DEFINITION OF FALSIFICATION

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Abstract

Allegations of fraud involving falsification as research misconduct may result in severe consequences for those convicted. The focus of this article is the Public Health Service's (PHS) definition of falsification. A well-articulated revised definition is required for veritable instances of falsification as misconduct are to be consistently identified and potentially offer a framework for elucidation. A philosophical critique of the explicit definition is undertaken to determine what comprises falsification at its core, which could substantially reduce the number of allegations of fraud as suspected instances of misconduct. The flaw in the PHS definition of falsification is due to circular logic, which allows anything to be proven according to it. Furthermore, to be confident that falsification has occurred, one must be certain of what is true when it has not occurred, which is demonstrated not to be plausible. falsification was found to be the most common type of fraud as misconduct alleged yet the rarest to be determined to occur because the flawed definition confounds what constitutes an occurrence of it. In addition to conceptual ambiguity and ignorance, allegations of falsification are suggested to occur strategically as maneuvers by researchers who may exploit the inherent flaw in the definition to eliminate rival competitors.

Keywords Ethics, Research Misconduct, Philosophy, Philosophy of Science, Lexical Semantics

DEFINITION AS A FORM OF ARGUMENT

This article aims to achieve its goal of analyzing and interpreting the definition of falsification according to the PHS based on a logically philosophical framework. By appropriating with minor adjustments as needed many concepts familiar to those who have ever studied logic, this facilitates our task of ultimately reconstructing the definition of falsification immensely. It will be imperative that both the word being defined and its explanation are deconstructed sufficiently, which are referred to as the *definiendum* and *definiens*, respectively (Cook 2009).

Attempting to deconstruct any definition, which includes the PHS definition, without sufficiently atomizing both the definiendum and definiens to their core components could result in overlooking important aspects that should be given the full respect and consideration that they deserve. Moreover, the fragmentation of the existing definition into irreducible elements will allow for the identification of the building blocks present as well as the additional ones that will be required to construct a complete argument for a replacement definition of falsification. The complete argument herein constructed in support of a replacement definition of falsification will be comprised of the actual replacement definition that is being proposed itself. Therefore, in this paper, the construction of the definition is being approached as one would the construction of a philosophical argument.

An argument is comprised of a set of statements or declarations that includes premises followed by conclusions (Cunningham 2012). Furthermore, premises may be understood as statements or declarations that provide evidence, or support, on which an argument relies in order to justify its conclusions (Cook, 2009). In addition, a statement is itself considered to be a formal or explicit assertion (Oxford 2017b). *What is interesting to note is that, according to the*

definition just presented, a definition itself qualifies as a statement because it formally or explicitly makes an assertion. Since a definition makes one or more formal or explicit assertions, a definition may be understood as a set of one or more statements or declarations. Furthermore, comprised of one or more statements, a definition must also consist of a consistent set of premises and a conclusion. Moreover, given that a set of statements is what comprises an argument, a definition may, therefore, also be considered an argument.

The Foundation for a Formal Definition

If the desire is to construct an adequate definition that does not involve circular reasoning, then there must exist explicit guidelines to follow in constructing a formal sentence definition. As the reader may recall, I have previously mentioned that there are always both similarities and differences among two or more things that exist. Similarities and differences are extremely useful for a variety of purposes, which includes the present one concerning the word falsification. Undoubtedly, there are at least two words that exist regardless of how one might qualify that existence metaphysically; thus, there must also be similarities and differences found among whatever words one grants.

When the words comprise a sentence, both the similarities and differences together are what may be used to distinguish words from one another. Furthermore, whether the words represent abstract concepts like falsification, or they have material referents in the external world, it is the existence of distinguishing similarities and differences that ultimately define them. Therefore, as found in Swales and Feak (2012), a formal definition of a word for our purposes will be comprised of an assignment to a class, or group, to which it belongs based on the similarities shared, which is then distinguished from other terms in the same class through explicit mentioning of any differences.

It has been established that the flaw in the construction of the PHS version of falsification is due to using the idea in the definition of a word that is being defined, which is analogous to the case of circular reasoning in argumentation that assumes what it is attempting to prove. In order to avoid such circular logic, which will allow for the definition of a word to be sufficiently formulated as an argument, the core idea of the word being defined must not be contained as a core idea derived from a word anywhere in the definition itself (Swales and Feak 2012). Let us suppose that based on the surprisingly unanticipated success of the current research paper, the use in print of one word that the author has coined has apparently been recognized for the first time despite previously having

A Formal Sentence Definition Word Verb Article Class Relative Pronoun Distinguishing Detail(s) Propriosophy is the wisdom of oneself that may be derived from one's own reality; the

Wisdom that is obtained through the application of the guiding principle of consistency in the interpretation of one's experiences readily abandoning any beliefs or positions, which are determined to be inconsistent with one's experiences} used it. He coined the word "propriosophy" to describe an idea that was the result of fusing two previously separate constructs that had garnered the attention of the editors at the world famous alliteratively named dictionary publishing company, Lucky Lexicon. The author is both honored and humbled when they ask him to provide a definition of propriosophy for the upcoming edition of their dictionary. So, the author offers the following as the author's official submission: Propriosophy The wisdom of oneself that may be derived from one's own reality; the wisdom of self that is obtained through the application of the guiding principle of consistency in the interpretation of one's experiences readily abandoning any beliefs or positions, which are determined to be inconsistent with one's experiences. c 1997

The reader should note that no words contained in the definition may be reduced to the same ideas in the term being defined. Both root words comprising the term proposed mean "wisdom" and "own/self" and are incorporated into the definition. Nevertheless, their usage in the definition does not result from being derived from the meaning of another word that was used.

The new term reduced to its core word components "wisdom" and "own/self" has been defined through the usage of the core word components to which the term may be reduced. Therefore*, because the definition does not rely on words that may be reduced to the same ones that comprise the new term, it is not considered circular*. As a result of not relying on circular reasoning, unlike falsification, there should be no confusion as to what does or does not qualify as a case of propriosophy.

The purpose of presenting the word I coined for example was to establish what a non-circular example of a definition might resemble. Having a comparison of what a definition should look like can help to identify what necessary components there are in a final definition of falsification. Furthermore, unlike the definition that was just encountered according to which no confusion should be possible, because the PHS definition of falsification is circular, which makes confusion both possible and likely, the author argues that one should be able to prove anything by relying on it and shall do so. The reason that it will be beneficial to demonstrate that anything may be proven through the use of circular reasoning is that it allows for one to appreciate and thoroughly understand why it is that circular reasoning is both dangerous and insufficient for any argument or definition.

The Use of Recursion in the Development of Definition

We have seen how definitions may be interpreted as an argument. Similar to the structure of an argument, the set of one or more consistent statements of which the definition is comprised does include two components the reader may recall from earlier: the definiendum (i.e., description) and the definiens (i.e., word itself). In order to provide the best possible definition, I argue that the explicit definition include unique definiens and definiendum and should result from employing a recursive process to construct them.

Recursive definitions are inductive because after the initial terms have been identified, all subsequent terms are defined in terms of the prior ones (Cunningham 2012). Through the addition of layers, the recursive process incorporates all previous definitions to be used as a premise for some subsequent conclusion. In essence, through the development of a definition resulting from recursion, the definition itself may be considered fact because each step is constructed from the prior one about which there was already an agreement, which renders the definition to be a fact (Boylan and Johnson, 2010).

Conceptual Adequacy

By conceptually adequate, I mean that the definition of falsification at its core is comprised of the qualitative aspects of provability and validity. The former is in reference to being able to demonstrate proof for what is claimed. The latter defined with respect to an argument is a quality in which the conditional "if ... then..." will never go from true antecedent preceded by "if" to false consequent preceded by "then." Both provability and validity are fundamental to conceptual adequacy and their relation to one another determines the pseudo-qualitative abilities that I refer to as soundness and completeness (Garson 2014).

The Pseudo-Qualitative Abilities of Soundness and Completeness

Soundness and Completeness are concepts that are related to that of adequacy and frequently encountered in mathematical and philosophical logic (Garson 2014). Specifically, soundness refers to a conditional argument in which the following is true: *"if there is proof of an argument then that argument is valid."* Conversely, completeness may be understood as a conditional argument in which "if an argument is valid, then there is proof of that argument." Thus, if the notions of soundness and completeness that comprise conceptual adequacy with respect to a given argument have been established, since they are conditional and are true in both directions, the relationship between them may be interpreted as being bi-conditional.

In a state of conceptual adequacy, an argument that is bi-conditional, which in our case is a definition, is sound if and only if that argument is complete as well, and vice versa (Garson 2014). Moreover, as it pertains to the soundness and completeness of an argument, an argument is provable if and only if that argument is valid. Because if and only if indicates that one thing is always true when another thing is or false when another is false, the bi-conditional is used to represent the idea of logical equivalence (Cunningham 2012). According to this perspective of adequacy regarding the bi-conditional relation between soundness and completeness, soundness can be interpreted as logically equivalent to completeness much the same as provability can be understood to be logically equal to validity.

Definition as Argument and Conceptual Adequacy A conceptually adequate argument is sound if and only if it is complete because there is proof if and only if the argument is valid.

Pseudo-Qualitative Notions of Ability

Unlike other qualitative characteristics that are readily perceived through the faculties requiring nothing more than perception itself, if the properties of soundness and completeness are to be attributed to anything, then they must both be demonstrated for verification. By demonstrated, I mean that there is no way to perceive either soundness or completeness as a property, quality, or characteristic of a thing passively; there needs to be some way to show that their existence has been established that requires active perception by the observer. Active perception is in reference to the usage of any of the faculties of sense perception each occurrence of which results in an event that operates along a locative-temporal continuum such that the truth value of a property predicated of an object derives from the truth-function of the coordinates for events A through A sub n.

With respect to each dimension, there exists a discrete coordinate such that no product of them may occur more than once. By product, it is meant that it is not possible for there to exist more than one set of unique coordinates and event derivative. Although there can be identically derived aspects from different coordinate event sets, no two sets of coordinates and event derivative may exist and be identical.

For instance, if one perceives something in particular with a unique locative-temporal coordinate (e.g., proof of A) and then perceives that same particular thing in a different locative temporal coordinate (e.g., A is valid), then as a result of the order perceived (i.e., proof to valid) and what was perceived where (i.e., locatively in the realm of truth in proof and the realm of truth in validity), one may conclude or attribute soundness to that thing. However, merely perceiving in a snapshot fashion either proof as event or validity as an event as passive does not provide sufficient justification for concluding soundness; there needs to be two or more (i.e.,

greater than any single instance of perception, which requires activity on the part of the one perceiving in the form of reasoning to make sense and derive understanding. Thus, the main distinction between traditional quality and pseudo-qualitative abilities is that qualities may be concluded with a single perception and are done passively whereas pseudo-qualities require more than one perception and active participation of the perceiver.

In order to establish evidence of both soundness and completeness, assuming that there exists proof of an argument the argument must be derived to be valid; and if we begin by assuming an argument is valid, we must be able to prove that it is. The general definition of valid is being well-grounded in logic (Oxford 2017a). However, in consideration of the validity of an argument with respect to logic, the definition is somewhat different. The difference is due to the potential for flaws to exist that would compromise the conclusion of the argument.

There may exist valid arguments for which there is no proof to allow us to conclude as much. Conversely, for a given system, it may be the case that, although there exists proof seemingly justifying the conclusion of an argument, the proof may be of that which is in fact not valid. Regardless of the case, either situation results in logical missteps that are of no use for the purposes of substantiating the conclusion of an argument. Ultimately, although validity and provability are extremely important for the cogency of any argument, they are neither the same, nor does the existence of either guarantee the presence of the other.

One well-known development concerned with provability, mathematics, and logic is Gödel's second incompleteness theorem, which claims that a given system that is consistent cannot prove its own consistency (Garson 2014). A consistent system may be understood from the perspective of an absence of a flaw in which there exists proof of a contradiction. However, if there is no proof of contradiction then there is no proof that there is no proof of contradiction.

Due to the uncertainty concerning accepting proof related to the potential for a system that was relied upon to obtain a particular proof, there may be no way for a system's claim of proof to be believed on its own basis. Thus, without such a basis for the belief in a system's claim of proof, there can be no confidence in that proof or what it entails either.

The absence of confidence in something being the case based on the existence of proof for that something in a given system makes it difficult for the concept of soundness to be established. Soundness may be easily understood in terms of what asserting it would mean. Such an assertion would be that "if there is proof of sentence B, then sentence B is true." Nevertheless, the assertion of soundness cannot be guaranteed nor can the claim that to be the case given the potential flaws of a system. Flaws that are discovered in a particular system could either allow for invalid arguments to be proven or allow for both a proposition and its negation to be demonstrated. Because of the potential to undermine any proof through the discovery of flaws would render any proof of claims regarding sentence B to alone be both questionable and insufficient. Since provability of a sentence B alone is insufficient to establish its truth, the soundness as an aspect of argument to which I refer as being pseudo-qualitative needs to demonstrate why one should accept that proof of a sentence implies that the sentence is the case. Because the probability of sentence B, which is at the core of soundness itself, for instance, is not taken at face value, I argue that soundness should not be considered a quality in the usual sense. The situation is analogous to some quality for which there is proof, such as a shape, requiring proof that proof of the quality implies that the quality is the case: the proof being once-removed from the quality also renders the supposed quality once-removed as well, which I refer to as pseudo-qualitative.

System of Free Logic Inspired Rules Universal Out

I refer to soundness and completeness as being "pseudo-qualitative" because they are conditional or contingent as opposed to actual. Conditionality restricts affirming them by requiring that certain conditions be met (hence, conditional) prior to such affirmation. The condition that needs to be satisfied beforehand may simply be thought of as the existence of the condition regardless of what that may be. In this respect, the structure of an argument for soundness and completeness resembles one in the form of a rule as found in a system of free logic (Garson 2014).

show comparison between pseudo-qualitative and rule of free logic here.

The most attractive feature of a free logic system is that it allows for the blockage of undesirable inferences (Garson 2014). Since there is no presumption with regard to existence made, a system of free logic prevents inferences that would allow for the proof of undesirable conclusions (Garson 2014). In such a system, *when there is proof of the existence of something it means that there is already evidence of the existence of that thing.* This fact is similar to the statement of Axiom GL previously mentioned with regard to proof.

show GL with Universal Out Rule

Pseudo-Qualitative Claims and Abilities

Let us suppose that we want to claim that x is a square. Now, in order to make such a claim, because claiming x is a square implies x being an instance of an actualist's claim that "there is an x such that x is a square," there needs to be a way of substantiating what it is that allows being a square to be predicated of x. That is, we need to verify that conditions satisfying what a square is do exist before concluding that x is one. Thus, unlike the outright declaration that something has the quality of being square, what I have termed a “pseudo-qualitative”

version might claim something similar to the following: *"if a 2-dimensional geometrical shape with four sides where opposing pairs of sides are parallel to one another creating four equivalent 90 degree angles with adjacent sides has internal angles which total 360 degrees, then the shape is a square."*

The main difference between traditional qualitative characteristics and pseudo-qualitative ones is that in order to establish the quality, the Pseudo-quality requires proof of the condition's antecedent in order to conclude the consequent of a conditional claim. Soundness may be understood as an ability to show that proof of an argument being the case implies that the argument is in fact true given the possibility of yet to be discovered flaws. Furthermore, in order for any proof of the argument to be meaningful, due to provability necessarily being contingent on the ability of soundness to be demonstrated (i.e., need for proof that proof implies the truth of a given argument), means that the theorem expressing this should be phrased as a conditional statement.

In a system of Free Logic (FL), Axiom (GL) If it can be demonstrated that proof of argument A implies that argument A is the case, then there is already proof of argument A. The concept of provability has been shown to relate to that of soundness and completeness. Provability shows up in both notions and is expressed in the axiom (GL) as well (Garson 2014). Axiom (GL) for Gödel-Loeb claims that if there is proof for the soundness of a given argument (i.e., that proof of the argument implies that it is valid), then that argument is provable. In addition, if the reader recalls, the notion of validity with respect to an argument means that the argument will never proceed from true premises to a false conclusion.

