey, of European early-career researchers which reported little interest on the part of their institutions and supervisors on RCR matters (Krstić, 2014). Given that there are two types of motivations for *not* facing the offending colleague—fear of retribution and the feeling that a discussion will do little good (see below for more details on this point)—the fact that fewer individuals bring their dissatisfaction to colleagues in another institution suggests a *pessimism* for success that outweighs any fear demotivator. A statistically significant correlation was found between those individuals who *did* discuss the credit issue among two or three categories of offending individuals. Apparently, the context (one's own professor or

a colleague within or outside one's own institution) does not affect whether certain individuals will speak up. Rather, it appears to be more of a personality quality and behavioral ability of each individual. If an individual would speak up in one situation, that person would likely speak up in all of these situations.

Whether the respondent did, or did not, approach the offending person (Q4, Q11, and Q18; [Table 2](#)) did not relate to any of the demographic questions (chemistry discipline, year of receipt of their Ph.D., Ph.D. from an American institution, and number of publications; Q47, Q48, Q49, Q50, respectively). This is consistent with the previous observation (Seeman and House, 2010b) that having a credit problem with one person was not predictive of having a credit problem with another person. It appears that it is not so much the respondent who is generating—or perceiving—these credit problems but the situation, a conclusion supported by the lack of any correlation between the data in [Table 1](#) and [Table 2](#) and demographics.

We next asked, is the willingness to confront one's professor or colleague who has failed to give adequate credit related to any other behaviors or experiences? Or are there simply individuals who are not assertive (or the converse, people who are so assertive that they will discuss all the infractions)? Correlations were performed with all variables that were reasonable to consider in this question. Several had significant differences. As shown in [Table 3A](#), respondents who think public responsibility is an important part of authorship may have an enlarged view of what public responsibility is and, therefore, may be conscious of public opinion. These individuals may place more significance of putting one's name as an author. When they perceive that they are not getting credit, however, they are not likely to complain. In other words, these individuals may take more responsibility for their own behavior (i.e., responsibility for what they publish) than for other's behavior (i.e., willingness to confront the behaviors of others). The results in [Table 3B](#) suggest that those respondents who are conscious of the importance of peer review are less likely to confront their professor on credit issues. These individuals may have opinions but are reluctant to express themselves publically. They prefer the anonymity of peer review.

For those respondents who initiated a discussion—or confrontation—with the offending party, [Tables 4](#) and [5](#) provide a summary of the outcomes of those discussions. In the majority of instances—whether the offending party was the respondent's professor or colleague at his/her own institution or another institution—the discussion led ultimately to “no change” in the original decision, i.e., the individual was still not given the credit he/she felt was appropriate. Notably, not a single instance was reported in which a discussion with one's own professor or teacher led to co-authorship. There are surely many explanations for these statistics. For example, the professor may feel that he/she is already sufficiently thoughtful and substantially generous regarding credit and that any action by a student flies against the perception of

**Table 3:** Relationship between discussing, or not discussing, the perception of lack of receipt of appropriate credit by one's professor (Q4) with (A) the individual's sense of public responsibility for what he/she publishes and with (B) the individual's assessment of their interest in performing peer reviews<sup>a</sup>

A		
"How important do you consider each type of contribution for a person to be a co-author of a publication: 'Took public responsibility for portions of the content'?" (Q37I)	Q4: "Thinking about the last time that this event occurred—did you discuss this matter with your professor?"	
	No	Yes
Low importance – 1	3	4
2	8	3
3	7	6
4	19	10
High Importance – 5	36*	9*

  

B		
"How do you rate yourself as a peer reviewer? This is a task that I try to complete as quickly as possible." (Q46c)	Q4: "Thinking about the last time that this event occurred—did you discuss this matter with your professor?"	
	No	Yes
False	63*	22*
True	10*	10*

<sup>a</sup>A z-test was used on the proportions instead of a t-test because we are dealing with frequencies of categorical data. This approach points to which categories are different within the question.

\*Statistically significant.

his/her already-present considerations and generosity. The professor may also not respond favorably to any challenge to his/her authority. The feeling may be, "I am in charge. I will respond to any challenge of my authority or my wisdom by digging in my heels and maintaining my position. I will not back down." Analysis of other questions in this survey previously reported that professors tend to be more generous to their own students with regard to giving credit than to the students of other professors (Seeman and House, 2010a). Consequently, providing further generosity may be found to grossly exceed the faculty member's initial judgment, as far as these faculty are concerned.

There may well be a serious cost to initiating such a credit-oriented confrontation. Given the low percentage return (unlikely change in the credit decision) and high potential risk (resulting from challenging another's judgment if not authority), there is a significant emotional and practical threshold to taking what likely will be considered by the offending individual as a confrontational position. On the other hand, there will likely be emotional value in speaking one's mind and requesting, if not demanding, what one considers fair treatment. How can confrontation be minimized or avoided entirely? It is

**Table 4:** For those individuals who discussed their perception of not getting sufficient credit on a paper with their professor or colleague, the results of those discussions are tabulated below

**When an individual failed to adequately acknowledge one of your suggestions, which was essential for the successful completion of his/her project, and you spoke with this person, the results of this meeting were the following ones:**

Results	Outcome			
	You were placed as a co-author on the paper	You were given an acknowledgement in the paper or in some other fashion	There was no change	Other <sup>a</sup>
Your professor or another teacher (n = 32) (Q5, Q6)	0%	19%	62%	19%
A colleague in your own institution (n = 35) (Q12, Q13)	17%	14%	55%	14%
A colleague in another institution (n = 23) (Q19, Q20)	13%	9%	56%	22%

<sup>a</sup>See Table 5 for detailed textual responses.

much better to be proactive and understand, if not discuss, credit issues within one’s local community (e.g., one’s research group) before the ideas are shared and the research begun. Of course, this approach is contrary to free sharing and spontaneity, fundamental to much of the joy in doing science.

A small but statistically significant percentage of the peer-to-peer confrontations led to either a credit revision, to either co-authorship or an acknowledgement (Table 4). The fact that many professorial colleagues did make the survey respondent a co-author could be due to the symmetry of their relationship as opposed to the response for a student-faculty confrontation.