According to the notion of validity, then, since soundness must show proof of an argument A as true premises leads to a true conclusion, the idea of soundness may be viewed as

entailing validity. In other words, for soundness to be substantiated, there must not exist a case in which the acceptance of truth of provability of argument A could lead to argument A being false; therefore, the condition for soundness describes that for validity. If there is proof of a given argument, then that argument is true. On the other hand, the converse of soundness in which it is asserted that if valid, then there exists proof of a given argument, is what may be referred to as completeness (Garson 2014). Altogether, the concepts of provability, validity, soundness, completeness, and the role of pseudo-qualitative abilities based on the notion of restricting undesirable inferences as found in free logic interrelate coherently to comprise a framework I refer to as *conceptual adequacy*.

What I have termed conceptual sensitivity and conceptual specificity are based on ideas that I have appropriated from the field of epidemiology and medicine, as it pertains to the identification of diseases through the use of tests. The notions of sensitivity and specificity capture the essence of what any definition as argument should be able to accomplish.

In the traditional interpretation related to epidemiology and medicine, the understanding of sensitivity relates to the ability of a test to result in positively identifying a disease when a disease is present (Boslaugh 2012). On the other hand, specificity is defined with respect to a test that does not identify disease in cases in which the disease is absent (Boslaugh 2012). Occasionally, there are tests that have false positive results just as there are those that fail to identify the disease when the disease is actually present. By determining how many false positives and false negatives occur for a given test, the sensitivity and specificity may be ascertained. Analogous to an experimental test for disease, I view the role of a definition as one in which the definition comprised of the word being defined and its explanation is a test that may be used to correctly identify instances of the word being defined, which I refer to as conceptual

sensitivity. In addition, the ability of a definition to correctly fail to identify something when it is not there I define as conceptual specificity. In this capacity, the notions of conceptual sensitivity and specificity, like their traditional counterparts in epidemiology, serve as a measure of the usefulness and effectiveness of a given definition.

Sensitivity and Specificity as Components of a Definition

A definition equals a word plus a description. Envisioning the relationship between (conceptual) sensitivity and specificity as a biconditional statement may assist in understanding how it relates to a definition more readily. A biconditional relationship is one in which an "If...then..." conditional statement is true in both directions (Garson 2014). A conditional statement consisting of an antecedent preceded by if and a consequent preceded by then is true just in case either the premises are false, or the conclusion is true. However, the special assignment in which the antecedent (or premises) is true, and the consequent (or conclusion) is as well describes the notion of validity with respect to arguments (Cunningham, 2012).

Assuming the biconditional, the presence or absence of either proof of a proposition or validity of it, leads to conclusions that should be familiar to the reader. For instance, under the assumption given, if there is proof of a sentence being the case, then it may always be deduced that the proposition is the case. Furthermore, when it is impossible to go from the truth of premises to a false conclusion, then the argument is considered valid (Cunningham 2012). In addition, when it can be demonstrated if there is proof of a sentence being the case, then the sentence is valid, soundness will have been established. Given that a positive test result in the presence of disease is analogous to a definition given the word being able to positively identify instances of it by description, a biconditional statement that expresses sensitivity and specificity should be considered a form valid argument. Valid Argument Moreover, when it can be

demonstrated (i.e., proven) that if there is proof of something, then that something is valid, we can also conclude that the sensitivity of an argument implies that it is sound as well. For that matter, showing that there is an absence of proof when something is not the case, which is specificity, because as an argument form, the truth of the antecedent entailing the truth of the consequent means that this is valid.

Conversely, when read in the opposite direction, then if an argument is valid, then there is proof of it. In addition, the relationship of the biconditional statement is such that if there is no proof of a given disease, then it follows that there is no disease. Upon closer inspection, this conditional statement expresses and argues for specificity. As we progress through the present study keep in mind that it is better to have as much sensitivity and specificity as possible integrated into a definition of falsification. Let us now consider allegations and fraud.

THE VIOLATION IMPERATIVE: PART ONE

According to data from case summaries of misconduct outcomes between 2006 and 2015 from the Office of Research Integrity (ORI), while number of cases of misconduct being considered has increased, the number of cases in which there were findings of misconduct has remained relatively consistent (ORI, n.d.). This trend has the disturbing corollary that not only has making false allegations become more frequent, but because of the increased number of accusations despite the absence of a commensurate increase in findings of misconduct, more individuals are being falsely accused. Moreover, such an increase in false accusations implies that, unless only those actually guilty of misconduct are the ones whose cases result in findings of guilt, which is obviously untrue, there are necessarily increases in the amounts of false convictions as well tarnishing personal and professional reputations —sometimes, irreparably.

Regardless of the social, ethical, or legal transgression of which one may be accused, one thing is certain: there will always be a proportion of such allegations that ultimately and inevitably will be determined false. Nevertheless, certainty of occurrence in no way implies frequency of such. Even given the most generous estimate of frequency, it would be difficult to imagine –let alone accept— that false allegations are being made nearly as often as instances in which there is a legitimate basis for whistleblowing. Unfortunately, however, between 2006 and 2015, for each year except just one outlier, there were more cases resulting in no findings of misconduct than there were those in which there were findings. Furthermore, in the absence of any significant increase in actual findings of research misconduct occurring, any attempts at understanding the data become rather complicated.

Efforts to reconcile the trends in the data and possible justifications for them were the impetus behind this paper. Could all of the accusers responsible for the false allegations during all but one year outnumber legitimate complainants? If so, what motivated the false allegations? Could they have hallucinated yet truly believed the object of their hallucination? Perhaps the accusers were fully aware of their actions intentionally making false allegations? Better still, although it is not high on a tentative list of explanations, in all fairness maybe the problem really is not related to the whistleblowers at all. Unless year after year there is evidence to support the same accusers making allegations that cannot be substantiated based on there being no finding of misconduct in cases, which is very unlikely, there is only one other commonality that potentially connects the cases and it does not relate to the motive, intent, or action of the accusers at all: the gatekeepers in charge of *determining whether to hear the cases and rendering decisions concerning cases heard*.

Although due diligence requires that all realistic possibilities be given serious consideration, rather than jumping to the absolute worst conclusion of either the people making false allegations, or that those sworn to uphold the virtues of the profession and the entire scientific community at large have orchestrated some fantastically brilliant yet devious plan conspiring to limit findings in cases heard in order to bolster the image of adequate self-regulatory capacity, it would be more reasonable that the problem lies not with actions, or the failure to act. Giving people the benefit of the doubt that they are genuinely doing their best to maintain integrity, the issue that would be consistent with adopting this framework for viewing the phenomena of false allegations would be the presence of a flaw or defect with the manner in which the classifications comprising misconduct are defined, which contributes to misunderstanding what constitutes an instance.

Depending on one's perspective, both the best and the worst aspect of allegations in general is the same: *allegations do not require evidence.* This is consistent with the fact that, if there were to be evidence of what is alleged, then there could not be any allegations; there would be findings of the transgression in question. *It is only after ruling of no findings that allegations may be determined false. Unfortunately, by the time a ruling of no findings has been made, the damaging effects have already occurred to the individuals who have been cleared of wrongdoing*.

While it may be the case that transgressions —be they criminal, ethical, or otherwise— do not always leave evidence of their occurrence, does this imply they ought not be requisite to make allegations? Without evidence, on what ground would allegations rest? Before we can consider this and other questions, we must understand what it means to "allege."

Allegations as a Losing Proposition for the Falsely Accused

By definition, to allege is "to assert without or before proof (Merriam-Webster 2017)." On the one hand, individuals wrongly accused of having committed misconduct may view the absence of an evidence requirement in order to make allegations as the worst possible thing. Since there is no evidence required to make a claim against others, it does not matter whether one will ultimately be exonerated because nothing will have changed concerning the status of evidence. Nevertheless, at best, he or she will always be remembered for having been rightfully cleared of allegations of misconduct of which they were accused.

Alternatively, at worst, he or she may potentially be wrongly convicted for something that he or she did not do, which occurs often enough to merit the creation of scholarly works dedicated entirely to the phenomenon of False Convictions concerning various types of crime and misconduct (Turvey, Savino, & Baeza, 2017). Regardless of which outcome occurs, neither

exoneration nor false conviction is particularly beneficial or designed to protect those unjustly accused. Although there are procedures in place to appeal when falsely convicted, there are no such means in the case of those falsely accused. In particular, even when exonerated of alleged misconduct after being falsely accused, one is truly never wholly "cleared" in the eye of the many due to flawed reasoning that leads to the erroneous belief that only the guilty are alleged to have committed transgressions. This phenomenon of persistent guilt despite the lack of findings is eerily reminiscent of the manner in which allegation phenomena operate. Because of their similarities, we will begin this paper by considering what may be responsible for such irrational guilt persistence in spite of the absence of reason. It is hoped that by beginning here, insight into our ultimate purpose with this series of papers will be gained.

Serial-Positioning as a Framework for Perceiving Allegation Phenomena

With such a poor outlook for anyone falsely accused regardless of the outcome of their hearing, the phenomenon of allegations and their aftermath merit consideration in the author's opinion. As a potential tool for analysis borrowed from a different field, the author proposes that observations be understood from the perspective of the effects of serial-positioning (i.e., presentation order of items) on recall (Neiman, Loewenstein, & Shteingart, 2013).

Concerning *primacy versus recency,* as it relates to serial-positioning, it has been observed that the last or most recent item in a list of items, is what people are most likely to freely recall while second-most-likely in a list of items studied for subsequent recall are those that were among the first encountered (citation). In fact, it is based on such research findings that in textbooks on academic writing suggest structuring the series of points for one's argument with the second-most important point mentioned initially and the most important point stated last (Behrens & Rosen, 2018). Applied as a lens through which to view the impact of allegation,

primacy guiding cognitive bias in the best and worst scenarios would predict allegations themselves standing out regardless of any subsequent findings to be most likely recalled whereas exoneration either at trial initially or upon appeal subsequently occurring lastly being recalled would implicate recency effects as the dominating force behind cognitive bias.

Given the damaging effects of allegations to the personal and professional lives of individuals accused even when allegations are immediately discredited or discrediting is delayed, primacy is that which appears to take precedence. However, despite this obvious primacy effect, the basis for it is both unintuitive and unclear. Moreover, in the face of multiple allegations on separate occasions, the primary effect seems to be reinforced.

What is interesting is that over time, the primacy effect is transient. Transience makes sense when considering that the longer a list of items may be, the longer the time since the first item was mentioned, which affects recall. Nonetheless, it is recency that not only determines what is most likely to be recalled but has also been shown to increase recall with successive trials (Huang, Tomasini, & Nikl, 1977). Thus, recency would be expected to guide recall in the case of exoneration of the innocents, which means the outcome of allegations and not the allegations themselves are what should be recalled. Yet, persistence of the presumption of guilt based on having been alleged despite the exoneration is very real. The question is why this is the case?

One explanation is that there may be a crucial difference between a list of items for recall and actual events such as allegations: the inextricable link to, and attribution of, values. That is a series of letters or unrelated words one is asked to study for later recall would be devoid of any meaningful, inherent attributes that rely upon judgment or assessment. Conversely, concerning a list comprising a string of events that one is instructed to study for later recall in which there is a piece of information included stating a prominent scientist is alleged to have committed

research misconduct, appended to the content of the item itself would be some form of valuation resulting in the attribution of either good, bad, or possibly neutral. In this particular instance, the information content would likely be labelled with some variety of semantic tagging much the same way an internet framework called “Cog Tag” has suggested (Wu, Qian, Riguidel, & Chen, 2013). When later prompted for free recall, undoubtedly certain tagged items (e.g., deemed good or bad) would come to mind before others.

Given the incessant war waged between our evolutionary pressures to the self and those to the group (Pediditakis, 2014), it would make sense that events that are labelled and interpreted as threats are more readily recalled. Furthermore, of the two evolutionary pressures, I contend that the pressures to the self are given priority over those to the group since self-preservation is the best way to guarantee one’s ability to satisfy both pressures. Attentional resources are quite supple and may be directed according to the needs of the particular task of the moment (Morrison, Conway, & Chein, 2014), and the task above all else is self-preservation, the ability to direct one’s attention as required with the tagged “bad” items in memory could explain the observed behavior of persistence of guilt and the aftermath of false allegations in general. On a primal level, recalling or remembering allegations despite them being dismissed are perceived as red flags and threats to the self.

Allegation as Allegory: Circular Reasoning

From the perspective of the one making allegations, the absence of an evidence requirement is perceived as the best thing about the manner in which allegations may be made. The onus is effectively on the accused and the "system." After all, the mindset of an accuser who claims to have the utmost faith in the process may be that if they should be wrong about the accused, then he or she ought not be found guilty and will be exonerated.

Although I would strongly disagree with such a lackadaisical attitude for a number of reasons, which include wrongful convictions do occur on occasion, if the wrongly accused is fortunate enough to be exculpated, should he or she confront the person responsible for putting them through the ordeal afterward and state "I told you that there was no evidence for the allegations that you made," the accuser is still within reason to truthfully retort, "I know. I believe you because there was no evidence when I made the allegations."

Despite the hypothetical scenario being rather distressing to acknowledge for some, as an allegory it serves to underscore a major issue that this series of papers attempts to tackle. By no means is the author claiming that herein exists a panacea, nor that one exists elsewhere; however, given that there may always exist the potential for something so devastating to occur, success in small increments that this work aims to accomplish ultimately contributes to overall progress. Furthermore, that there exists a possibility of being falsely accused should be cause for concern regarding allegations in general, as well as those related to research misconduct in particular because there is sizable cost associated with being involved regardless the outcome of the allegations.

The Aggregate Cost of Allegations

For obvious reasons, it should be understood that all allegations of research misconduct may lead to severe consequences if the parties accused are ultimately convicted regardless. Furthermore, for one to go from an allegation to a ruling in a suspected case of research misconduct is a process that may be protracted as well as costly. Research regarding cost estimates attempted to determine the aggregate cost (AC) of a case of scientific fraud using a statistical method that incorporates both measurable and intangible costs (Michalek et al. 2010).

The AC estimate produced from the analysis conducted by Michalek et al. 2010 was calculated to be $525,000.

Costs associated with cases are not the only setback resulting from allegations. According to work done by Hey & Chalmers (2010), which discusses how allegations of suspected misconduct that were unfounded led to a case that was widely publicized when it occurred in the UK, *allegations may be responsible for damage to defendants that ensues even when no evidence is ever found.* It was the resultant damage that still occurred despite the absence of proof that justified the claim that the situation was handled inappropriately and inadequately in the author's opinion. Moreover, the damage that occurred was protracted taking eleven years to determine that there was no real basis for the allegations made.

The ultimate cost was more than an estimated £6 million in total (Hey and Chalmers 2010). Given the repercussions of allegations, it may be concluded that the manner in which they function in general is extremely problematic. The most problematic aspect from any defendant's perspective is that the sole recourse that the accused may have if another alleges misconduct is to attempt to sue for libel (Hey and Chalmers 2010). However, to successfully sue for defamation as a strategic legal maneuver may prove exceedingly difficult.

The difficulty would be in proving how allegations may be considered libelous, or defamatory given the possible outcomes. On the one hand, if the accused is convicted on the basis of findings produced during the trial, then no "good character" can be said to have been tarnished because there exists evidence which nullifies the potential for libel claims. Conversely, if acquitted, the exoneration of the accused is supposed to ensure that his or her reputation remains intact. Unfortunately, as mentioned previously, this is not how it tends to be for the accused whether exculpated or not.

It appears as though one may become easily ensnared by the web of allegations of research misconduct due to lack of evidence required. That notwithstanding, allegations are seemingly impossible to escape because although an absence of evidence may eventually result in the case being found not to have merit, due to the very same lack of proof required to allege, a conviction is not needed for damage to occur. While it may be exceedingly difficult to target allegations directly, the approach that I will use consists of addressing the issue of research misconduct, which involves allegations indirectly. Specifically, the issue that will be addressed in this paper relates to one of the foundations of research misconduct as it is defined to be in a widely accepted established definition of the Public Health Service (PHS).

Because the entirety of research misconduct may not be adequately addressed in any single article, as part one of a multi-part philosophical critique, I will consider only a single pillar that comprises the definition of research misconduct. By concentrating on one main aspect in each paper, the total result of my work in this series may provide understanding and allow for the re-framing of suspected instances of research misconduct. In addition, any novel ideas that are derived from the findings may have the potential to contribute to the discourse concerning the ethical conduct of research and possibly prevent future allegations from being made frivolously or due to honest ignorance. In this article, I will be deconstructing the definition of falsification under the rubric of research misconduct as defined by the Public Health Service (PHS).

GEOMETRICAL METHOD OF DECONSTRUCTING FALSIFICATION AS MISCONDUCT

Fabrication, falsification, and plagiarism (FFP) that comprise explicit definitions of research misconduct may each be considered to result in instances of fraud when these acts are perpetrated. As an explicit definition, the definition of falsification provides sufficient detail to allow for identified instances matching the definiens (i.e., the description) to be substituted with the definiendum (i.e., word) “falsification” being defined (Cook 2009). As far as the term is routinely understood, fraud may be defined as "*that which is done with the intent to deceive*" (Fellbaum 1998). According to this definition of fraud, one may infer that there exist at least two aspects:

1. The aspect of intent and
2. The aspect of deception.

What is interesting to note is that, despite their existence, neither the aspect of intent nor that of deception may be directly observable or measured, which renders them both theoretical constructs (Martella 2013). As mental abstractions, theoretical constructs are often relied upon to convey ideas, concepts, or notions that defy immediate perception. Furthermore, any percept comprised of an instance of a construct shares underlying characteristics with all others. In fact, it is only through the realization of such percept that one is justified in claiming the existence of constructs.

A claim of understanding concerning fraud in this capacity would be that the core aspect of fraud is that of intent. *Core aspect* refers to that which is requisite, foundational to the occurrence of fraud, or considered that without which it would be impossible for fraud to occur. That is, while deception can occur without intent, as we will discuss in the remainder of this

section, the absence of intention would violate the definition given, as well as most commonsense understandings of fraud. That notwithstanding, although the core aspect of intent may be necessary, it must still be qualified by the aspect of deception.

Qualification of intent by the aspect of deception influences what counts as fraud in the following two significant ways. Firstly, qualification affects the aspect of intent by establishing a relation that resembles equivalence superficially. Such a resemblance whereby intent is interpreted to be deception leads to an apparently explicit relationship in which one may be thought of as being interchangeable with the other. Nonetheless, the substitution of one for the other is, in fact, not possible. Unfortunately, "intent" cannot be substituted by "deception" in any place that it occurs because *each instance of deception does not necessarily have to correlate with that of intent*. The qualification of intent by deception may be best understood as descriptive. As such, qualifying intent with deception serves only to explain how things were, are, or will be (Browne and Keeley, 2015).

The second way in which the qualification functions is in its subordination of the aspect of intent itself. By subordination, I refer to a reduction in the status of the aspect of intent to that of deception. A reduction occurs in which *the property of being perceptible becomes required for the aspect to be realized*. As counter-intuitive as it may seem, I view the additional property of being perceptible as a reduction in status because it results in another requirement. For instance, both intent and deception can exist independently of one another. However, it is only through certain acts of deception (e.g., example of check forgery) that intention may be inferred. In this respect, it is impossible for intention to be perceived directly; thus, it may only be so indirectly. Conversely, deception may be perceived by both direct and indirect means. Going from direct to indirect perception is the reduction of intention to which subordination refers.

The reduction of the status of intent to that of deception is due to the absence of true bidirectionality, or biconditionality. Bicondionality, as a class of relation between two objects, refers to the symmetry of conditionalization such that if A then B, then if B then A (Cook 2009). From the truth of such symmetry, it may be understood why biconditionality is used to represent or describe one concept of equivalence (Cook 2009). Equivalence among the two aspects of intent and deception that results from a reduction in status of intent is established through the construct of subordination.

The aspect of intent is conceptual and immaterial whereas that of deception manifests itself in observable forms. Given the nature of, and relation between, both intent and deception, deception is directly verifiable whereas intent may only be confirmed through a performative behavior, such as an act of deception. Therefore, despite rendering the aspect of intent less powerful, the reduction of intent to the level of deception through subordination serves the purpose of making it possible for intent to be verifiable.

Relational Semantics of Intent and Deception

The aspects of intent and deception, as qualities or properties, are related to one another in a variety of ways. Individually, each of the relations that one aspect bears to the other, or to itself alone, has meaning. Nevertheless, were we to analyze as many of the relations as possible to assess the aspects of intent and deception for consistency and what they entail, then it would provide more insight into their essence and guide the process of interpretation, which leads to more profound understanding.

Case of Fraud: Cashing a Forged Check.

In order to analyze the relation between the aspects of intent and deception, it will suffice to examine a prototypical instance of fraud comprised of these two aspects. Thus, let us begin by supposing that there actually exists a forged check and that the forged check was successfully cashed. From the actual existence of this forged check, it will be our goal to determine, with respect to the two aspects, what the instance of fraud entailed.

Forgery may be defined as the act of producing a copy of either a document, signature, or work of art (Oxford 2017a). Given that something is copied, through this definition one may interpret forgery in the context of an absence of authenticity. By virtue of both the behavior of the individual and the act itself associated with the committal of forgery, outside of coercion, entrapment, or otherwise being forced against one's will, it can be inferred that the person responsible for committing fraud could only have intended for deception to occur.

By copying the signature of another person onto the check, going to the bank, and handing the forged check over, it may be concluded that passing his or her signature off as that of another so as to cash the check was not only their intention, but upon successful completion was also to become their deception. That notwithstanding, intending for deception to occur does not imply that deception will result. Moreover, the concept of forgery has multiple frameworks from which to be interpreted as fraud.

From either the perspective of the one committing the act (i.e., intention), or the one not committing it (I., deception); and from within the framework of the process itself, which is active (i.e., copying the signature of another) and from that of the product that results (i.e., consequences of copying the signature of another). Does the existence of multiple perspectives in any way influence what would be categorized as fraud? Should it? In other words, from a

framework of intention alone regardless successful outcome, success in deception regardless intent, the action itself regardless the intent or success, or consequences regardless the action, is there an example that qualifies all four frames? We must evaluate and redetermine core aspect designation.

Thought experiment: Characterizing Fraud.

We have thus far assumed that intent to deceive is requisite for fraud to occur. Nonetheless, I contend that intent is neither core, nor is it even pertinent to the process of committing fraud. I will discuss a hypothetical case concerning a forged check and demonstrate the inherent flaw in the definition of fraud as it currently stands.

Let us suppose that there is an actual check that was signed for and cashed by a person for whom it was not meant. The person who forged the signature and check, therefore, intended to deceive. Additionally, upon successfully cashing a check, he or she has committed fraud. So, it is either the case that this forger had to have signed the name of another, or he or she had to just have not signed his or her own name. Which is the most adequate phrasing for the stipulation of forgery? In other words, with respect to fraud, is it more important to propose that the forger signed the name of another person, or that he or she did not put his or her own signed name down?

In order to decide which wording should be used to frame the act of forgery, one needs to first determine whether it is possible for both versions of the criterion to be consistent with one another. By consistent, it is meant that both versions of the framing of criteria may be true simultaneously without contradiction. An example analogous to this may be found in the Principles of Ethics in which comparisons are made between beneficence and nonmaleficence.

When comparing doing good by beneficence with not doing harm through nonmaleficence, one is afforded the opportunity to potentially see the same thing from multiple perspectives. Nonetheless, while it may be true that doing good would be considered not doing harm, not doing harm is not necessarily considered the same as doing good, which demonstrates the necessity in having the perspectives of the same thing from both as principles.

Procedure for Comparison

The key to comparing multiple perspectives of the same phenomenon is the construction of both an affirmation and corresponding denial statement. For instance, concerning the notion of good, constructing it as a principle of ethics in the form of "doing good" (i.e., beneficence) initiates the comparison process through the use of a verb. After the verb-phrase, the next stage requires the construction of the negated form. Nonetheless, with "no(t)" plus verb phrase, we are left with "not-doing good" and not doing good is not equivalently formulated. Since this negated construction cannot be compared because it is not the same, it can be corrected by extending the negation in a different context to the notion of good itself. In this fashion, once “not good” is obtained, it may be substituted for its equivalent (i.e., bad or harm) to result in "not doing harm.” Finally, not doing harm can be rewritten swapping the negation with the verb yielding “doing no harm.

The reason for the aforementioned procedure is to allow for the logical analysis of the structures. This procedure is analogous to what occurs with higher-order logics in which a statement as a particular realization is abstracted and regimented in order to obtain its logical structure and logical form, respectively. For instance, if "John writes" is the particular realization under consideration, then the statement may be rewritten in a logically structural format "there is an x such that x is john and x writes." As it pertains to ethical principles of beneficence, the

negated form "not doing harm," is the negative construction that may be thought of as that which results from a metaphoric rarefaction in which there is a stepping back to allow for the more general form. In so doing, "doing no harm" may now be properly compared with "doing good."

The actual comparison occurs by examination of the relation between both constructions, which in this case is binary. Is it true that doing good is equivalent to not doing harm? Yes. Conversely, is it true that not doing harm is equivalent to doing good? It is possible yes and possible no; but not necessarily so, which makes the statement contingent. A statement is considered to be contingent if it is both possible that the statement is true, and possible that it is false (Cook, 2009). Therefore, this first relational comparison reveals an asymmetrical relation to exist between both beneficence and nonmaleficence such that necessarily if beneficence, then nonmaleficence, yet it is possible if nonmaleficence, then beneficence AND its possible if nonmaleficence, then not beneficence as well. That is, to say, the conditionalization of beneficence to nonmaleficence is one of necessity whereas that of nonmaleficence to beneficence is one of contingency—possibly yes or possibly no but not necessarily either. If x's doing good for y allows y to do good for z, then is it true that Bxz? That is, if Bxy and Byz, then Bxz true? Yes, so B (beneficence-doing good) and N (nonmaleficence-not doing harm) as they are in a relation to one another are so transitively.

There are other such relations concerning B and N as well, which model the manner in which a relation may be used to determine the nature of the status. In addition, the relation between intent and deception may be analyzed in much the same fashion as beneficence/nonmaleficence was, which should assist in uncovering the semantics of the connection that is shared. Let us suppose for our hypothetical scenario, there exist two distinct individuals. Each of them is named Frank Frauder. one has middle initial D., and the other E..

Both males, similar appearance but not identical. They live in the same state, different towns and addresses, different phone numbers too but, they were born on the same day, or work in the same company, to make it interesting.

Although unlikely, these facts are all theoretically possible and will be our base case for the determination. We will now begin by assuming from the following different perspectives: that from fraud being known to occur and that from the one committing it. The perspective of the one committing it will be divided into wittingly and unwittingly committing fraud. Knowing that Fraud occurred not having been the one to commit it. Thus, the question of intent concerns how best to phrase the action that resulted in the fraud: as an affirmation or denial. Is it writing or signing the name of another, or not signing one's own name, that most adequately labels what transpires?

As the intention before it was done, once completed, however, the action(s) successfully carried out become the deception. The only difference between the two aspects relates to the ontological status. In other words, the ontological status pre-commission distinguishes intention from post-commission at which point the intention becomes manifest as the deception itself. While it is possible for the action to be carried out and be unsuccessful, it is prior to being carried out and success in being carried out that are the main concerns because from these two outcomes all four scenarios may be determined according to their framework. Prior to being carried out delineates or demarcates pure intention which may not be verifiable; if successfully carried out, then we know deception occurred and there were consequences as well. Carried out unsuccessfully implies that the act itself is what matters most whether intention preceded it or not.

Relevant Dichotomies

In consideration of what we know regarding the notion of fraud based on the definition previously given, the intent to deceive stipulation resulting in the two aspects of intention and deception as criteria for determination may be understood through the manner in which they are related to one another. As it currently stands, however, it seems as though the definition of fraud stipulating intention to deceive may be incorrect.

In an effort to determine whether fraud, as defined, will hold, the nature of the relationship between intention and deception must be thoroughly vetted. We must ascertain as much relevant information about these two aspects as possible. Given the information will be pertinent to either one or the other if the two aspects are not identical, it is recommended that the approach to this task be by analyzing for what I have termed the "relevant dichotomies." Relevant Dichotomies may be understood as opposing pairs of qualities, properties, or characteristics that either the presence or absence of which allows for their classification into groups according to similarities and differences. In the case of intention and deception, the relevant dichotomies concern the binary relation each aspect as object bears on the other.

For example, let us suppose that we have just thrown into the air and let fall as they may two or more coins. I claim that, through relevant dichotomies, it is possible to separate the coins with ease. One relevant dichotomy would be the color. That is, while no coin may be exactly a match, any of the coins may be split into groups of those that are either silver or near-brown. Another relevant dichotomy could be whether the coins show a particular side of themselves (e.g., heads). In this fashion, one could continue to identify other relevant dichotomies that would eventually result in all remaining coins being categorized.

There will be readers who swiftly point out that a coin could have landed on its edge in theory, which would result in a trichotomy: heads, tails, and edge. These individuals would wonder how this would be possible to reconcile since there are three outcomes possible and not two. Please note that the purpose of selection of categorization was embedded in the name. Most crucial is the ability to make the process simplistic. Thus, the requirement of both relevance and dichotomization at each step achieves simplicity.

In the rare case that among tossed coins a coin is found to be standing on its edge, then neither head side nor tail side shows. Therefore, the relevant dichotomy would be showing sides either yes, or no. Then, the sides showing group undergoes dichotomization into heads or tails, which results in the three groups. While it may have been just as easy to trichotomize in this case, the point may have been missed by implementing dichotomization. Instead of three categories, in the event that there were ten or one-hundred different groups that could be formed, it would be readily understood how quickly -otomizing immediately into however many categories encountered might overwhelm by becoming unnecessarily difficult. There is a distinction between taking additional time and being difficult: often, I would argue the way to discern the two would be that if a procedure takes less time to complete, but results in a higher chance of error, then that procedure would be labeled more difficult.

The approach for dichotomization is general to specific. It proceeds in a logically structured manner so as to minimize error despite taking as long or longer to complete. Nonetheless, because dichotomization requires only two categories, whether compared to trichotomizing, or more, I contend that it will always be simpler and faster to look upon a pile of items for rapid assessment —be the items coins dropped or otherwise— and notice a dichotomy (2) than a trichotomy (3) or higher split. In this particular case, this allows one to separate coins

on their sides from those that landed on the edge-thickness almost instinctively and more rapidly without taking much more time to complete the dichotomization of the coins showing sides. Moreover, if such a procedure were carried out iteratively with the prior round's results serving as the basis for subsequent ones in a recursive process, completing a relevant dichotomy assessment would result in more easily managed, less error-prone, and finely categorized groupings.

Propositions and the Dimensional Properties of Fraud

The following propositions with regard to fraud are crucial for understanding the issue:

1. In the event of success in the core aspect of intention, there would also be success in deception (i.e., if the intention to forge a check exists and is carried out successfully, then deception will have occurred).
2. Additionally, were an individual to have failed in their attempt of the intention, the failure does not alter the fact that deception was the intent.

The potentially relevant dichotomies for intention and deception involve several properties and dimensions concerning the manner in which each relates to the other and to itself. Such dimensional properties include the *ontological, the temporal*, and *those related to achievement*. For instance, if x intends to deceive, then the following may be inferred: *The intention exists before the deception and the deception exists after the intention.* This inference points to the temporal nature of the relation that the intention bears on deception concerning earlier than/later than. Furthermore, we also can infer that because the relation earlier than is the inverse of later than, the relation is considered asymmetrical ($\forall x \forall y: \sim x = y\ (Rxy \rightarrow \sim Ryx)$. For example, an asymmetrical relation would be the binary predicate *is the biological parent of* ***(P_ _)***. The reason that the relation is asymmetrical is because for all x and all y such that x is

not equivalent to y, if x is the biological parent of y (Pxy), then it's not the case that y is the biological parent of x.

We may also consider another relevant dichotomy, which concerns achievement of the intent when present. Thus, whether the intention was successful is the focus and what being successful means in the case of deception. Important to note is that, on its own, as an intangible, intention itself has no way of realizing achievement directly; it may only be considered successful through the actions that result in the object of the original intention, which preceded them. Conversely, the perspective may be altered such that one could directly address whether the deception is successful and what that means for the intention. Such an alteration may provide valuable insight that would have otherwise been missed.