A fair number of respondents provided text responses that provide additional information as to the results of their credit-discussions (Table 5). These responses fall within several clusters of responses (or no response) by the offending colleague, which we have characterized in the following clusters:

1. No response, no change, no explanation.
2. Apologies.
3. Credit was provided in some fashion.
4. No change on the current paper but authorship in subsequent papers or patents, whether authorship was deserved or not.

In the majority of instances, the individuals who perceived that they had been wronged did not discuss the matter with the offending individual (Table 2).

**Table 5:** For those individuals who challenged their professor or colleague about their perception of not getting sufficient credit on a paper, the results of that discussion are tabulated below

**When your professor or another teacher failed to adequately acknowledge one of your suggestions, which was essential for the successful completion of his/her project, and you spoke with this person, the results of this meeting were as follows (Q5, Q12, Q19):**

Individual who failed to give you credit	Responses to "Other" (Q6, Q13, Q20)
Your professor or another teacher	<ul style="list-style-type: none"> <li>a) "An excuse was made that some time elapsed and in editing my name was omitted."</li> <li>b) "They apologized."</li> <li>c) "The professor did not put me on the paper and later recognized his error. He then put me on a paper that I had little (but some) input on that I would have been happy with being left off as a co-author. This was seen as an "evening out" by him. However, I did not discover that I had been added to this paper until a year or more after it had been published."</li> <li>d) "I was a graduate student at the time and it was acknowledged that my contributions both intellectual and experimental were central to the project and the paper but that since the other graduate student co-author of the paper had few papers and I had many, that I would be acknowledged rather than made a coauthor. I agreed at the time because it would not have been in my interests to push the P.O."</li> <li>e) "No responses to email or phone calls."</li> <li>f) "I discovered the paper in Scifinder."</li> </ul>
A colleague in your own institution	<ul style="list-style-type: none"> <li>a) "They apologized."</li> <li>b) "An apology was offered and accepted, but the paper was not changed."</li> <li>c) "Co-authorship in subsequent papers."</li> <li>d) "The colleague offered to put my name on another paper on which I had contributed nothing. I declined."</li> <li>e) "I only knew about the paper's contents after it was published. We spoke frankly face to face and gave each other frank opinion and decided on a course of action for the future."</li> </ul>
A colleague in another institution	<ul style="list-style-type: none"> <li>a) "It was discussed after the fact. The individual is a close friend with whom I had many conversations and who had made a simple oversight in not acknowledging me. It was minor."</li> <li>b) "A proper credit was given in an oral presentation at a later date."</li> <li>c) "An apology/correction was published in a later issue of the journal."</li> <li>d) "I was made a co-inventor on a patent."</li> </ul>

**Table 6:** For those individuals who did not challenge their professor or colleague about their perception of not getting sufficient credit on a paper, their reasons for not challenging that individual

You have said, “YES,” an individual failed to adequately acknowledge one of your suggestions that was essential for the successful completion of his/her project (Q2, Q9, Q16). Furthermore, you did not discuss this matter with that individual (Q4, Q11, Q18). Thinking about the last time that this event occurred, “Why did you not approach the listed individual with a complaint that you were not sufficiently publicly credited for a suggestion essential for the completion of the project (Q(i) is one of Q7, Q16, Q23)?” Percentages relative to the number of responses. The entries with an “x” or a “y” in the column refer to those pairs which are statistically significantly correlated with each other

Reported motivation	That individual was: (number of respondents)					
	Your professor or another teacher (Q7)		Colleague in your department (Q14)		Your colleague in another department (Q21)	
	Q4NO = 73		Q11NO = 87		Q18NO = 102	
	True	Difference	True		True	
Q(i)g I could not imagine any good coming from such a conversation	78%		77%		78%	
Q(i)a I was afraid of being in a compromised situation	47%		30%	x	24%	x
Q(i)b It just did not matter much to me	45%	x	54%	x	63%	y
Q(i)e I did not think I'd be heard	32%		28%	y	21%	
Q(i)f At the time, I did not understand my rights to be treated fairly	21%		10%		12%	
Q(i)c I tried a little but he/she did not listen	21%		9%		7%	
Q(i)d My colleagues or friends said I ought not to do so	11%		6%		7%	

The survey inquired as to why the respondent did not approach that offending individual. Seven options were provided, for “true” or “false” responses (Table 6) and an option was provided for textual responses (Table 7). The most prominent reason for not challenging the offending individual was “I could not imagine any good coming from such a conversation” (80% of those respondents who did not challenge either their professor or one of their colleagues). Next most prominent were “It just did not matter much to me” and “I was afraid of being in a compromised situation.”

Of least importance were “I did not understand my rights to be treated fairly,” “I tried a little but he/she did not listen,” and “My colleagues or friends

**Table 7:** For those individuals who did *not* challenge their professor or colleague about their perception of not getting sufficient credit on a paper, the results of that discussion are tabulated in Table 6. The respondents were also given the opportunity to respond to this questions (Q7, Q16, Q23) with an open-ended text response "Are there any other reasons that you did not approach this (individual)?" (Q8, Q15, Q22)

Individual who failed to give you credit	Responses to "Other" (Q8, Q15, Q22)
Your professor or another teacher (Q8)	<p>a) "Science is about cooperation and sharing of ideas—expecting written acknowledgement for each idea is ridiculous—such behavior encourages people not to share ideas which goes against scientific principles (do we acknowledge the anonymous listener who asked a question at a seminar or the suggestion from an anonymous reviewer ? You may think it was originally your idea when in reality it was not."</p> <p>b) "I should have known to nail down the credit for the idea before broaching it to someone else."</p> <p>c) "I also have been struggling with the question as to when freely dispensed advice weighs enough to warrant authorship."</p> <p>d) "The postdoc mentor was a general jerk who only cared about himself!"</p> <p>e) "I was working with Prof. XXX of YYY. I found that she was falsifying data to an enormous extent however she made it clear to me that if I exposed her, she would accuse me of sexual harassment."</p> <p>f) "Didn't know what my 'rights' were."</p> <p>g) "Other conflicts were more important."</p> <p>h) "He was substantially junior to me not particularly generous and I consider it a somewhat marginal case. Not worth worrying about. I was being generous to his student who came to me for help. Many times I would not want to be co-author; I have turned down offers. This case was slightly the other way."</p> <p>i) "I had many papers—although I would have done it differently, it seemed fair enough in the give and take of these things."</p> <p>j) "I had moved on. Also I was happy to have been on papers in which I thought my contribution was minor so I reasoned that on balance I should forget about it."</p> <p>k) "I had gone to a different field."</p> <p>l) "It was a joint student project with a professor in a different department. I provided the chemistry she provided the anthropology. I had tenure she did not. She thought it would be better for her promotion file to be the sole professor on the paper."</p> <p>m) "The paper was published already when I found out and I was embarking on my own academic career in the same field so I didn't think there was much up-side in complaining."</p>

(Continued)



Table 7: (Continued)

Individual who failed to give you credit	Responses to "Other" (Q8, Q15, Q22)
A colleague in your own institution (Q15)	n) "Lab politics."
	o) "Fear. You don't want to alienate the person that holds the key to your success in the field."
	p) "I was concerned it would make my work environment even more intolerable; the interactions with the parties involved were already pretty strained and I was convinced going to this professor about it would make it worse."
	q) "Recommendation letter for future position."
	r) "Relations between this person and the other members of the faculty are not conducive to honest discussions."
	s) "The work was already published without my knowledge and thus the situation wasn't likely to change."
	t) "The paper was already published before I knew about it (I had left the lab)."
	u) "The paper was already published when I saw the omission."
	a) "Was not sure about 'culture' of the organization."
	b) "I discussed this previously."
	c) "This was on a collaborative grant. One collaborator took an idea I had (I am an experimentalist) and published a theoretical paper on the idea. This in spite of the discussions the PIs had when we got the grant about authorship on publications. The other PIs lived up to the agreement this collaborator did not."
	d) "Did not make any sense."
	e) "It is humiliating to ask to be on paper even if the contribution was significant."
	f) "Such a conversation may do more harm than good."
	g) "He was an old 'friend' who I had good reason to believe was jealous of the success of our research program and did not wish to give us credit."
h) "I thought it was not worth the bother of making an issue of it."	
i) "I was offended and this damaged a friendship—I did not want to damage it further."	
j) "Generating waves between an otherwise healthy friendship."	
k) "I did not want to compromise our friendship as we also interact socially. I was actually very disappointed and surprised that the PI. of my lab and I were not acknowledged in the published article as a lot of our time and resources from our lab were fundamental for the collection of the data."	

(Continued)

Table 7: (Continued)

Individual who failed to give you credit	Responses to "Other" (Q8, Q15, Q22)
	<p>l) "I did not want to damage my relationship with the individuals nor get a reputation as someone who thought every idea was his or hers."</p> <p>m) "The colleague is very self-centered."</p> <p>n) "It was a junior colleague hunting for tenure."</p> <p>o) "He had funding problems and needed a lead publication to 'get back on his feet.'"</p> <p>p) "He was leaving the University without tenure and I didn't think it would be a good time to discuss the issue."</p> <p>q) "It was a senior colleague and I don't have tenure."</p> <p>r) "He was much senior to me and fighting city hall does not do you any good."</p> <p>s) "Dependent situation; awaiting promotion."</p> <p>t) "The colleague had a reputation for similar actions with other nontenured individuals."</p> <p>u) "The person was in a position of power relative to me. I was afraid that if I complained I would not get good references from this person."</p> <p>v) "The publication was not that substantive."</p> <p>w) "They defined authorship very narrowly."</p> <p>x) "Younger student while I was a postdoc."</p> <p>y) "I didn't help him again."</p> <p>z) "I did not find out until after the paper was published and I did not think that anything could be done to change the situation."</p>
	<p>aa) "I just learned about this in a paper that was recently published. There's nothing to be done at this point and it's a minor issue about providing material but someone else was acknowledged for a similar contribution and I feel that it would be most fair to include us if this other person is also being given authorship. I will soon speak (again) with our collaborator about acknowledging our role."</p> <p>bb) "It was not that important and I found out by seeing the article in print."</p> <p>cc) "He has done the same thing to others."</p> <p>dd) "I decided to get revenge by other means."</p>
A colleague in another institution (Q22)	<p>a) "I was a grad student. Only years later did I put two and two together and realize that a very famous individual almost certainly reviewed my paper, did a 1-day observation, sent that to another journal for publication, sat on my paper for several weeks, and then accepted mine without change. His version much less detailed appeared a week before mine. When this dawned on me thirty or more years later . . ."</p>

(Continued)

Table 7: (Continued)

Individual who failed to give you credit	Responses to "Other" (Q8, Q15, Q22)
	b) "I was treated as a paid consultant."
	c) "This is a more or less accidental consequence of being open. I believe that we all benefit by more collaboration and less secrecy in our research. The few times I have been 'scooped' because of this are vastly outweighed by the overall benefit of openness. I have plenty of publications and plenty of recognition."
	d) "People who have a lot of ideas and are open about them are sitting ducks for this sort of thing."
	e) "I approached an editor who took care of it when I submitted an independent manuscript."
	f) "Did not make any sense when people do this (using your ideas) they know very well what they are doing."
	g) "He is a good friend who has done a lot for me. I did not want to damage the relationship which is worth more to me than the pubs."
	h) "I felt I should have shut up and done the experiment myself rather than suggest it in a casual conversation with him. Serves me right."
	i) "He went overseas, to a remote location."
	j) "I did not think it was worth the effort."
	k) "I felt it had the potential to undermine our working relationship on other matters."
	l) "I just did not have the time."
	m) "Modesty"
	n) "My bosses contacted the person."
	o) "There were cultural and disciplinary differences that I believe were at the root of the matter."
	p) "Too late and not that important. Not considered deliberate snubbing, but just lack of attention."
	q) "The paper had already been published so it was too late."
	r) "It was too late for any good to come of a conversation—I found out when I read the paper which was already published."
	s) "Just move on and close all ties with collaborations."

said I ought not to do so." Apparently, the respondents either did not understand their rights; or, when they approached the offending person, they either did not "try a little" or the individual did not listen; and either advice from colleagues or friends was not sought or when it was, the advice was discouraging.