Achievement Reveals Status of Intention

Evaluation of the success or failure of fraudulent acts as a relevant dichotomy relates to both intention and deception. Upon evaluation, can any intention be said successful if it does not exist? No, it cannot. Thus, intention must exist. Nonetheless, can deception be considered successful on evaluation if the intention to deceive does not exist? Yes. In other words, it is *possible* that someone may be deceived by another's actions without the existence of the intent to deceive. For instance, on several occasions, by pure happenstance, the color and clothing I have worn resembled that of staff in a store to those failing to pay close attention. As a result, questions were asked of me that I was unable to answer. Upon my notification, the person who asked me replied "Oh, I'm sorry! I thought you worked here." The people were deceived into thinking I was someone I was not without my intention to deceive (i.e., commit fraud). So, this is a crucial piece of information that reveals something about the nature of deceit and the role that intentions, acts, and achievement play, if any, in their success.

If an intention is to be successful, then it must itself exist. Also, because the intention is deception, a successful intention implies deception was achieved. Nonetheless, even if the intention were not successful (i.e., failed), then it would still have to exist; although, the deception would also be unsuccessful. It appears as though if the intention exists, then either it is successful or unsuccessful. If successful, deception is successful; if unsuccessful, then deception is as well. If the intention exists, then either deception is successful or unsuccessful. Therefore, since the intention must exist regardless of the success or failure of deception, the existence of intention *cannot determine* whether or not deception succeeds. It may be concluded that successful deception is independent of the existence of any intention to deceive.

Additional questions then would include, if the deception is successful based on the fact that someone was deceived (e.g., wrong about me being employee), then is there a case of fraud? Why? Is it because both deception succeeded and intention succeeded, or just deception? Now that we have critiqued the conditionalized statement from left to right, we will consider the opposite direction for consistency. The converse line of reasoning begins with whether or not deception can be successful without the corresponding success of the intent. That is, if the intent to deceive requires intention and deception, if deception succeeds, can we determine anything about intention? If deception succeeds, then it occurs. But, if the deception occurred (e.g., someone was under the impression of something about which they were wrong), then is it necessarily the case that an intention to deceive existed? No. The intention may or may not have existed prior. Also, if the intention existed, then it may or may not have succeeded. Thus, since success in deception may or may not have been preceded by an intention to deceive that existed, it cannot be considered a determiner of the success of the deception. In addition, even if there

exists an intention, which was successful, success in deception cannot depend on the success of the intention to deceive.

The issue that arises is deception, when successful, exists; when it is unsuccessful it does not exist. There is no way for deception to exist but be unsuccessful like intention. *It is in this respect that the status of intention may be said to be higher than deception.* Once intention is reduced to the level of deception by being executed, it has become equivalent with deception through its own demotion such that it may no longer exist independent of success or failure.

There is something fascinating about the nature of intention and that of deceit, which merits mentioning. When comparing among derivations the verbs and noun word-forms, grammatically, verbs give rise to nouns in use. For instance, if I sing, then singing results. In addition, if I think, thinking results. So, whether physical or cognitive action, noun results. However, because the occurrence of deception (the noun) is not guaranteed by the one who deceives (the verb), there cannot exist a causal binary relation such that the verb bears this relation to the noun that is the effect.

Supervenience as a Framework for Comprehension of Aspects of Intent of Deception

Having established the aforementioned relationship regarding intent and deception, it may be beneficial to note that concerning falsification with respect to the classification status of fraud, as a tool for analysis the concept of *supervenience* could potentially provide a framework for understanding. *Supervenience* theory refers to the relation between two sets of properties, one of which seemingly emerges from another that is more basic (Mclaughlin and Barrett, 2011). Although more basic can be understood to mean core, as it applies to the present topic, I argue the following: *It is not the case that the designation of fraud as a status for misconduct supervenes on the status of intent and deception being considered.*

The basis for claiming fraud does not supervene on intent and deception is that a difference in fraud status (i.e., guilty/not, or occurred/did not) does not require a difference in the status of either intention or deception. That is, to say, according to supervenience theory, A-properties supervene on B-properties *if and only if* a difference in A properties requires a difference in B-properties—or, equivalently, if and only if exact similarity with respect to B-properties guarantees exact similarity with respect to A-properties (SEP, n.d.). In other words, with respect to fraud as it may be said to supervene on intention and deception, if the difference in the property going from not being a fraud to being on is determined, then there must be a corresponding difference going from not having the intent to deceive to having the intent to deceive. However, it has been demonstrated that doing something with the intent to deceive does not guarantee that what was done was successful; furthermore, the intent to deceive need not be successful either. But, if what was done or intended was not a result of one's action, then because it was not successful how could one be guilty of it? Take forgery of a check, for instance... the intent is to deceive, and the deception is passing off the check. Nonetheless, the intent is to pass signature as that of another; deception is passing signature off as that of another. Thus, intent is deception, but deception is intent realized.

Contextualism as a Framework for Understanding

Contextualism is the view that the meaning of an expression is a function of more than just the meaning of its constituent parts and the manner in which those constituents are combined to form the complex expression – in particular, the context within which that expression occurs contributes to its meaning (Cook 2009). Contextualism as a philosophical framework for understanding has a lexical counterpart in the word deictic. Contextualism is to an expression as deictic is to a word. Thus, the adjective deictic describes a word whose meaning is dependent

upon the context within which it is being used (Oxford 2017a). Both contextualism and deictic bear a relation to one another and to themselves, the appreciation of which I claim has the potential to assist in understanding falsification conceptually. Furthermore, if the meaning of an expression is a function of more than just the meaning of its proper parts (semantics) and the manner in which those parts combine (syntactics), then as the context within which the expression occurs, which comprises the semantico-syntactic understanding, what additional non-semantico-syntactic dimensions comprise the context? Moreover, would a determination regarding the additional things comprising the context help us progress beyond the current state of understanding in which we are? Some non-semantico-syntactic aspects of context may include the ontological and the locative. While these aspects are neither explicitly stated, nor directly related to the meaning of the words or expression per se, their ontological or locative status nonetheless can influence the overall meaning of an expression. If the context within which the meaning of an expression is being determined hinges on the ontological status or locative status of an aspect not explicitly stated, then the overall meaning of an expression may be impacted. For instance, the statement: the person in front of you now standing on the platform has given birth twice. The meaning of the expression varies depending on the person. But, if there is no person (ontological status is nonexistent or false) or there is a person, but not in front of you (locative status is not where you said when you said it/false), then the meaning is impacted. Given the inconsistency that has been encountered based on the definition of fraud that required the intent to deceive, how do we reconcile what was deduced to adequately define fraud? That is, if the following statements are true:

1. that Fraud comprises the intent to deceive
2. that the intent to deceive consists of two aspects: intention and deception

3. that using relevant dichotomies to describe the properties of the relation of both to one another and each to themselves it was shown that the aspects are consistent and possible together but not necessarily so

4. that intention to deceive either may exist, or may not exist (i.e., is contingent) in instances of successful deception

5. that if intention to deceive does exists, then either it may be successful, or unsuccessful

6. that if intention to deceive is successful, then both the intention is successful, and the deception is successful. Upon analysis success in deception appears to occur independently of the existence of any intent to deceive. Whether the intent was achieved (i.e., deception occurred), or not should not be what determines guilt in instances of fraud; that there was intent to deceive is paramount. Furthermore, although without the aspect of intention there can be no fraud, given successful cases of fraud result in the occurrence of deception, whether the intent was real or merely perceived from the perspective of someone who claims to have been deceived, the aspect of deception must have been the intent. There is an informal fallacy associated with Fraud that concerns affirming the consequent (Cook 2009). When the consequent of a conditional statement, which is the latter half preceded by "then," fallaciously is affirmed, the error is made in concluding that since the consequent is the only observation that was made of the conditional, the antecedent is responsible. In the case of the definition of fraud, the intention precedes the deception. Clearly, this must be true since one cannot claim intention to deceive following the occurrence of the deception. Furthermore, it is not possible to simultaneously have intended that which occurs as it is occurring. Thus, the conditional formulated from the definition may be stated as "if intention, then deception." However, if someone is deceived, then they incorrectly affirm the deception based on the formulated conditional relationship by assuming that there had

to be intention for it to occur. Of course, this logical fallacy is the result of faulty logic and the creation of false causal relationship between intent and deception. Thus, deception can occur without intent the same way that intent can occur without deception.

Hypothesis Concerning De Facto Fraud Classification in the Literature

Despite the technical definition of the term fraud according to which each constituent of FFP would qualify as an instance, it appears as though the classification of fraud has been applied to certain types of traditional misconduct to the exclusion of others, which results in the formation of a de facto group under the rubric of fraud. The forms of misconduct classified as members of this de facto group under fraud include both fabrication and falsification (Stroebe, Postmes, and Spears 2012).

An analysis of the de facto forms (i.e., fabrication and falsification) categorized as fraud in the literature was the starting point for obtaining insight into the basis for such classification of misconduct. When characteristics of de facto types are compared to that which is not included among them as fraud (i.e., plagiarism), the findings lead me to hypothesize that there are several perspectives that could have been used to make the distinction. Of the forms comprising the de facto fraud group, there is at least one characteristic or property they share that the other type of misconduct that is excluded from the group lacks. *That characteristic, I argue, is the de facto forms being, or directly resulting, from the actions or behavior of individuals that occurs during the course of performing research*.

While it could be maintained that such a characteristic may be significant for multiple reasons from any one perspective, it may also be for multiple reasons from a variety of perspectives. Regardless of the perspective, however, the ability to utilize this quality to distinguish particular types of misconduct from one another is paramount. In addition, *an*

awareness of the characteristic of the occurrence of an act of misconduct may also be used as a basis according to which one may determine the level of perceived gravity. That is, de facto fraud can be deemed more serious than forms that do not include the de facto group.

Alternatively, those forms of misconduct classified as fraud not only characteristically occur during the conduct of research, *they also directly lead to the distortion of knowledge*. In fact, according to the distortion of knowledge criterion as a characteristic for the purposes of classifying the de facto group members, the distinction could be seen as even more pronounced than with misconduct occurring solely while research is being done. Either from the perspective of "when" the misconduct occurred, or "what" occurred as a result of it may be equally useful in determining a classification system for misconduct as fraud. Additionally, although plagiarism as a type of misconduct may be considered as deceitful, *since misappropriating the work of another and presenting it as one's own neither results from actions that occurred during the conduct of research, nor directly leads to distortion of knowledge (i.e., concerning the content of the work itself), plagiarism would not be included as a form of de facto fraud according to such a method of determination*.

Based on the analysis of the characteristics of the types of misconduct and the categories into which certain types have been grouped, my hypothesis is consistent with the grouping of both fabrication and falsification under fraud (Stroebe, Postmes, and Spears 2012) as de facto members. Moreover, I contend that the grouping may suggest that either "when" or "what" might have been used to distinguish the types of misconduct from one another, or that they perhaps ought to be.

The decision to address falsification as fraud in this article was based on its being considered one of the most serious types of misconduct (George 2016). In particular, within the

domain of fraud, the topic was restricted to the PHS definition of falsification that is currently established. Despite the existence of the current PHS definition, in consideration of the serious nature of the consequences that may potentially result from involvement in suspected cases of falsification as misconduct, I claim that further elaboration and refinement of the definition of falsification as misconduct under the rubric of fraud would likely reduce the number of new allegations and convictions. Through the provision of such transparency as refinement in definition would bring, the resultant clarification would not only contribute to the deterrence of misinformed allegations, but also reduce the potential for career-ending false convictions for individuals unjustly accused. It is for these reasons that a conscious decision has been made to focus on the definition of falsification as a type of research misconduct.

DEFINITION AS A FORM OF ARGUMENT

This article aims to achieve its goal through the interpretation of the definition of falsification according to the PHS. In order to ultimately reconstruct the definition of falsification , it will be imperative that both the word being defined, and its explanation are deconstructed as well, which are referred to as the definiendum and definiens, respectively (Cook 2009). Attempting to deconstruct any definition, which includes the PHS definition, without sufficiently atomizing both the definiendum and definiens to their core components could result in overlooking important aspects that should be given the full respect and consideration that they deserve. Moreover, the fragmentation of the existing definition into irreducible elements will allow for the identification of the building blocks present as well as the additional ones that will be required to construct a complete argument for a replacement definition of falsification . The complete argument herein constructed in support of a replacement definition of falsification will be the actual replacement definition that is being proposed itself. Therefore, in this paper, the construction of the definition is being approached as one would the construction of a philosophical argument. An argument is comprised of a set of statements or declarations that includes premises followed by conclusions (Cunningham 2012). Furthermore, premises may be understood as statements or declarations that provide evidence, or support, on which an argument relies in order to justify its conclusions (Cook, 2009). In addition, a statement is itself considered to be a formal or explicit assertion (Oxford 2017b). What is interesting to note is that, according to the definition just presented, a definition itself qualifies as a statement because it formally or explicitly makes an assertion. Since a definition makes one or more formal or explicit assertions, a definition may be understood as a set of one or more statements or declarations. Furthermore, comprised of one or more statements, a definition must also consist of

a consistent set of premises and a conclusion. Moreover, given that a set of statements is what comprises an argument, a definition may, therefore, also be considered an argument.

The Use of Recursion in the Development of Definition

We have seen how definitions may be interpreted as an argument. Similar to the structure of an argument, the set of one or more consistent statements of which the definition consists does include two components: the definiendum and the definiens. In order to provide the best opportunity, I argue that the explicit definition should result from employing a recursive process to construct them. Recursive definitions are inductive because after the initial terms have been identified, all subsequent terms are defined in terms of the prior ones (Cunningham 2012). Through the addition of layers, the recursive process incorporates all previous definitions to be used as a premise for some subsequent conclusion. In essence, through the development of a definition resulting from recursion, the definition itself may be considered fact because each step is constructed from the prior one about which there was already an agreement, which renders the definition to be a fact (Boylan and Johnson, 2010).

Demonstrating the Recursive Method

To see how this works, we must begin with something about which there is an agreement. If at any stage of the recursion there is no agreement, then the process discontinues. So, let us suppose the following: words are used in reference to something. Furthermore, that something to which a word may refer could either be the word itself, or something other than itself. There should be no disagreement thus far. In addition, that to which a word refers may be either physical or metaphysical, such are tangible objects or immaterial ideas. Moreover, when multiple words are used together, abstract ideas or physical objects may be described. Thus, if descriptions consist of words, then descriptions must also be in reference to something as well,

which is what they describe. When a group of words is used together with an individual word to label that which is described, the description and a word comprise a definition. A definition constructed makes a formal or explicit assertion about something (i.e., that to which the description and words used to describe). As such, the definition may be considered a statement or declaration. When statements are made as a set, these statements together comprise an argument. Therefore, an argument is in reference to something. Given what we have thus far established, the following demonstrates how the recursive definition of argument may be developed:

1. understanding may be derived through meaning or interpretation and is dependent on perspective

2. Meaning, along with any other physical or immaterial thing, is something referred to and conveyed by words

3. Meaning and words are used to describe that to which they refer

4. Meaning and words used to describe that to which they refer comprise a definition

5. Meaning and words used to describe that to which they refer comprise a definition thereby making a formal or explicit assertion about the referent

6. Meaning and words used to describe that to which they refer comprising its definition and making a formal or explicit assertion about it consist of a set of statements or declarations

7. Meaning and words used to describe that to which they refer comprising its definition and makes a formal or explicit assertion about the referent consisting of a set of statements, which defines an argument

8. Therefore, from understanding, it has been demonstrated how a definition is a form of argument, which is about something.