There are some correlations between the reasons given for avoiding a confrontation (the rows in Table 6). All three groups also had at least one

significant correlation between “My colleagues or friends said I ought not to do so” and one of the other rationalizations (or columns in Table 6), but not always the same one. For the three groups (the type of offending person), there is a statistically significant correlation between “I did not think I’d be heard” and “My colleagues or friends said I ought not to do so,” indicating that these are only one and not two independent factors. The groups “Your professor or another teacher” (Q7) and “Your colleagues in another department” (Q21) have many more significant correlations between “I was afraid of being in a compromised situation” and the other variables, but “A colleague in your department” (Q14) does not.

“I was afraid of being in a compromised situation” and “It just did not matter much to me” were *inversely* and statistically significantly correlated (Q7 and Q21). This is reasonable, for if one were fearful in a situation, it would “matter a lot” to that person.

For the six variables (rows) in Table 6, there is a similarity in the responses between the two groups involving a peer-to-peer relationship (a colleague in your department” and “a colleague in another department”). However, the relationship between these two groups and “Your professor or another teacher” breaks down for several variables. For example, there is much more fear, less of understanding of rights, in trying without success with one’s professor or another teacher than with a peer-to-peer colleague. Forty-seven percent of the respondents cited “I was afraid of being in a comprised situation” when the question referred to “your professor or another teacher” who had been perceived as unfair. Because of the asymmetry in the student-professor relationship and the clear need to have support from one’s professor during graduate school and for letters of recommendation, graduate students and post doctorates clearly respond to the need to be congenial if not deferential. The fear factor drops off to 30% when the offending person is a colleague within one’s own department and to 24% for a colleague at another institution. Clearly, the more symmetrical the relationship and the greater the geographic distance separating the individuals, the less important the fear-factor is. Indeed, Lee et al. have “provided striking evidence for the role of physical proximity as a predictor of the impact of collaborations” (Lee et al., 2010).

A large number of respondents provided text responses which give additional information as to why these individuals did not approach the offending individuals (Table 7). Several of the responses are sufficiently surprising that they are repeated here. Of course, given the anonymity of the sources, attributions are not possible. These responses are indicated by the quotation marks in the text that follows.

“I was working with Prof. XXX of YYY. I found that she was falsifying data to an enormous extent however she made it clear to me that if I exposed her, she would accuse me of sexual harassment.”

“I decided to get revenge by other means.”

“It is humiliating to ask to be on paper even if the contribution was significant.”

The reasons disclosed in [Table 7](#) are so broad that they defy being summarized in just a few categories. Analysis provides many lessons, including the following ones:

“He has done the same thing to others.”

“Relations between this person and the other members of the faculty are not conducive to honest discussions.”

It is likely that behavioral trends will be repeated, time and again. This survey indicates that most individuals within the academic chemical community in Ph.D. granting institutions in the United States adopt RCR behaviors that they have observed in graduate school, primarily as modelled by one’s Ph.D. advisor rather than having sought guidance from published codes of conduct (House and Seeman, 2010). Members of the academic community surely accept the goals of minimizing interpersonal relationship conflict and optimizing research productivity. Sharing breakthrough ideas will best be achieved in an environment of trust. It is important to develop community norms that embody the highest standards of responsible conduct of research. From an anonymous reviewer of this paper:

“Science is about cooperation and sharing of ideas—expecting written acknowledgement for each idea is ridiculous—such behavior encourages people not to share ideas which goes against scientific principles (do we acknowledge the anonymous listener who asked a question at a seminar or the suggestion from an anonymous reviewer?). You may think it was originally your idea when in reality it was not” (Anonymous reviewer, 2015).

Robert K. Merton has discussed multiple simultaneous discoveries, forming the philosophical basis for duplicative Eureka moments (Merton, 1973). Probing the possibility of independent ideas may help resolve inventorship and priority claims.

“I should have known to nail down the credit for the idea before broaching it to someone else.”

“This suggests coming to agreements before or very early in what may be viewed by some, but not necessarily all, as collaborative projects.”

“I had many papers—although I would have done it differently, it seemed fair enough in the give and take of these things.”

The various codes of RCR do not provide for “averaging out” of or apportioning credit over a certain number of publications. Frequently, what makes sense to one person—how one person perceives a situation—is totally different than what makes sense, or is perceived by another person. Such a disparity

becomes particularly toxic when the situation involves very high emotional or professional stakes. Open dialogue, as soon as possible, is one recipe for resolution.

“I approached an editor who took care of it when I submitted an independent manuscript.”

There are numerous sources of assistance, both within and external to one’s educational institution including editors of journals, the institution’s ethics committee and ombudsman, a department or the institution’s human relations department, the Office of Research Integrity (ORI) or related departments in granting agencies (though it must be emphasized that the ORI does not intervene in disputes over authorship). Typically, ethics committees of professional societies such as the American Chemical Society—one of the pioneers in developing ethical and RCR standards—will not participate in conflict resolution or mediation or nonjudicial analyses.

“Just move on and close all ties with collaborators who have displayed unfair credit behavior.”

On a related note, we end this section with an instance of possible plagiarism of a chemical discover from over 150 years ago. As discussed by historian of science Alan Rocke, James Dewar likely was the first to suggest the formula for pyridine while Guglielmo Körner was the first to publish the structure in April 1869. For the nonchemists reading this article, pyridine is the nitrogen analogue of benzene. Rocke states as follows:

“It is a testament to Dewar’s character that, despite having strong suspicions of Koerner’s plagiarism, he maintained his friendship and never made a public priority claim” (Rocke, 1998).



Benzene



Pyridine

Rocke’s analysis continues, however, as follows:

“It was this diffidence on the part of both men that partially explains the continuing confusion in the literature on this question [as to the true discoverer of the structure of pyridine]” (Rocke, 1988).

From this historical example, one can thus conclude that the history of science is best served by application of the most appropriate codes of authorship, so that the historical record will be accurate and correct in all details.

## The Role of Asymmetry in the Academic Research Environment

In academic science, decreasing resources increases competition, conflict, and misconduct (Swazey et al., 1993) and increases the importance of productivity and publications. That 50% of the respondents of our survey reported experiencing a failure to receive the credit they felt they deserved *plus* their report that essentially 80% of them were unwilling to discuss the matter with the offending individual is strong evidence of both dissatisfaction and dysfunctional behavior within the academic chemical community. The survey produced data indicating that this is, at least in large measure, a consequence of asymmetrical relationships and the use or potential use of power. Bird has reported that even mentors may demonstrate “a misuse of power” (Bird, 2001). In contrast, Kuhar and Cross have pointed out that “The goal of collegial ethics is to actively support our colleagues . . . the golden rule” (Kuhar and Cross, 2013).

To a large measure, the scientific community and especially the academic setting is inherently asymmetric. Consider the following relationships: student and faculty member; untenured and tenured; the “big player” and the “small player” (funding, prestige, size of research group, and other co-correlates); the “big” university and the “small” university; and the psychologically powerful and the less psychologically powerful. There is a natural tension between fear and respect for one’s professor (Donohue and Kilburg, 2014). Some behaviors defer to authority, with fear being the silent motivating force. But Donohue and Kilburg concluded, “for an academic leader to be truly effective, s/he must be respected both for their intellectual virtue (academic accomplishments) and their moral virtue (character)” (Donohue and Kilburg, 2014). That being said, clearly there are other less virtuous routes to academic accomplishment, and it has been argued that some “plausible-sounding ethical principles . . . might be damaging or unworkable” in the scientific enterprise (Woodward and Goodstein, 1996).

According to Donohue and Kilburg, “Respect and fear tend to increase the organizational strength of a hierarchy” (Donohue and Kilburg, 2014). Asymmetrical relationships in academia control the reward systems and regulate student–faculty, faculty–faculty, faculty–staff, and faculty–administration interactions (Brown-Wright et al., 1997; Seeman and House, 2010a,b). Hierarchy in academia is related to both power and status, as it is in other social settings (Magee and Galinsky, 2008). It is this asymmetry that is the source of, and ultimately, the resolution—as determined by the most powerful—of many disagreements including those dealing with credit.

This survey demonstrated that fear plays a role in several aspects of the research environment, the greater the asymmetry, the greater the fear, and the converse, the more powerful, the less fear. There is literature precedent. Lubalin et al. discussed the negative consequences of power, including the



pressure to drop allegations of wrong doing, ostracism, possible reductions in resources, with “substantial involvement and direction by institutional officials” (Lubalin et al., 1995). Senior faculty reported that they are more likely, than junior faculty, to report suspected misconduct by other faculty (Swazey et al., 1993). Koocher and Keith-Spiegel reported that individuals are more likely to intervene in potential misconduct events “if they were senior to the suspect . . . and significantly lower when the suspect was sender to the respondent” (Koocher and Keith-Spiegel, 2010).

### **The Relationship between Whistleblowing and Blacklisting and Reporting Scientific Misconduct and Misbehavior**

“Blacklisting” has been defined as “a process of shunning, sometimes harassing, and excluding an individual, usually for perceived misbehavior” (Kuhar, 2008) and for being “selectively restricted or banned” (Gori, 2009) from normal connections with others within the scientific community. Kuhar listed a number of consequences of being blacklisted, including: “damage to reputation, experiencing humiliating treatment which in turn causes emotional damage, denial of opportunities, loss of competitiveness, damage to career . . .” (Kuhar, 2009).

Several researchers (Kuhar, 2008; Malek, 2010) have suggested that whistleblowers may suffer many of the same effects of individuals being blacklisted, including retaliation (Keith-Spiegel et al., 2009; Lubalin et al., 1995; Swazey et al., 1993). Retaliation can include withholding, or encouraging others to withhold, the behaviors expected of one’s teacher and colleagues (e.g., participation in ongoing research and in writing publications, writing letters of recommendation, obtaining financial support, providing emotional support, helping develop professional relationships, and employment opportunities) (Anderson et al., 2001b). A recent news report stated as follows:

“Whistle-blowing has always made people uncomfortable. People who do it are ‘snitches’ or ‘traitors.’ Whistleblowers are also stigmatized and their career prospect diminished, to say the least. Not only that, the government itself has had an uneasy relationship with whistleblowers . . . .” (Solomon, 2014).

We note that “accused but exonerated individuals in research misconduct cases” (Lubalin, 1996) can also experience negative treatment, e.g., negative effects on professional reputations, job security and mobility, networking, as well as serious emotional turmoil, as for those blacklisted or whistleblowers.

Based on the comparison shown in [Table 8](#), we now posit that some of the same effects of blacklisting can result from confronting one’s professor or one’s colleague regarding a failure to receive credit. It surely takes courage to confront an individual—especially one’s own professor or teacher—regarding credit issues along with a strong hope that a change will be made. [Table 2](#)

**Table 8:** Comparison of consequences of “whistleblowing” with “questioning credit issues”

Situation	Reporting possible research misconduct	Reporting authorship claims
	Consequences to the Whistleblower (Malek, 2010)	Consequences to the Student
Effects on one’s current situation	Yes, e.g., blacklisting	Yes, e.g., poor collegial interactions, blacklisting
Effects one one’s future career	Yes, e.g., blacklisting	Yes, e.g., poor reference, blacklisting
Presence of regulations or institutional protections	Typically, yes	No
Protections for the whistleblower (stated policies and institutional practices)	Typically, yes	No
Psychological consequences	Typically, yes	Typically, yes

shows that only 23–35% of the respondents were willing to take that risk. Table 4 shows that the reward is unlikely, and perhaps nil if the offending person is one’s advisor. Our survey did *not* inquire as to any negative caused by the offending individual following a credit confrontation.

Near and Miceli (1995) have concluded that an individual most likely to be effective as a whistleblower will be in a position of higher power compared to the individual(s) being reported. Ironically and conversely, the individual who perceives a lack of credit and initiates a confrontation can suffer at the hands of an individual of equal or higher power. We note one other contrast: the action of whistleblowing is sometimes, but not always, a public action. Initiating a discussion with one’s colleague is most often a private matter, though in the extreme, a dispute can become quite public.