Definition: Description if and only if the word □ □ Description ↔ Word Definition = Description □

I claim that if the word falsification and the PHS description of the word are together the statement or declaration that comprise the PHS definition of falsification that is assumed as fact, then the definition may be seen as the basis for any argument to be made regarding falsification . In other words, the description and the word itself that comprise the definition of falsification are the criteria against which something that may potentially be categorized as an instance is to be compared. Moreover, the definition consisting of the description and word assert the existence of what amounts to being a logical equivalence between two or more things. In a logically or semantically equivalent relationship represented by a materially bi-conditional relation, one thing is always true when another is true in the same interpretation (Cunningham 2012). Concerning the present case of the definition of falsification, this implies that anytime the word may be interpreted as true (with regard to something), the materially bi-conditional relationship establishes that the description may be interchanged with the word. Moreover, it is due to the semantically equivalent relationship between the word and description that comprises a definition that a conclusion may be made with regard to something being determined to be an instance of the object of the definition. Definition: Description if and only if the word □ □

Description ↔ Word Definition = Description □

Let us suppose that for all definitions, there exists a word and a description that comprise them. The relationship between them is: word if and only if the description is the case. Therefore, if it can be shown that there exists a y such that either y fits the description, or that y is an instance of the word, then the opposite can be concluded to be the case. Furthermore, if there exists a definition consisting of a word and its description assumed to be the case, and

something is found that matches the description of the definition, then it may be concluded that the something can be described by the word. In fact, given any two aspects as premise, the third may be deduced as the conclusion. In plain terms, based on the assumption of a definition consisting of a word (i.e., definiendum) and description (i.e., definiens): – Either something matches the description of a definition and we conclude that something may be referred to by the word. – Something described and referred to by a word, which results in something being defined. – Something defined by a word matching its description. Theorem e = mc Completing the process of deconstruction results in the discovery of elements of which the word, description, and definition as concept was made. Also, the outcome of deconstruction may yield novel aspects of which we were unaware. Both the novel aspects found and the repurposing of old ones that have been discovered may then be used to construct a definition of falsification that I claim should be conceptually adequate, sensitive, and specific. These ideas that I have appropriated and modified contribute to the development of a solid foundation that will serve as a framework for definition in general.

Conceptual Adequacy

By conceptually adequate, I mean that the definition of falsification at its core is comprised of the qualitative aspects of *provability* and *validity*. Probability is in reference to being able to demonstrate what is claimed. The latter defined with respect to an argument is a quality in which the conditional "if ..., then..." will never go from true antecedent preceded by "if" to false consequent preceded by "then." Both provability and validity are fundamental to conceptual adequacy and their relation to one another determines the pseudo-qualitative abilities that I refer to as soundness and completeness (Garson 2014).

The Pseudo-Qualitative Abilities of Soundness and Completeness

Soundness and Completeness are concepts that are related to that of Adequacy and frequently encountered in mathematical and philosophical logic (Garson 2014). Specifically, soundness refers to a conditional argument in which the following is true: "if there is proof of an argument then that argument is valid." Conversely, completeness may be understood as a conditional argument in which "if an argument is valid, then there is proof of that argument." Thus, if the notions of soundness and completeness that comprise conceptual adequacy with respect to a given argument have been established, since they are conditional and are true in both directions, the relationship between them may be interpreted as being bi-conditional. In a state of conceptual adequacy, an argument that is bi-conditional, which in our case is a definition, is sound if and only if that argument is complete as well, and vice versa (Garson 2014). Moreover, as it pertains to the soundness and completeness of an argument, an argument is provable if and only if that argument is valid. Because if and only if indicates that one thing is always true when another thing is, the bi-conditional is used to represent the idea of logical equivalence (Cunningham 2012). According to this perspective of adequacy regarding the bi-conditional relation between soundness and completeness, soundness can be interpreted as logically equivalent to completeness much the same as provability can be understood to be logically equal to validity.

Definition as Argument and Conceptual Adequacy A conceptually adequate argument is sound if and only if it is complete because there is proof if and only if the argument is valid.

Pseudo-Qualitative Notions of Ability

Unlike other qualitative characteristics that are readily perceived through the faculties requiring nothing more than perception itself, if the properties of soundness and completeness are to be attributed to anything, then they must both be demonstrated for verification. By demonstrated, I mean that there is no way to perceive either soundness or completeness as a quality of a thing passively; there needs to be some way to show that they have been established that requires active perception by the observer. Active perception is in reference to the usage of any of the faculties of sense perception each occurrence of which results in an event that operates along a locative-temporal continuum such that the truth value of a property predicated of an object derives from the truth-function of the coordinates for events A through A sub n. With respect to each dimension, there exists a discrete coordinate such that no product of them may occur more than once. By product, it is meant that it is not possible for there to exist more than one set of coordinates and event derivative. Although there can be identically derived aspects from different coordinate event sets, no two sets of coordinates and event derivative may exist and be identical. For instance, if one perceives something in particular with a unique locative temporal coordinate (e.g., proof of A) and then perceives that same particular thing in a different locative temporal coordinate (e.g., A is valid), then as a result of the order perceived (i.e., proof to valid) and what was perceived where (i.e., locatively in the realm of truth in proof and the realm of truth in validity), one may conclude or attribute soundness to that thing. However, merely perceiving in a snapshot fashion either proof event or validity as an event as passive does not provide sufficient justification for concluding soundness; there needs to be two or more (i.e., greater than any single instance of perception, which requires activity on the part of the one perceiving in the form of reasoning to make sense and derive understanding. Thus, the main

distinction between traditional quality and pseudoqualitative abilities is that qualities may be concluded with a single perception and are done passively whereas pseudoqualities require more than one perception and active participation of the perceiver. In order to establish evidence of both soundness and completeness, assuming that there exists proof of an argument the argument must be derived to be valid; and if we begin by assuming an argument is valid we must be able to prove that it is. The general definition of valid is being well-grounded in logic (Oxford 2017a). However, in consideration of the validity of an argument with respect to logic, the definition is somewhat different. The reason for the difference is due to the potential for flaws to exist that would compromise the conclusion of the argument. There may exist valid arguments for which there may be no proof to allow us to conclude as much. Conversely, for a given system, it may be the case that, although there exists proof seemingly justifying the conclusion of an argument, the proof may be of that which is in fact not valid. Regardless of the case, either situation results in logical missteps that are of no use for the purposes of substantiating the conclusion of an argument. Ultimately, although validity and provability are extremely important for the cogency of any argument, they are neither the same, nor does the existence of either guarantee the presence of the other. One well-known development concerned with provability, mathematics, and logic is Gödel's second incompleteness theorem, which claims that a given system that is consistent cannot prove its own consistency (Garson 2014). A consistent system may be understood from the perspective of an absence of a flaw in which there exists proof of a contradiction. However, if there is no proof of contradiction then there is no proof that there is no proof of contradiction. Due to the uncertainty concerning accepting proof related to the potential for a system that was relied upon to obtain a particular proof, there may be no way for a system's claim of proof to be believed on its own basis. Thus, without such a basis for the belief in a

system's claim of proof, there can be no confidence in that proof or what it entails either. The absence of confidence in something being the case based on the existence of proof for that something in a given system makes it difficult for the concept of soundness to be established. Soundness may be easily understood in terms of what asserting it would mean. Such an assertion would be that, "if there is proof of sentence B, then sentence B is true." Nevertheless, the assertion of soundness cannot be guaranteed nor can the claim that to be the case given the potential flaws of a system. Flaws that are discovered in a particular system could either allow for invalid arguments to be proven or allow for both a proposition and its negation to be demonstrated. Because of the potential to undermine any proof through the discovery of flaws would render any proof of claims regarding sentence B to alone be both questionable and insufficient. Since provability of a sentence B alone is insufficient to establish its truth, the soundness as an aspect of argument to which I refer as being pseudo-qualitative needs to demonstrate why one should accept that proof of a sentence implies that the sentence is the case. Because provability of sentence B, which is at the core of soundness itself, for instance, is not taken at face value, I argue that soundness should not be considered a quality in the usual sense. The situation is analogous to some quality for which there is proof, such as a shape, requiring proof that proof of the quality implies that the quality is the case: the proof being once-removed from the quality also renders the supposed quality once-removed as well, which I refer to as pseudo-qualitative.

System of Free Logic Inspired Rules Universal Out and Pseudo-Qualitative Abilities

I refer to soundness and completeness as being "pseudo-qualitative" because they are conditional or contingent as opposed to actual. Conditionality restricts affirming them by requiring that certain conditions be met (hence, conditional) prior to such affirmation. The condition that needs to be satisfied beforehand may simply be thought of as the existence of the condition regardless of what that may be. In this respect, the structure of an argument for soundness and completeness resembles one in the form of a rule as found in a system of free logic (Garson 2014). show comparison between pseudo-qualitative and rule of free logic here. The most attractive feature of a free logic system is that it allows for the blockage of undesirable inferences (Garson 2014). Since there is no presumption with regard to existence made, a system of free logic prevents inferences from being made that would allow for the proof of undesirable conclusions (Garson 2014). In such a system, when there is proof of the existence of something it means that there is already evidence of the existence of that thing. This fact is similar to the statement of Axiom GL previously mentioned with regard to proof. show GL with Universal Out Rule Let us suppose that we want to claim that x is a square. Now, in order to make such a claim, because claiming x is a square implies x being an instance of an actualist's claim that "there is an x such that x is a square," there needs to be a way of substantiating what it is that allows being a square to be predicated of x. That is, we need to verify that conditions satisfying what a square is do exist before concluding that f is one. Thus, unlike the outright declaration that something (e.g., f) has the quality of being square, a pseudoqualitative version might claim that "if a 2-dimensional geometrical shape with four walls where opposing walls are parallel has four equivalent internal angles which total 360 degrees, then the shape is a square. The main difference between traditional qualitative characteristics and pseudo-qualitative ones is that in

order to establish the quality, the Pseudo-quality requires proof of the condition's antecedent in order to conclude the consequent as the conclusion. Soundness may be equated with, or defined as, an ability to show that proof of an argument being the case implies that the argument is in fact true given the possibility of yet to be discovered flaws. Furthermore, in order for any proof of the argument to be meaningful, due to provability necessarily being contingent on the ability of soundness to be demonstrated (i.e., need for proof that proof implies the truth of a given argument), means that the theorem expressing this should be phrased as a conditional statement. In a system of Free Logic (FL), Axiom (GL) If it can be demonstrated that proof of argument A implies that argument A is the case, then there is already proof of the argument A The concept of provability has been shown to relate to that of soundness and completeness. Provability shows up in both notions and is expressed in the axiom (GL) as well (Garson 2014). Axiom (GL) for Gödel-Loeb claims that if there is proof for the soundness of a given argument (i.e., that proof of the argument implies that it is valid), then that argument is provable. In addition, if the reader recalls, the notion of validity with respect to an argument means that the argument will never proceed from true premises to a false conclusion.

According to the notion of validity, then, since soundness must show proof of an argument A as true premises leads to a true conclusion, the idea of soundness may be viewed as entailing validity. In other words, for soundness to be substantiated, there must not exist a case in which the acceptance of truth of provability of argument A could lead to argument A being false; therefore, the condition for soundness characterizes that for validity: *if there is proof of a given argument, then that argument is true (i.e., valid)*. On the other hand, the converse of soundness in which it is asserted that if valid, then there exists proof of a given argument, is what may be referred to as completeness (Garson 2014). Altogether, the concepts of provability, validity,

soundness, completeness, and pseudo-qualitative ability based on notion of restricting inference found in free logic interrelate coherently to comprise conceptual adequacy. What I have termed conceptual sensitivity and conceptual specificity are based on ideas that I have appropriated from the field of epidemiology and medicine, as it pertains to the identification of diseases through the use of tests. The notions of sensitivity and specificity capture the essence of what any definition as argument should be able to accomplish. In the traditional interpretation related to epidemiology and medicine, the understanding of sensitivity relates to the ability of a test to result in positively identifying a disease when a disease is present (Boslaugh 2012). On the other hand, specificity is defined with respect to a test that does not identify disease in cases in which the disease is absent (Boslaugh 2012). Occasionally, there are tests that have false positive results just as there are those that fail to identify the disease when the disease is actually present. By determining how many false positives and false negatives occur for a given test, the sensitivity and specificity may be ascertained. Analogous to an experimental test for disease, I view the role of a definition as one in which the definition comprised of the word being defined and its explanation is a test that may be used to correctly identify instances of the word being defined, which I refer to as conceptual sensitivity. In addition, the ability of a definition to correctly fail to identify something when it is not there I define as conceptual specificity. In this capacity, the notions of conceptual sensitivity and specificity, like their traditional counterparts in epidemiology, serve as a measure of the usefulness and effectiveness of a given definition.

Components of Definition

Definition = word + description

Envisioning the relationship between (conceptual) sensitivity and specificity as a biconditional may assist in understanding it more readily. A biconditional relationship is one in

which an "If...then..." conditional statement is true in both directions (Garson 2014). A conditional statement consisting of antecedent preceded by if and a consequent preceded by then is true just in case either the premises are false, or the conclusion is true. However, the special assignment in which the antecedent (or premises) is true and the consequent (or conclusion) also describes the notion of validity with respect to arguments (Cunningham, 2012).

Assuming the biconditional, the presence or absence of either proof of a proposition or validity of it, leads to conclusions that should be familiar to the reader. For instance, under the assumption given, if there is proof of a sentence being the case, then it may always be deduced that the proposition is the case. Furthermore, when it is impossible to go from the truth of premises to a false conclusion, then the argument is considered valid (Cunningham 2012). In addition, when it can be demonstrated if there is proof of a sentence being the case, then the sentence is valid, soundness will have been established. Given that a positive test result in the presence of disease is analogous to a definition given the word being able to positively identify instances of it by description, a biconditional statement that expresses sensitivity and specificity should be considered a form valid argument. Valid Argument Moreover, when it can be demonstrated (i.e., proven) that if there is proof of something, then that something is valid, we can also conclude that the sensitivity of an argument implies that it is sound as well. For that matter, showing that there is an absence of proof when something is not the case, which is specificity, because as an argument form, the truth of the antecedent entailing the truth of the consequent means that this is valid. Conversely, when read in the opposite direction, then if an argument is valid, then there is proof of it. In addition, the relationship of the biconditional statement is such that if there is no proof of a given disease, then it follows that there is no disease. Upon closer inspection, this conditional statement expresses and argues for specificity. It

is arguably much better to have as much sensitivity and specificity as possible integrated into a definition of falsification. That is, if either a given sentence is not provable, or it is not one that is valid, then the other is not the case either. Valid Argument Let the predicate letters be defined as follows: Nx = x is sensitive; Px = x is specific for all x, x is sensitive if and only if x can be proven and x is the case: $\forall x(Sx \leftrightarrow (P\ x \wedge Cx))$ Axioms will be based on the accepted definitions. In addition, propositions herein stated will either have been established based on those coming beforehand or developed from axioms and definitions. Although not exactly replicating the format, in addition to the occasional presentation of corollaries and other simplified demonstrations, the analytic-synthetic method of approach herein incorporating the use of definitions, axioms, and propositions has characteristics that the reader may find somewhat familiar because it has been employed with much success in great philosophical works such as that of the Ethics by Spinoza (Spinoza and White 2012). As a strategy, it is this manner of analytic-synthetic approach that will be heavily relied on and may be referred to as being Geometrical (Waller 2017).

DEFINITIONS, AXIOMS, PROPOSITIONS, CORRELLARIES, UNIVERSE OF DISCOURSE, SETS, NEED TO BE DEFINED

Background and Context

As one of the gravest instances of research misconduct, falsification seldom occurs (George 2016). Due to the infrequency, data concerning both falsification and fabrication have been combined for research purposes (Fanelli and Tregenza, 2009). According to the findings of the investigation in which both falsification and fabrication were incorporated into one class of "actions to distort," 1.97% of scientists admitted having committed at least one act to distort while 14.12% confessed to the knowledge of at least one colleague who has committed such an

action (Fanelli and Tregenza 2009). The discrepancy between self-reporting and reporting awareness of a colleague's transgressions is not surprising. Although it is plausible for discrepancies in the percentages to exist and be significant due to the distinction between allegations and the truth, the difference in rates may be somewhat reflective of a certain level of embarrassment on the part of self-reporters and exuberance on the part of those reporting on the behavior of colleagues. That is, to say, despite Fanelli & Tregenza (2009) remarking that the percentages are likely conservative estimates (i.e., lower than the real values), the actual value may lie between the two estimates and likely be closer to the percentage self-reported. Experiences with research misconduct may be had from a variety of perspectives. Various views may provide additional insight into the essence of the perceived phenomenon of misconduct. For example, while investigating experiences with misconduct from research coordinators (RC), it was concluded that the most common way RCs learned of the occurrence of misconduct was through witnessing it themselves (Habermann, Broome, and Pryor 2010). Also, results obtained from the same study by Haberman, et. al., (2010) confirmed that the rarest form of misconduct that occurred was falsification. Besides witnessing suspected misconduct, research conducted through the use of surveys found that 1.2% of the respondents had participated in the research during which the fraud that they reported had occurred (Gardner, Lidz, and Hartwig, 2005). Suspected research misconduct that is witnessed provides helpful information and more credibility. Nevertheless, such credibility associated with observing suspected cases of fraudulent misconduct that occur in a researcher's work environment can be even greater. The Office of Research Integrity (ORI) funded research in which researchers approached determining the prevalence of fraudulent misconduct by asking participants to report cases of misconduct that they perceived in their departments over the course of a three-year period (Gallup Organization

2008). That notwithstanding, there were some crucial methodological differences between the Gallup Organization (2008) study and that of Fanelli & Tregenza (2009) that are worth mentioning, which may provide insight into the discrepancy found among the results that were obtained.

Discrepancies in the Literature

According to the findings of Gallup Organization (2008), the estimated incidence of fraudulent (i.e., fabrication and falsification) research misconduct was indicated to be 1.5% of annual research conducted (Stroebe, Postmes, and Spears 2012). There was a discrepancy, as found in Fanelli & Tregenza (2009) that existed between those who self-reported and those who were reporting colleagues. Although obtained from different studies, there is a discrepancy between percentages related to the reporting of misconduct by colleagues. Of the findings from the two different studies, the estimated percentage obtained in the Gallup Organization (2008) study may be more reflective of the actual value than Fanelli & Tregenza (2009). That one may be more reflective than the other has nothing to do with either research study being better or worse than the other. The Gallup (2008) study would yield findings that are closer to the actual value sought for the following reasons: 1) meta-fraud or meta-falsification is significantly minimized because participants are not answering for themselves, which eliminates both the fear of potentially self-incriminating embarrassment and the incentive to falsify responses, 2) one participant per department being allowed to provide an answer the question minimized potentially duplicating the reported cases perceived, and 3) there was the direct witnessing requirement as a condition of the report of a colleague, which further reduced the occurrence of falsification /fabrication in responses because respondents own credibility is being challenged indirectly.

Analysis of the Discrepancies

Despite the various perspectives of the previously mentioned studies, if one were to continue under the assumption that the studies' results were calibrated such that a comparison could be made, then the reader would note the absence of a significant difference between 1.97%, 1.5%, and 1.2%. Furthermore, the perspectives are that of a researcher reporting on himself or herself, a researcher reporting on a scientist colleague, and a non-researcher RC reporting on a researcher. In other words, the perspectives involve the one reporting the misconduct witnessing it occur by either committing the fraud, seeing another commit the fraud with or without participating in the study or participating in the study in which the fraud occurred. While it may be theoretically possible for someone to have been involved in a study in which research misconduct occurs without witnessing it themselves, whether it was perceived does not detract from the heightened credibility associated with a report of fraud by another on the same team in which the reporter participated. Such a statement by a participant is even more believable without the suspected event being witnessed first-hand simply due to the consequences of research fraud leading to a team member's dismissal or the study being shut down entirely. Together, the various perspectives on suspected research misconduct are analogous to those involved in triangulation procedures (Martella 2013). Triangulation methods are beneficial to implement in that they allow different perspectives and sources of information to be utilized to corroborate findings by assessment for similarity. Concerning the present paper, the results being assessed for similarity to which triangulation refers are the percentages 1.2%, 1.5%, and 1.97%. Based on the rates being so close, despite obtaining them from different perspectives, what their proximity to one another likely reflects cannot be easily ignored. Thus, the closeness of the percentages may reflect the actual prevalence of research fraud, which is likely in the vicinity of

the 1.2% 1.5% 1.97% estimates. That notwithstanding, due to the inherent irony of the inquiry into falsification, meta-falsification (i.e., lying about lying) is an aspect that one must consider when interpreting any results. In other words, given meta-falsification may occur whenever one researches falsification, there should always be a level of caution exerted before accepting any findings as truth.

CONCERNING FALSIFICATION AS MISCONDUCT: ALLEGATIONS OF FALSIFICATION AS A STRATEGIC MANEUVER

Some advocate an expansion in the scope of the definition of misconduct to include more than just FFP (Habermann, Broome, and Pryor 2010). Conversely, as opposed to expanding it, there are others who argue that the scope of research misconduct requires restriction to cases only consisting of FFP (Koppelman-White 2006). Regardless of whether the scope is expanded beyond FFP or remains FFP strictly, falsification is still the most serious type of misconduct, yet it is found to occur rarely ever, as was discussed previously. Also, the most frequent allegation of misconduct that results in an investigation being initiated involves falsification (Koppelman-White 2006). Moreover, a different study that was conducted in which Kornfeld (2012) analyzed 146 reports of cases where convictions of misconduct occurred were obtained from the Office of Research Integrity (ORI) covering an eleven-year period from 1992 through 2003, which confirmed that falsification was indeed the most common allegation (66%) that led to misconduct convictions. Therefore, given all of these findings, if one were to accept the information regarding FFP that has been discussed thus far on authoritative grounds (i.e., being trustworthy), then one's propositional attitude towards the characteristics of falsification would have to be that he or she believes the following to be the case: (1) that falsification is considered the most serious form of misconduct, 2) that falsification is the rarest form of misconduct, and 3) that falsification is the most frequent type of misconduct reported in allegations. Through the comparative analysis of the three propositions themselves, it may be determined what possible explanations exist that could account for the fact that these Propositions are true.

Propositional Analysis of Falsification

Upon close examination, each of the three Propositions concerning falsification appear to share a number of similarities, as well as differences. While both are important, it is the former, as superlatives, that will be relied on for our purposes. Superlatives may be defined as an aspect of the adjectival system in English that allows for comparisons to be made between two or more things on the particular quality represented by an adjective (Peters 2004a). Furthermore, with few exceptions, the superlative may be expressed through the terminal affixation of suffixes to adjectives (e.g., -er, or -est), or it may be so periphrastically through the use of phrases (e.g., "more" + adjective). The superlatives found in the Propositions used in reference to all three characteristics of falsification may be interpreted as indicative of something underlying the findings that could contribute to further understanding. That is, the superlative usage may intimate at what could be the underlying basis for the frequency with which falsification is alleged. For this reason, it is worth thoroughly evaluating these Propositions as a set of three premises of an argument from which two at a time are to be considered for comparison in order to determine what may be inferred from the set. In other words, given the assumption of the set of Propositions are believed to be the case, it will be our immediate goal to interpret each of them together in a manner that will maintain consistency.

Pairwise Comparison One: The First and Second Propositions

It should be immediately apparent that Propositions 1 & 2 may be consistent without worry. There is nothing that threatens consistency when both are true. Although they contain the same superlative "most" and concern a "form" of misconduct, Proposition 1 is in regard to "seriousness of form" whereas Proposition two refers to "rarity of form." Because these forms

are contradictory in the sense that one is a serious form, and the other is not a serious form, both Propositions 1 & 2 do not contradict one another. Therefore, Propositions 1 & 2 are consistent.

Pairwise Comparison Two: The Second and Third Propositions

Unlike the previous pair, Propositions 2 & 3 do need to be given more attention due to the presence of contradictory superlative forms of adjectives. In this case, the superlatives rarest (i.e., most rare) and commonest (i.e., most common) are not consistent. In order for the contradictory adjectival qualitative descriptors "rarest" and "commonest" not to lead to an absurdity, they must refer to a different aspect of misconduct. If they were to be in reference to the same aspect, then that would result in a contradiction. Thus, it is necessary to determine whether the superlatives are in reference to either one or two aspects.

The most straightforward method to make such a determination involves establishing from either Proposition 2 or 3 an obvious bit of information that will prove useful. One such piece of information would be that Proposition 3 concerns "allegations," or the act of alleging. To reiterate, to allege is to make an assertion in the absence of proof or evidence. As far as Proposition 3 mentions them, this would imply that the allegations are of misconduct. Thus, the superlative in Proposition 3 is used in reference to misconduct that has not been proven or established. Proposition 2 only refers to misconduct without mention of allegations. There is nothing in the Proposition that would allow one to infer anything other than what it claims. That is, the claim concerns misconduct and not allegations of it.

If Proposition 3 uses a superlative in reference to allegations, because Proposition 2 does not concern allegations, Proposition 2 may be considered the opposite of Proposition 3. Furthermore, as the opposite of Proposition 3 that mentions allegations (i.e., assertions without proof or evidence), Proposition 2 would claim the opposite of an allegation, which means that it

would be an assertion with, after, or on the basis of proof or evidence. Therefore, Proposition 2 may be restated more explicitly in the following manner: falsification is the rarest form of misconduct that has occurred. Moreover, because allegations of misconduct is not the same thing as misconduct for which there is proof or evidence of occurrence, the superlatives are used in each Proposition do not contradict one another. In other words, given their claims are in reference to different things, Propositions 2 and 3 remain consistent.

Pairwise Comparison Three: The First and Third Propositions

Propositions 1 & 3, viz., "the most serious form of misconduct and the most common form alleged," may not be immediately identified as either consistent or inconsistent. Nevertheless, that their superlatives are identical can be misleading. The issue is, given the truth of 2 (that it is the rarest form of misconduct that occurs), why would 3 be the case? That would be analogous to a doctor claiming to diagnose one specific disease most commonly that he or she knows from the evidence occurs least commonly in the population; the likelihood of being correct is slim, and he or she is aware of this. So, why might one continue to allege something more frequently than one know it to occur? One reason is analogous to why, despite the odds against them, someone would continue to determine the time of day according to the time shown on the face of a broken watch whose hands do not move; the likelihood of the time shown being wrong does not alter the fact that it will be the correct time twice daily. In other words, making enough allegations against the innocent will eventually result in someone accused being found guilty. In the world of science, competition is fierce, and the publish or perish phenomenon can liberate the strategist from within the scientist who lies in wait for the precise moment at which to strike out at a rival and advance his or her own position (Latour and Woolgar 1986). One less colleague with which to compete has the potential to make all the difference professionally from

their standpoint. Therefore, falsification is the more severe and, despite being known as the rarest to occur, is the most common allegation because the absence of an evidence requirement makes alleging one of the best strategic maneuvers for the accuser. From the standpoint of the accuser, maximizing the potential for benefit regardless of whether evidence is uncovered while minimizing potentially self-inflicted damage is a win-win situation, which is due in part to the lack of a requirement of proof to make allegations. By no means, a panacea for all the ails plaguing falsification and misconduct, the institution of some form of preliminary evidence requirement may remedy the situation by placing the burden of proof either solely on the accuser, or at least equally on the accuser. In this fashion, the awareness that the accuser will at least be put through similar scrutiny to the accused should significantly reduce the number of allegations of falsification by discouraging research misconduct allegations as a strategic move while encouraging and restoring more ethically motivated reporting.

Exposing the Flaw in the Established Definition

The History and Philosophy of Science (HPS) provides the contextual underpinnings that facilitate a comprehensive treatment for educational purposes that is deserving of all the contributions to knowledge that have been made by scientists (Duschl 1994). From the standpoint of HPS, an appreciation of science can reveal many aspects that may be otherwise overlooked. For instance, the aspects potentially overlooked include that of the social, which was related to the development of scientific knowledge and theories. As occurred in the case of William Thompson, a.k.a. Lord Kelvin, whose undeniable genius led to the correct assertion that the solar system is counting down yet was wrong in his calculations estimating the age of the Earth (Hellman 1998), sometimes false scientific theories have lasted for years. Conversely, it is also true that some whose theories were correct encountered opposition and efforts to have the

knowledge suppressed. In addition to the social aspects and politics apparently involved, other nonscientific aspects of science such as reliance on gut feeling and intuition have played important roles. Given the social, political, religious, or interpersonal pressures that are nonscientific one may wonder to what extent, and what role, actual science itself plays in contributing the final knowledge of the process of science. In light of the influences just discussed, science may be considered nothing more than conjecture and refutation (Popper 1959) argued. In fact, scholars have claimed that induction, inference and the scientific method as a whole, do not exist as they are portrayed. According to these scholars, induction, inference, and the scientific method do not exist because there is no justification that allows one to go from instances of occurrence to generalizations in the form of theory (Popper 1959). Furthermore, the periodic nature of scientific and theoretical frameworks coming into prominence and going out also supports the position that there is a pattern to the revolutions concerning scientific knowledge that consists of much more than just the science itself (Kuhn 1970). For instance, if an event occurs that current scientific theory could not explain or predict, it has been shown to recognize the event depends as much on the event itself as it does on the scientist observing the occurrence of the inexplicable. Based on the perception of an unpredicted event, any hypothesis that is generated by the scientist that is proposed as a theory to test experimentally, which is a generalization that purports to explain a natural law or guiding rule, could not have occurred solely as a result of perception. Interpretation by this individual and their feelings at the time of the perception are crucial to the potential there may be to solve any problem before them. Thus, as was the case concerning Galileo and pendulum motion,[1]1 That is, to say, the conceptual framework of the scientist serves as the foundation for framing the research problem (Kuhn

[1] Galileo's training in a non-Aristotlean school of thought led to the framing of the problem of pendulum motion and permitted him to see much more than others, as a result. The case of Galileo underscores the importance of theoretical underpinnings to any approach to a scientific problem.

1970) regardless whether or not the framework was correct. The purpose of the previous paragraph was to introduce the idea that, just as an established scientific theory that is based on all available perceptional data thus far having been satisfactorily explained, when it encounters a single unpredicted or unexplained event, or anomaly (Kuhn 1970) it becomes very easily recognized how is right until it is wrong. That is, basing a scientific theory or conclusions on all the data obtained from every event possible still does not guarantee that the theory or conclusion is certain. All it takes is a single perception to change everything. Moreover, that an event has not ever been witnessed does not imply that it will never be. Even In the best possible world in which a hypothetical researcher has obtained data from the perception of every event whenever it has been known to occur throughout history, the generation of a scientific theory using data from all of the perceptions in the absence of any single anomaly may only result in the theory being uncertain, or tentative. Through the use of mathematical (i.e., logical) induction (Garson 2014), it will be the aim to prove that regardless the number of perceptions from which data may be obtained, or the amount of data used from that which was obtained from whatever number of perceptions, a theory may only be tentatively correct at best. The reason the tentative nature of scientific theories will be demonstrated is that doing so will assist in revealing the flaw in the PHS's research misconduct definition of falsification as inaccurate representation through the manipulation of data. Such a revelation concerning the flaw in one of the foundational aspects used in defining misconduct should suffice to convince the reader that the manipulation of data that occurs in science, fraud as falsification, and research misconduct as a whole are not as easily identified as many would like to believe. I argue that falsification, as an inaccurate representation of research through deletion or failure to include data, should not be considered research misconduct because it is not a significant departure or deviation from standards of practice in the

community. In particular and most importantly, as defined, I argue that the reason that it should not be considered research misconduct is that falsification does not influence the accuracy of the results concluded from the research because of the tentative nature of scientific theory. That notwithstanding, this is by no means to be misconstrued as holding the position that falsification cannot ever be considered misconduct. Falsification may, in fact, be considered misconduct providing that a satisfactory definition can be developed according to which an actual instance of falsification results in significantly impacting the accuracy of the scientific conclusions obtained. As it is currently defined, however, falsification is not acceptable for the reasons that have been provided, which transcend the various notions of falsification that may exist.

An Approach to the Meaning of Falsification

It is anticipated that some individuals will be at odds with the approach to semantics concerning falsification that I have presented in this paper. Their main contention is likely to be that there exist multiple notions of falsification, which I have conflated. In particular, it will be claimed that the resultant conflation includes Popper's (1959) notion of falsification, which was epistemological having nothing to do with falsification *per se* as it pertains to research misconduct according to the PHS definition and the scientific community.

In disagreeing with that statement, I contend that an epistemological notion of falsification is *directly* related to the issue of falsification *per se* as a form of research misconduct. For, if one’s knowledge of falsification (i.e., epistemic notion of falsification) fails to relate to or identify instances of it, then not only does the inconsistent nature of the relation make what is claimed to be known wrong, it any knowledge claims simply fail to be useful. Furthermore, regardless of whether there exists one, or several, distinct notions that have been conflated, falsification must ultimately be reduced to an epistemic context, framework, or

commitment that is consistent with its object. It is the consistency between an epistemic notion and its referent or object that is requisite for claims of knowledge to not only allow for the identification of instances but also to allow the formulation of scientific theory for precisely the same reason: *a supposed scientific theory that fails to explain instances of the phenomena it claims is useless.*

The hermeneutical approach that I took in arriving at the meaning of falsification and herein presented relied on the components comprising the instances of the lexical item itself. Furthermore, while by no means the only framework with regard to hermeneutics, I argue that the most important perspective adopted for the process of interpretation should be that of representation. *I view the condition that a word and its meaning should be reflective of one another as an extension of the requirement that a definitional meaning and instance of a lexical concept be reflective of one another.* If there is to ever be any hope of restoring the definition of falsification with clarity as research misconduct, then ensuring the satisfaction of the condition between a word and its meaning and that between a meaning and an instance exemplifying it is critical.