In his excellent book *Introduction to the Responsible Conduct of Research*, Steneck states that RCR “is simply good citizenship applied to professional life” (Steneck, 2007). Community development of, participation in, and commitment to a set of RCR-sensitive norms along with self-policing of those norms are critical to the RCR. This includes actions such as protection of whistleblowers, issue-raising, appropriate intervention, and conflict resolution to direct the process, as necessary, *during the course of research* (Claxton, 2007). This is a responsibility and an obligation shared by all researchers. In addition to attempting to obtain the credit that one feels is deserved, there are powerful moral reasons to confront offending authors (Malek, 2010). Ultimately, there are also consequences to the public and the scientific community as a whole, as well as emotional consequences to individuals involved.

Being silent in the face of misconduct or misbehavior may well be a form of collusion. The converse of “fear preventing an individual’s action” is proactively buying favor. Mainous III et al. have reported that junior faculty are far more likely to engage in honorary authorship, i.e., to include individuals as authors who do not meet the standard criteria for authorship, especially when those individuals have administrative authority in their organization (Mainous III et al., 2002). Related is a faculty’s favoritism or inequitable treatment of their students (Sullivan and Ogloff, 1998).

## RECOMMENDATIONS: STUDENT-FACULTY INTERACTIONS

One of the authors of this article (JIS) has conducted numerous interviews with approximately 50 academic chemists over the past six years (Myers, 2014; Reichardt, 2014; Wang, 2009, 2013). In those interviews and in many other informal discussions, both junior and senior faculty from across the United States profess great responsibility for their students’ education and enormous pride in their students’ successes. In fact, almost all interviewees, when asked what brings them the greatest joy in their career, respond in some fashion, “My students.” *The unanimity of these candid and spontaneous responses speaks powerfully for a cadre of chemistry professors dedicated to the success of their students.* One may rightfully be confused: How, then, could such a large percentage of respondents to our survey report instances that their own professor failed to give them the credit they believed they deserved?

Let us review the drivers involved that underpin conflict in credit decisions.

First, and critical to this entire discussion, is the matter of perception. There is a fundamental conflict of interest: individuals involved all seek maximum value for their own contributions and see the world from their own unique perspective. Individuals will almost always assign more value to their own contributions than will others. This is directly analogous to assessing the value of a house for sale: an owner always feels his house is worth more than does a buyer (Ariely, 2009). A reviewer of this article stated,

“We are close to the core of all problems in society—the beliefs and desires of individuals (and nations) interacting with each other in a group inevitably lead to tension. One teaching strategy I have at times used in my group in a multi-author paper is to have all people propose an order of authors for the paper . . . The process allows different views on the collaborator’s perceived role to emerge. I make the decision in the end, but I think everyone is happier and more sensitized to various views of the ethics of publication and credit. So what could have been a peremptory decision is turned into a salutary, educational experience” (Anonymous reviewer, 2015).

Second, a senior faculty member has a broader, more experienced, and more nuanced vision as to value of a contribution than does an early-stage

researcher, increasing the probability that contributions will be weighed differently by different collaborators. There may well be translucent issues dealing with group dynamics, previous “debts-to-be-paid,” and other factors that a principal investigator may consider important and that are unknown to or undervalued by a junior member of the team. In addition, because the intellectual and practical stakes are high, passions may rise easily and individuals may attribute actions based on differences in perception instead and *incorrectly* as actions that are based on dishonesty.

How and why do differences in the perception of the value of research contributions sometimes escalate to dispute and then to conflict? We review a number of factors. (1) Asymmetry in power and status within the academic community which can lead to poor communication between the involved individuals and unilateral decision making by the higher ranking individual. (2) The exposed status of students and untenured faculty within the academic hierarchy which can lead to fears of repercussion if one challenges a person of higher rank. (3) The somewhat-insulated nature of academic appointments from external control, especially after receipt of tenure, can encourage senior academics to be unilateral and inflexible—if not defensive—in their decision making, for example, regarding authorship of their papers. Of course, tenured faculty are not entirely insulated from the real world. The ability to perform research requires funding and willing students—who may be attuned to the rumor mill—both of which are effective external influences (Laszlo, 2010). (4) Teaching assignments and laboratory space determinations by the institution are among other institutional influences. (5) The temporary nature of student residency can lead to a “grin and bear it but be unhappy and hold grudges” attitude. (6) The lack of clear and comprehensive authorship guidelines and conflict resolution processes which may lead to disputable decisions. (7) Standards which support hierarchical systems are often unenforceable. (8) Increasingly, financial, human, and physical resources for research attenuate competitive *versus* collegial behaviors.

In chemistry departments, tenured faculty operate as lords of their own kingdoms. They can act unilaterally on many matters and may not wish to share power, especially with their students—even if they encourage peer-to-peer relationships, such as being on a first-name basis. Many faculty have limited resources and consider any distraction—be it authorship controversy or their students’ time away from the laboratory attending RCR-required training—to be a drain on productivity. For “productivity” in the previous sentence, read “career” or even “life.” In terms of running their research groups, faculty often follow the model of their own Ph.D. and postdoctoral advisors—which may be based on behavioral norms of several decades prior (House and Seeman, 2010).

How are conflicts in authorship and credit resolved? Neither journals (Cohen et al., 2004) nor professional societies nor the ORI participate in

authorship and credit adjudication even though such organizations do provide credit criteria and training requirements. Educational institutions and their deans/department chairs prefer not to get involved in such disputes though institutional ombudsmen may participate in conflict resolution. Thus, credit decisions are typically left to the individuals involved. However, as students understand quite well, they are beholden to their professors for thesis approval and letters of recommendation, and thus there is a fear factor that restricts open dialogue, effectively reinforcing higher-rank policy decision making.