It may be argued that a contextual framework would be equally, if not more, important to the process of interpretation or understanding, which could imply that such an aspect ought to be considered in the case of defining falsification. Nevertheless, while undoubtedly important, I would disagree that the contextual framework is as important as, or more important than, a representational framework. *The main reason for the disagreement is that a contextual framework is reliant on what a word represents* while *the converse of this statement is not the case.* Thus, when I use the term representational with respect to the semantics of a word, I refer to an interpretation of a particular word based on what that word *denotes* or is taken to represent

conceptually (Carter 2012). In contrast, I understand the contextual framework in approaching semantics to be one in which a word's meaning would be associative, or *connotative*. To use an example of any random English language slang phrase such as "Jane is resting in John's *crib."* Now, if contextually, Jane refers to a particular human 28 years of age whose older brother is John, then despite crib defined as a "Baby bed with high sides made of slats," although it is possible that a customized crib was made to scale for an average height human adult male named John has Jane resting in it, this makes no sense so is unlikely. Instead, it would be most probable that since John is not a baby, given crib is to baby as bed is to adult—and both are in a house—in light of the context that is based on what crib represents, crib refers to the commonality that exists between where the adult equivalent of where a baby could be found resting, which is known as a bed: neither a baby could not rest in its crib, nor could an adult rest in its bed ***WITHOUT STAYING IN A HOUSE.*** where a baby stays, but John is not a baby,

In the case of the word falsification, as it relates to the research misconduct definition in particular, a denotative understanding in which a word represents the concept to which it may be traced is most appropriate because it allows for disambiguation from among various meanings that may be connotative in origin.

Falsification and Epistemic Aspects of Scientific Theory

Falsification as discussed by Karl Popper (1959) is relevant to the present study because it addresses epistemological aspects of scientific knowledge and theory. Such epistemological aspects may be understood as those that relate to the theory of knowledge, how knowledge is obtained, the validity of said knowledge, its scope, as well as distinguishing between justified beliefs and opinions (citation). Specifically, the words "conjecture" and "refutation" do not merely appear at random in the title of one of Popper's famous works, based on their semantics,

it may be interpreted that they were both deliberately selected because in some capacity they each pertain to knowledge, its acquisition, validity, purview, and doxastic element. In general, refutation may be defined as an action whereby a scientific theory is proven wrong (Oxford 2017c). On the other hand, conjecture is understood to be an opinion that one forms based on incomplete information (Merriam-Webster, 2017). Nevertheless, as it pertains to the field of mathematics, for instance, meanings of some words are slightly altered when applied to specific subjects. For instance, the mathematical interpretation of conjecture is "a statement for which there is some evidence supporting the belief that the statement is true" (Cunningham 2012). When compared to the general definition of conjecture, the specific formulation for mathematics is consistent. That is, conjecture as an opinion formed on incomplete information may very well be a statement for which there is evidence supporting the belief that it is true regardless of whether it actually is. The main difference between the two definitions is that the general implies what the specific makes explicit: the aspect of belief. In other words, whether in a specifically mathematical context, or in a more general sense, conjecture relates to an individual's belief in the opinion held or statement made. The concept of that which relates to an individual's belief is such an important area of study to philosophy that there is a word used that succinctly captures the idea, which is "doxastic." The word doxastic is a philosophical term that is defined as that which relates to an individual's beliefs, it is derived from the Greek word "doxastikos," which means "conjecture" (Oxford 2017a). Clearly, everything is interrelated since epistemology concerns aspects of knowledge and the justification for one's beliefs, which itself is within the realm of doxastics meaning "conjecture" in Greek and is included in the title of Popper's (1959) work in which he deals with a notion of falsification that is considered epistemological.

As either conjecture or refutation, scientific knowledge and theory may be understood epistemologically to comprise the following four aspects:

1. Nounal (i.e., knowledge-conjecture)
2. Verbal (i.e., process-product)
3. Veridical (i.e., true-indeterminate)
4. Applicable (i.e., relevant-irrelevant).

The Nounal aspect of a scientific theory, as either conjecture or refutation, refers to the content about which the knowledge may be as being either real or imagined. When mentioning the Verbal aspect, it indicates whether the theory is about a process or product. The Veridical aspect refers to the truth or falsity of a scientific theory. Lastly, the aspect describing whether or not theory content-knowledge is relevant to the field is that of the Applicable. Together, these aspects yield a composite of the concept about which knowledge or a scientific theory is concerned, which directly relates to the epistemology of the theory. In order explain how each aspect relates to a scientific theory, let us suppose that there is a scientific theory, which claims that unicorns exist. Since this theory proposes the existence of unicorns, given that this is not the case, the Veridical aspect would be indeterminate. The theory may be declared indeterminate because there is an actual, or assumed, agreement that has been based on empirical evidence concerning the existence of unicorns, viz., that they do not exist. Such an actual, or assumed, consensus derived from real-life experience can be defined as a fact (Boylan and Johnson 2010). In addition, because of the fact that unicorns do not exist, the nounal aspect would be conjectural. Moreover, the theory is not Applicable since it neither concerns what is real, nor true; thus, it would be considered irrelevant. Lastly, it does not concern a series of steps taken toward an end or describe something that occurs defined as process (Oxford 2017b), the Verbal

designation would be that of product. Whether conjecture or refutation concerns these aspects, and each of these aspects can be considered an epistemological concern, scientific theory concerns epistemology. Refutation is an action whereby a scientific theory is proven wrong (Oxford 2017c). On the other hand, conjecture may be defined as an opinion that one forms based on incomplete information (Merriam-Webster, 2017). Synonymous with conjecture are the words theory and inference (Oxford 2017d). Thus, an inference or theory is an opinion based on incomplete information. Despite being incomplete, the information both comprising, and on which a scientific theory relies, includes facts, data, or other forms of content knowledge. As an object of scientific inquiry, the products that are content knowledge may only be arrived at through a series of actions or steps taken in order to obtain them. These actions or steps are formally referred to as a process, which is that through which scientific researchers must go in developing a scientific theory. Although the Popperian notion of falsification may be considered epistemological, an epistemological notion has practical significance for the present undertaking because a scientific theory concerns knowledge. Furthermore, the knowledge of a scientific theory will either be regarding a concrete person, place, or thing (i.e., nounal), be regarding actions or steps taken toward an end or the result of an end (i.e., verbal aspect process or product), be or be about the truth or indeterminate (i.e., veridical), or be pertinent or not (i.e., applicable relevant or irrelevant). Where there may exist a variety of notions of falsification, any attempt to distinguish between epistemological, ontological, or others should not affect the cogency of the argument herein presented. In other words, falsification may be reduced to an epistemological notion that relates to a flaw in the established PHS definition of falsification as research misconduct. It would be rather difficult to accept any knowledge claimed in a scientific theory without there being certainty. That certainty need not exist in the knowledge itself and

some may argue that it may not even be possible for it to be. However, assuming that it were possible, certainty does at least need to be in the person who claims knowledge even though the knowledge itself may turn out not be certain, which leads to the following point: All it takes is the perception of a single anomaly to cast doubt on any certainty that will herald a scientific theory ultimately being disproven. It must be understood that an event that has never been witnessed does not imply that the event is not possible, that it has not already occurred, or that it will never be perceived; the event may be perceived at some point, but nothing definitive may be stated at this point based on not having perceived anything. It is for this reason that in the best possible world in which a hypothetical research team has obtained data from observing every event whenever it has been known to occur, the generation of theory using data from all perceptions in the absence of any single anomaly may only result in the theory being uncertain, or tentative. Through the use of mathematical (i.e., logical) induction (Garson 2014), it will be the aim to prove regardless the number of perceptions from which data are obtained or the amount of data used from what was obtained from the perceptions by the researcher, a theory may only be tentatively correct or incorrect at best. Mathematical induction is a formal method of proof in which integer numbers may be used to demonstrate that a claim holds in a two-step verification process.[2] Employing mathematical induction will reveal the flaw in the research misconduct definition of falsification as inaccurate representation through the manipulation of data. Such a revelation concerning the flaw in defining misconduct should convince the reader that the manipulation of data in science, fraud as falsification, and research misconduct as a whole are not as self-evident as many would like to believe. Falsification as an inaccurate representation of research through deletion or failure to include data should not be considered

[2] For more about mathematical induction, see "A Logical Introduction to Proof," by Daniel Cunningham, which is included in the references section for further reading.

research misconduct because it is not a significant departure or deviation from standards of practice in the community and does not influence the accuracy of the results concluded

[2] For more about mathematical induction, see "A Logical Introduction to Proof," by Daniel Cunningham, which is included in the references section for further reading. from the research. However, this is not to be misconstrued as the position that falsification cannot ever be considered misconduct; falsification may be considered misconduct providing that a satisfactory definition can be proposed according to which an actual instance of falsification results in significantly impacting the accuracy of the scientific conclusions obtained. As it is currently defined, however, falsification is not acceptable for the reasons that have been provided.

Word Formation: A Semantico-Syntactic Understanding of Falsification

I have thus far been establishing the groundwork for the assertion of my argument, which is referred to as my claim (Machi and McEvoy 2016). As a declaration, it is crucial that the claim I am making be logically substantiated. In particular, the types of claims that I am making consist of a claim of concept and a claim of interpretation.

According to Machi and McEvoy (2016), the former claim attempts to "define or describe a concept, idea, or phenomenon" whereas the latter "provides a frame of reference for understanding an idea" (pp. 44-45). Nevertheless, analogous to both the distinction that exists between, and the relationship that exists among, the contextual and representational (i.e., between connotative and denotative) meanings that were discussed, there, too, exist similarities and differences with respect to claims of concept and interpretation: as was said earlier regarding the connotative meaning deriving from the denotative meaning, the claim of description (i.e., concept) derives from the frame of reference claim (i.e., interpretation) on which it relies. In other words, a claim of concept derives from a claim of interpretation.

Since a claim of concept concerns describing phenomena, it may be considered to be phenomenological. While the term has had acquired many different meanings over time, phenomenology, as taken under its original sense, is a philosophical doctrine proposed by Edmund Husserl based on the study of human experience in which considerations of objective reality are not taken into account (Oxford 2017b). According to this understanding of phenomenology, it may be inferred that if more than one human exists to experience, then no two human experiences may be the same.

Because every human experience is unique, two or more humans may literally share the same experience yet have different experiences because they are had from subjective viewpoints. To clarify, consider the following. Sameness I interpret as being multidimensional. Same may refer to various aspects of things, such as context, topic, perspective, location, or time. The main distinction to be made is that since perspective can never be truly objective, for however many *n* such that *n* = dimensions one identifies concerning two or more things, literal sameness between those things requires $n - 1$ of them to be shared.

Two people, each from different "racial" backgrounds, being arrested for some reason—even simultaneously together—share the same experience of being arrested, as do their arresting police officers. However, despite simultaneously occurring not only in the same location but at the same time, concerning the same topic, and in the same context, the same experience shared is not necessarily *experienced the same* by either the officers, arrestee one, or arrestee two, each person has a different perspective. These differences preclude objective interpretation in phenomenology; thus, phenomenology aims to describe what occurs, which is essentially a claim of concept. Interesting to note, however, is that, despite the distinction that is implied, whether one may describe without interpreting is questionable. That is, how does one reconcile any form

of description of a phenomenon, or anything for that matter, without interpreting? I argue that it may not be possible. In other words, description and interpretation must go hand-in-hand. Moreover, interpretation must precede describing.

Distinction and the Legitimacy of Claims

While it would be quite easy to conflate a context with a frame of reference, to do so would be a mistake*; the two concepts are related and may be similar, but they are not necessarily equivalent*. A context may be thought of as that which restricts the domain of possible *frames of reference*, but the converse is not necessarily the case. It is not the case that frames of reference restrict a context. Likewise, any frame of reference itself will serve to further impose limits on the possibility of descriptions or definitions, but the opposite is not necessarily true either. It is not the case that descriptions or definitions impose or limit the frames of reference in which they are used, as literary devices would not exist as they do.

To support my argument for the unidirectional nature of the relation between a frame of reference and definitions or descriptions by word, I argue metaphor demonstrates as a counterexample. Successful metaphors occur precisely when words with particular definitions are applied from a different reference frame to differing contexts for effect. Therefore, context restricts or limits the frame of reference which restricts or limits description or definition.

For instance, let us take a given set of three words comprised of eating, taste, and sweet. Concerning this particular set and these words, I would identify the context with the word eating, the frame of Reference with the word taste, and the word to describe or define would be identified as sweet. General to specific would be how I explained the logical choice in the assignment of each word to its appropriate role in the relationship among this particular set of three words.

Let us suppose that there is an edible item on a counter at which we are looking. All that we were told is that it is the first of its kind ever encountered and that our task is to make a claim of concept and a claim of interpretation of a single word each. Given the novelty and unfamiliarity, it would be reasonable to contemplate whether, based on the types of claim, we need to establish that of one before the other, and if so, then in which order and for what reason. If a claim of concept is to define or describe an item and that of interpretation provides a frame of reference for understanding the same item, then it is neither likely, nor efficient for both to be made simultaneously because of the lack of coherence or consistency that could result. That is, if each of us spent time alone with the item after having been randomly assigned responsibility for either claim and were, on the count of three, to shout the one word to make our respective claim, odds are that the results of each round in which words were simultaneously shouted would be unmatched.

The experiment would be analogous to playing successive rounds of the game referred to as Rochambeau (Buescher, 2017) except, instead of merely having to choose each round from among rock, paper, or scissors, there would be an almost infinite selection of frames of reference and descriptors from which each person could choose. Even if we restrict ourselves to just three options in which each of the three frames of reference corresponds with only one of the three descriptors, the probability of calling out a frame of reference and corresponding descriptor is only thirty three percent. It will clearly become less likely for corresponding or matched pairs with each additional choice of word that is available from which to select. Therefore, approaching the task should not occur simultaneously; to have the best possible result, one will need to be established before the other and the other depends on the first.

As to which should be first established, the frame of reference should come first, then the definition or description. The reason that frame of reference must precede descriptor is that frame of reference allows for the understanding, or interpretation, of the descriptor/definition to be sensical. That is, in addition to the one word being applicable in two or more frames of reference, due to the polysemous nature of word-forms that may derive from both denotative and connotative meanings, if a word used for descriptor has both denotative and connotative meanings, then there will be no way through the word use itself for a corresponding word to be chosen for the correct frame of reference that was intended by its use.

For instance, if the word first shouted by someone as a descriptor is "hot," because the item had a temperature greater than humankind's when touched yet was very spicy when eaten, the frame of reference could be either touch or taste with equal likelihood, which leaves room for error. While better than outcomes of simultaneously choosing, descriptor selection before frame of reference still is not the best option because of the theoretical possibility of misinterpretation. Therefore, frame of reference should be first claim.

A word for the frame of reference, such as "taste," may have multiple meanings, interpretations, or both meanings and interpretations. That notwithstanding, as opposed to "hot" used as a descriptor with regard to an item, which of two intended meanings of "taste" when used as a frame of reference for the food item is not ambiguous at all since only one meaning of the word (i.e., denotative gustatory) makes sense. Furthermore, not only does providing the frame of reference word first (e.g., taste) eliminate irrelevant meanings of the word itself, but by doing so, we remove the potential confusion of an ambiguous descriptor word (e.g., hot). In other words, although it is true that hotness in temperature may be perceived in food, the perception of temperature is not through tasting; because hotness is a measure of spiciness, and spices are

perceived through taste, hot is clearly used as a descriptor in reference to taste as the frame of reference. It is based on this that I conclude that not only are both the frame of reference and the description/definition required, but a claim of concept should depend on a claim of interpretation.