It is likely that improvements in behavior and interpersonal relationships within the scientific community will be the result of voluntary actions (Friedman, 1997) of individual scientists encouraged by mandatory and improved educational experiences and awareness of codes of RCR. Normative behaviors will also continue to evolve and be reflective of new generations of scientists and new policies, instituted by pressures internal and external to their institutions. One might even predict that the perception by many researchers (House and Seeman, 2010; MacDonald and Williams-Jones, 2009) that useful and practical rules for RCR and their application will improve with time, as more and more individuals participate in RCR training. But a further prediction: RCR cultural change will come at a real cost: emotional turmoil between the young and the elder exacerbated by continuing reduced resources and competition for those resources.

Based on the literature precedents and the data provided by our own survey, we outline the directions that seem the most relevant, critical, and pivotal.

### **Cultural Changes: Academic Institutions**

Academic intuitions could be substantively supportive of the issues discussed in this article by going beyond the federal RCR guidelines, rewarding exceptional behavioral modelling by their faculty, and providing resources as appropriate. Institutional cultures could be developed which promote excellence in research along with the promotion of established and well-known codes of conduct, excellence in interpersonal relationships, just treatment of all, and processes for conflict resolution and intervention.

There is a natural hierarchical asymmetry in academia based on academic position, formal rank, and informal status within the community based on assumptions of power and productivity. Institutions could incorporate additional systems that protect the rights and the promise of fairness of those of low(er) rank in the system. Of course, the rights of both the faculty and the students must always be considered. Indeed, the view that “faculty can take care of themselves” can be counterproductive, given the evidence that authorship

disputes are not infrequent, that such disputes can do harm to all involved, and that improved management skills by faculty may well be productive.

Any system in which one individual has veto power over another's professional status and progress, e.g., in thesis acceptability, can be either unfair or perceived as being unfair by the person of lower rank. The power and asymmetry of the student–Ph.D. advisor relationship can be softened by having additional mentors and other faculty members on thesis committees, as is now done in many chemistry departments. Thesis committees with the *active involvement* of senior faculty not involved in the research, including senior faculty from outside departments, can provide a counterbalance to unilateral actions by a single advisor. Committees can be assigned early in a graduate student's tenure, and one member can serve as a mentor even before the choice of advisor and research program.

For research groups in which authorship conflicts have occurred, remediation tools could be made available. For institutions that experience an unusual number of authorship conflicts, special remediation programs could be enacted, e.g., each year, a list of all publications could be made available, including a statement as to the roles played by each member of the research team. This follows the contributorship model (International Committee of Medical Journal Editors, 2010; Kennedy, 2003; Rennie et al., 1997; Yank and Rennie, 1999) followed by some publications.

Ombudsmen, perhaps individuals with specific expertise assigned to each academic department, may be of value. These ombudsmen themselves could be provided with continuing training to hone their skills so that they can recognize and implement mediation before conflicts arise. Confidential academic procedures, sometimes including informal interventions, could be put in place to protect against blacklisting, discrimination, and retaliation. Confidential psychological counselling services for students and faculty, alike, can be provided. Faculty can be evaluated on their compliance and participation in integrity/RCR training as well as on their research productivity, research funding record, teaching effectiveness, outreach efforts, and compliance with safety regulations.

A reviewer has provided a serious counterargument for academic institutions providing nontechnical resources such as ombudsmen and mediation capabilities:

“Since the mid-1990s, universities in the USA and Europe, amongst other countries, have dramatically changed the ratios of academic to non-academic salary expenditure. Many universities today have legions of [unskilled staff] . . . I will give you just three examples, the current dominance of HR, which has damaged hiring the best scientists but has an exaggerated belief in its own abilities . . . non-academics hired to monitor health and safety issues but are usually not scientifically trained. They implement obscenely ridiculous policies not because they will make research actually safer but to attempt to cover imagined litigation. The

third are non-academics who are supposed to facilitate translation or academic spins outs but [are horribly unsuccessful]" (Anonymous reviewer, 2015).

Another reviewer of this article commented on the progress being made at universities and the motivational factors that often spearhead that progress:

"Many universities have made the changes you recommend, but it takes periodic terrible happenings like the suicide of the student [at Harvard (Hall, 1998; Nadis, 1998; Schneider, 1998) or the death of a chemistry researcher at UCLA following a *tert*-butyllithium accident (Torrice and Kemsley, 2014)], to make faculty take these seriously. Some of us stress to students that the role of the other members on their committee comes to the fore just in cases of conflict between student and main advisor. We have recently dealt at [major U.S. university name expunged] at great length with two cases of professors who managed badly their research groups. American students at least are not afraid to complain" (Anonymous reviewer, 2015).

### **Cultural Changes: Faculty**

By their normal activities, faculty can readily demonstrate that they are fully committed to their students' welfare as well as to their own careers and the progress of science. Faculty members could fully embrace training in research integrity and responsible conduct of research for themselves, for their students, and for all students in their department. Faculty can make it clear to their research group the criteria for authorship and the basis for those criteria. For example, the roles of each researcher could be defined as early as possible, with modifications clearly communicated to the entire research team during the course of the research. .

Faculty may see themselves as models for how best to perform research, obtain research funding, and run a research group; they can actively choose behaviors that model the best in research integrity and conformance to the ideals of RCR. Faculty can be educated in managerial skills. Faculty can seize pivotal decision-making points, e.g., deciding on authorship of an article at moments of differing opinion, as educational learning opportunities for their students. Faculty could consider encouraging "collective openness—the expectation that all members of the group (senior scientists, postdoctoral fellows, students, technicians) can and will raise questions [in a professional manner] about any aspect of the work underway at any time" (Anderson, 2007). Just knowing that there are potential conflicts that arise in the course of research and that there are means of resolving these conflicts may go a long way to fostering open and safe communication. It is excellent practice when faculty publicly praise students (and other hierarchically lower-ranking individuals) who model research integrity and RCR. Faculty can increase their awareness of the needs, visions, and perceptions of their students and see their students as much more than instruments that are needed to achieve their own professional



goals. Faculty and students can identify disputes before they become conflicts; in fact, any sense that a “student feels being cheated” can be a teaching opportunity. Some may be surprised to see the extent to which these behaviors will lead to an improved research environment and enhanced research productivity, not the converse.

### **Cultural Changes: Students**

Students could base their beliefs and behaviors on the principle that faculty and institutional administrators are committed to providing an optimal environment for their education and for their success. The authors strongly believe this to be the case; and the interviews of chemical faculty by one of us (JIS) discussed above strongly support this belief. (See comments above regarding differences in perception.) Students could do their part in communicating openly and positively when differences in opinion on authorship and other RCR matters arise; however, it is as much the responsibility of the senior ranking individuals to create an environment that not only feels but is safe for students to disagree with their professors. Students can be supportive of and take advantage of a “collective openness environment” and do what they can to encourage such an environment. This may be particularly difficult if a student perceives unfair treatment or possible misconduct of science. Students can know of and use all available institutional resources including mentors, senior faculty, and ombudsmen. Alpha Chi Sigma, chemistry’s professional fraternity, may be a leadership resource, and this organization along with individual students could be involved in the development of institutional and professional society codes of conduct. Once educated themselves in RCR, students can participate in the teaching of RCR. Students can be a positive force for change when paired with compelling suggestions for improvements plus support from faculty and administration to take an active role in their environment.

### **Cultural Changes: Those Conducting Research in the Field of RCR**

There is a growing need for more quantitative studies, e.g., observational research and surveys, to augment the numerous qualitative studies that are published in the field. There are several reasons for this recommendation. First, conclusions based on data are robust as they are amenable to statistical analyses. Furthermore, many physical scientists—whom this research is trying to reach—will have more faith in quantitative studies. In addition, there is a need to utilize the research in aligned fields, e.g., conflict and dispute resolution, organizational and social hierarchy, social dominance theory, and system justification theory to jump the gaps in RCR research. Lastly, researchers in RCR need to encourage research scientists in other fields to participate in the RCR community, including becoming teachers, mentors, and vocal supporters

of RCR training and culture change (Titus, 2015). There may well be a role for researchers to push improved RCR culture into the university for both professors and students, especially within their own academic institutions. Lastly, Kalichman et al. have recently reported a great diversity and lack of consensus in the “practices and perceived [RCR] standards, as well as perceptions about teaching and learning” for different disciplines (Kalichman et al., 2014a). It is possible that, even within the same discipline, there may be some diversity of RCR standards and training and responses to conflict from institution to institution, which could exacerbate these issues. This presents an opportunity for those conducting research in RCR as well as those who develop codes of conduct and teaching curriculum.

## **RECOMMENDATIONS: FACULTY-FACULTY INTERACTIONS**

Many of the recommendations in the above section (student–faculty interactions) are relevant to improving faculty–faculty interactions regarding credit disagreements, disputes, and conflicts, especially for intramural interactions. There is greater complexity when dealing with faculty who are located at different institutions. We believe the most important recommendation that can be made on authorship is discussing intellectual property rights as soon as possible, perhaps even before the actual research project has begun (Seeman and House, 2010a,b).

## **STUDY LIMITATIONS**

Our survey did not examine the past and current RCR policies of any of the institutions whose faculty participated in our survey were solicited. It would be useful and important to study the practices of these institutions and their chemistry departments regarding ombudsmen, the presence and roles of thesis committees, the attendance of faculty at RCR training sessions, and attitudes of the faculty regarding such training, the use of authorship issues as educational tools within research groups, etc.

## **CONCLUSIONS**

From the results of our survey of academic chemists in Ph.D. granting educational institutions in the United States, we have the following observations and conclusions:

1. Fifty percent of the survey respondents reported that their contributions to research projects have not been adequately credited, at least once in their career, by their colleagues or professors.

2. Individuals who do not receive the credit they feel they deserve generally do not discuss this with the “offending” individual (31% for their professor; 29% for their colleague in their department; and 23% for their colleague in another department). The reason for not pursuing the matter is anticipating the risk: “being afraid” (47%) to outweigh the possibility that “any good would come from such a conversation” (78%). Individuals also feel that they will not be heard (32%).
3. Professors have a tendency to be more generous regarding credit to their students than to the students of other professors. However, students who challenge their professors, feeling that they did not get the credit they felt they deserved, tend not to receive a credit-upgrade from their professors (0% for authorship; 19% for an acknowledgment).
4. In rare instances, fellow professors will give their colleagues more credit when confronted with a complaint (< 17% authorship).
5. There are many opportunities to improve both the credit allocation process as well as various intercession/discussion/mediation processes. This includes using “moments of conflict” as teaching opportunities.
6. There has been a dramatic increase in the awareness of and attentiveness to RCR and conflict within the academic communities worldwide. We believe there remain many opportunities for continuous improvements, and indeed, there is much room for optimism, even as reports of misconduct and misbehavior in science seem to be on the rise.
7. In this report, numerous recommendations were provided to all groups involved: students, faculty, administrators, and researchers in the field of RCR. The importance of authorship to the careers of those involved and to the history of science provide sufficient motivation for all involved to become as knowledgeable about integrity in science and RCR, to support “collective openness,” and to seek neutral mentors and ombudsmen and others to help navigate through these complex and sensitive matters.

We end the conclusion section by returning to the question we posed above: How could such a large percentage of respondents to our survey say that their own professor failed to give them the credit they deserved when, simultaneously, academic chemists interviewed by one of us (JIS) reported that what they were most proud of in their careers was the success of their own students? We believe that this contradiction is explained by several phenomena: First, yes, some faculty may know of or follow the codes of conduct promulgated by various professional organizations. Second, while professors say, and honestly believe, that the success of their students is first and foremost in their (the professor’s) priorities, their actions cannot always favor every student in their research group as the student may wish—as there may be other, less obvious factors

and other individuals with conflicting needs. Third, there may be perceptual differences of the value of individual contributions and legitimate differences in opinion as to authorship criteria that cannot be resolved to the satisfaction of all stakeholders. As stated by a reviewer of this article, “Differences in opinions about who should be an author sometimes have their roots in ethics (paradoxically), or in perceptions of ethics.”

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## NOTE

1. In this article, the term “conflict” refers to an opposition or antagonism of ideas, interests, or principles and is not to be confused with “conflict of interest.”

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