In consideration of my claim of concept being to define or describe falsification, it should be based on a claim of interpretation that provides a frame of reference for understanding what falsification means. To provide that frame, I will explain basic semantics concerning falsification relying on theoretical concepts from an applied linguistics perspective. Following that, word-formation, the abstract noun, and accuracy and definition are briefly mentioned. Finally, a corollary based on the definition, core-word substitution into the definition, and what adequate definitions should entail are addressed.

A FOUNDATION FOR UNDERSTANDING

The word-root is considered the smallest unit of meaning in the particular word-form and is referred to as an abstraction called a *morpheme* (Carter, 2012). Now, despite FALSE being the word-root, Falsification is also comprised of additional "smallest units" that complement it. FALSE may be considered a lexeme, as well. A lexeme may be thought of as an isolable abstract idea that provides a substrate for the development of other word-forms (Carter, 2012). In addition to roots, non-roots exist and are among the smallest units of meaning comprising word-forms classified under the rubric of a morpheme. Prepositions that are used by themselves, such as "by," or "in" are an example of non-roots. However, unlike the case of prepositions, some non-roots that are unable to stand alone (e.g., -ify, -ation). These non-roots referred to as bound non-roots or "affixes," must be combined with a free root, such as false, to create a word-form like 'falsification.' The requirement for such non-roots to connect to free roots leads to their being labeled bound non-roots (Carter, 2012). When bound non-root morphemes such as prefixes and suffixes known as affixes collectively are appended to free roots, the result is a different lexeme. It is lexemes that provide unique entries in the standard dictionary and are commonly generically referred to as words. Falsification, as a word-form, may be considered a derivation of the word root false. Unlike inflections, which are defined as the all the word-forms of a given lexeme in the same grammatical class (e.g., verb), by derivation, it is understood that a word-form has its own meaning as a separate lexeme among various word-forms comprising grammatically different classes obtained from one particular word-root (Carter, 2012). That is, from the word-root create of the lexeme CREATE, we may obtain the word-form create, as a verb. Inflections of this word-form may include create, creates, created, and creating, which are all verbal forms. However, derivations from the word-root create could result in the word-forms creator, creature,

creation, creationist, creative, creativity, or recreation. The derivations are of grammatically different classes despite being based on the same word-root, which is the smallest unit of meaning.

Word-Form

The word-form 'falsification' comprises: false (word-root/morpheme), and the bound non-root/morphemes of "-ify," and "-ation." As a bound non-root, "-ify" is often added to adjectival word-roots to create a verbal word-form like 'falsify,' which is a different lexeme. Derivation of the verbal word-form falsify to represent an abstract notion, or construct, may be accomplished by appending the suffix "-ation" (Peters, 2004). However, the replacement of "-y" with "-ation" requires the addition of "-ic" in front of the ultimate affix, which results in another lexeme. The newly created lexeme of falsification is also a word-form that may be classified as a noun. Interestingly, the suffix "-ation" consists of what appears to be a fusion of "-ate" and "-ion;" "-ate" is a bound non-root morphemic suffix that is added to word-forms to create verbs (Peters, 2004) whereas "-ion" is one that is appended to nounal word-forms to convert them into abstract nouns (Peters, 2004). Therefore, it may be concluded that FALSIFICATION realizes the word-form falsification, which is an abstract noun.

Abstract Noun

The abstract noun falsification has been defined as "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" (Public Health Service, 2005). Implicit in falsification is the notion of an action that has resulted in its occurrence. Included in this definition of falsification implicit in which are actions, the words "manipulating, changing, and omitting" are the gerundial forms (i.e., verbal nouns) that refer to these actions. Additionally,

other grammatical aspects of the definition include the direct objects "data" and "results." Also, data or results comprise the research record, which itself is part of the research as a whole. Lastly, the entire definition has as its focus the research not being accurately represented in the research record. Having described what research is and of what the research record consists, the only thing remaining is to decipher what the adverb "accurately" entails in relation to "being represented" and how its negation leads to falsification.

Accuracy and the Definition of Falsification

Accuracy denotes "an absence of error or mistake, which is based on the degree to which something conforms to the truth ("Accuracy Definition of Accuracy by Merriam-Webster," 2017)." Moreover, something lacking error in conforming to the truth means that it represents by portraying faithfully in some manner that to which it supposedly refers. Furthermore, the "conforming to the truth" is the representational aspect. In other words, accuracy is, in essence, correctness; correctness should be interpreted in relation to something representing another thing faithfully. In this case, something may either be the data, record, or research as a whole. Another thing would be the actual data, detailed record, and transparent research. Thus, if one were to speak of correctness in relation to the something representing another thing faithfully, then one may refer to the something being true. Moreover, to refer to the something that represents being true, one may use the word accuracy, or accurate. Establishing what the word "accurate" means, and that accuracy entails representation, it may be understood that, to say "accurate representation" is redundant. Nonetheless, as it is found in the PHS definition of falsification, the word "represented" may have been intentionally redundant when used with the word "accurate" to "prominently highlight" the "stressed emphasis." I interpreted the redundancy to be an indication that attention should be focused on "accurate," which is the reason that this section has

been dedicated to deconstructing the definition of falsification. Although somewhat protracted, the process of deconstructing falsification will allow the opportunity to fully appreciate the amount of effort that was placed into the construction of the PHS definition of falsification, as well as all those concerning the topic of research misconduct as a whole. Furthermore, because of the progress that we have made thus far, the remaining steps will be less difficult: since the definition preceded "accurate representation" with "not," and "accurate representation" implies "correct or true," it can be concluded that "not an accurate representation" means "not true." Therefore, the crux of the definition of falsification may be understood to be about that which is "not true." To summarize the complete definition based on the analysis, falsification, as it pertains to research misconduct, appears to be about actions being done to something (i.e., deleting data), or actions that result from something being done (i.e., omitting data being deleted), in such a way as to make that thing, or make of what that thing is a part, not true.

Syntactic Substitution of the Definition of Falsification

Logical flaws in the definition of falsification are precisely what linguistic scholars aim to prevent. Prevention may be achieved by ensuring that there exists a core vocabulary (Peters 2004b). One method that has been employed to determine a core vocabulary is syntactic substitution testing. Syntactic substitution testing reveals which words from a group may be substituted in place of others. The significance of discovering substitutability of words is that doing so is believed to reflect the fundamentality of words. As Peters (2004) states, a core word is one that is used as part of a defining vocabulary (Peters, 2004) in terms of which all other words are defined and may be beneficial to the process of language learning. Given that the word-root "false" is antonymic, and may be considered the negation of the word-root "true," when one reads the definition and attempts to syntactically substitute "not true" for the non-core

words used in the PHS definition that convey the same idea, the result is the following: falsification (i.e., not true) is manipulating research materials, equipment, or processes, or changing or omitting data or results such that the research is not accurately represented (i.e., not true) in the research record" (Service 2005). 40

Every Denial Implies an Affirmation

It may be worth mentioning that, according to the definition, as it is, as well as an understanding of it in basic terms, there is a corollary: in order for one to be certain, or have knowledge, that falsification occurred (i.e., that something that was done made another thing not true), one must be certain, or have knowledge of, what is true. That is, to say, to successfully make one's case that another is guilty of falsification, there is no way to provide evidence of falsification (i.e., that something resulted in being wrong from actions) without implying that one has knowledge of what is true; implicit in denial is an affirmation. By this, it is meant that, for instance, to successfully argue and be confident that "this x is not a spoon," one must be certain, have evidence, proof, or be able to know what a spoon is. In order to be certain about that which is not true, one must be certain about what is true. The main reason falsification cannot continue as it is currently defined is that the definition is flawed due to the use of circular reasoning, which I will demonstrate in a later section of this article leads to inconsistency and why the definition of falsification should not remain in its current form.

An Adequate Definition and the Foundation for a Formal Definition of Falsification

To use a word to define an idea or concept, the very idea or concept that is to be defined cannot be used anywhere in the definition in the form of another word. That is, properly defining vocabulary considered a new lexeme requires the use of core vocabulary. Otherwise, any effort to define will be analogous to employing circular logic in which one assumes in the premises of

an argument the conclusion that is to be proven. Thus, to construct an adequate definition of falsification as research misconduct, one must not rely on circularity; one must draw from the pool of existing concepts and ideas as core vocabulary outside of that which it is one's purpose to define. Failing to do so results in the reliance on circular logic, as encountered in the current definition of falsification as misconduct.

If the desire is to construct an adequate definition that does not involve circular reasoning, then there must exist explicit guidelines to follow in constructing a formal sentence definition. As the reader may recall, I have previously mentioned that there are always both similarities and differences among two or more things that exist. Similarities and differences are extremely useful for a variety of purposes, which includes the present one concerning the word falsification. Undoubtedly, there are at least two words that exist regardless of how one might qualify that existence metaphysically; thus, there must also be similarities and differences found among whatever words one grants. When they comprise a sentence, both the similarities and differences together are what may be used to distinguish words from one another. Furthermore, whether the words represent abstract concepts like falsification, or they have material referents in the external world, it is the existence of distinguishing similarities and differences that ultimately define them. Therefore, as found in Swales and Feak (2012), a formal definition of a word for our purposes will be comprised of an assignment to a class, or group, to which it belongs based on the similarities shared, which is then distinguished from other terms in the same class through explicit mentioning of any differences.

It has been established that the flaw in the construction of the PHS version of falsification is due to using the idea in the definition of a word that is being defined, which is analogous to the case of circular reasoning in argumentation that assumes what it is attempting to prove. In order

to avoid such circular logic, which will allow for the definition of a word to be sufficiently formulated as an argument, the core idea of the word being defined must not be contained as a core idea derived from a word anywhere in the definition itself (Swales and Feak 2012).

Let us suppose that based on the surprisingly unanticipated success of the present research endeavor, the use in print of one word that the author has coined has apparently been recognized for the first time despite previously having used it. The word coined is "*propriosophy*" and describes an idea that was the result of fusing two previously separate constructs. Let us also suppose the word had garnered the attention of the editors at the world famous alliteratively named fictitious dictionary publishing company, Lucky Lexicon. Thanks to the success, the author is both honored and humbled when they ask him to provide a definition of *propriosophy* for the upcoming edition of their dictionary. So, the author offers the following as the author's official submission: *"Propriosophy—The wisdom of oneself that may be derived from one's own reality; the wisdom of self that is obtained through the application of the guiding principle of consistency in the interpretation of one's experiences readily abandoning any beliefs or positions, which are determined to be inconsistent with one's experiences."*

The reader should note that no words contained in the definition may be reduced to the same ideas in the term being defined. Both root words comprising the term proposed mean "wisdom" and "own/self" and are incorporated into the definition. Nevertheless, their usage in the definition does not result from being derived from the meaning of another word that was used. The new term reduced to its core word components "wisdom" and "own/self" has been defined through the usage of the core word components to which the term may be reduced. Therefore, because the definition does not rely on words that may be reduced to the same that comprise the new term, it is not considered circular.

As a result of not relying on circular reasoning, unlike falsification, there should be no confusion as to what does or does not qualify as a case of *propriosophy*. The purpose of presenting the word I coined for example was to establish what a non-circular example of a definition might resemble. Having a comparison of what a definition should look like help to identify what necessary components are needed in a final definition of falsification. Furthermore, unlike the definition that was just encountered according to which no confusion should be possible, because the PHS definition of falsification is circular, which makes confusion both possible and likely, the author argues that one should be able to prove anything by relying on it and shall demonstrate. The reason that it will be beneficial to demonstrate that anything may be proven through the use of circular reasoning is that it allows for one to appreciate and thoroughly understand why it is that circular reasoning is both dangerous and inadequate to make a case for any argument or definition.

CONCERNING FALSIFICATION AND THE PROPERTIES OF A SCIENTIFIC THEORY

I will show that the manipulation, changing, or omission of data (i.e., falsification by definition) through deletion or discrimination (i.e., the action resulting in the manipulation, change, or omission) should not be considered an incidence of fraud, falsification, or research misconduct. Regardless of the amount of data used from any data obtained empirically by making whatever number of perceptions that corresponds to each event that occurs, this results in theories that are all equally tentative. The falsification in this case here will be considered the deletion of data obtained, manipulation of data through discretion regarding which to use and not use, or otherwise omission of data from the record or its consideration in calculation or construction of the scientific theory. It will be demonstrated that this may occur and result in a scientific theory that is as uncertain as it would have been had the falsification in question not occurred.

With respect to the formulation of scientific theories, there exists a nested relationship among the stages, or processes, which culminate in the product of the theories themselves, which may be understood as sets, subsets, and so forth. From the most general to the specific, I interpret them as follows: a) A universe of discourse comprised of the set of all discrete events that may occur, b) A corresponding subset consisting of perceptions that are made for each individual member of the set of the events that occur, c) The data that is obtained from the perceptions that are made, and d) Lastly, the data that may be used to formulate a scientific theory from that which was obtained from observations of the events.

An event concerning a particular theory in question may occur once or do so multiple times. Furthermore, each occurrence of the event may be perceived. Nevertheless, it is not

possible to see the identical event multiple times regardless of how similar in appearance each occurrence might be to previous ones for many reasons. Assuming an objective event, one crucial reason for the impossibility is logistical. because quantificationally pluralistic times observing a qualitatively identical event violates principles of consistency. More than one time implies events are different. Furthermore, an identical event is itself (i.e., one event) and cannot be the same if it occurs at two different times; the different time distinguishes the events. Thus, I argue that each perception will be of a different, and distinct event perceived with a one-to-one perception-event correspondence that precludes the possibility it can occur more than once.

The Rationale for the Existence of a One-to-One Perception-Event Condition

The distinction made between an occurrence of an event and the perception of that occurrence is critical to understand. One of the most important reasons that the distinction should be known are the conditions. some may argue that, for example, if as a researcher their theory concerns hail, then when an instance of hail as an event occurs that is perceived, whenever it is hailing and they perceive it, they believe that the hail is an event distinct from their perception. According to this belief, each instance of hail occurring that they perceive would be equivalent to their making multiple and distinct perceptions of a single independent event. Nonetheless, the author claims that this is not the case; the discontinuity is what allows us to designate the perception-events distinguishable from one another. In other words, the slightest discontinuity in the occurrence of either the event or the perception suffices to render events separable.

If the unit of analysis is comprised of a perception-event, and the occurrence of hail is the event in question, then the perception of the event must also be required. As the unit of analysis, the percept of the occurrence of hail implies that it is the main individual, or separable, an instance that is analyzed in one's research (Martella 2013). Furthermore, this means that when

one perceives the event to complete the unit, the particular event and its respective perception may only occur one as the unit; the hail one hour later will not result in the same perception-event unit of analysis because the time coordinate is different. In other words, if any aspect of the perception-event unit is different, which includes time of occurrence, location, the person observing, how they perceive, or the event perceived, then the whole unit must be different. There can be no way to conceive of a different whole consisting of a conglomeration of coordinating facts as being comprised of any of the same parts of a different perception-event whole. The idea of obtaining any of the same parts from different "wholes" is contradictory; a perception-event now, and one in an hour from now may be recorded not as two perceptions of one event of hail, but two separate instances of the perception-event hail.

For those who may contend that if only a single instance of hail was the event that one perceived firsthand that was faithfully recorded audio-visually, upon returning to the office, when one plays the recording and watches it, would that not be a case of making two perceptions of the same single event? In the previous example, the hail occurred at two separate times, which rendered the perception-event whole different. Nevertheless, although the recording is viewed at a different time, since the event on video is not occurring at a different time, could it not be said that because the perception fixed on the recording is the same, that regardless when the same person perceives it this yields the same perception-event whole?

An authentic perception is about experiencing. That is, seeing, hearing, tasting, touching, or smelling is indistinguishable from the experience of perceiving sight, sound, taste, touch, or smell. The experience consists of that which is being perceived by any mode and the one doing the perceiving. Although a complete perception may rely on the sense organs of the one perceiving, as well as their faculties of sight, sound, taste, touch, and smell, the entire experience

of perceiving also relies on the status of existence of that which is perceived. That is, to say, the nature of the perceptual experience of a unicorn may, but need not, be constrained by the laws of nature governing perception of something that actually exists with which one interacts.

Because organs, faculties, and that which is perceived are all required, any issues that affect the organs, faculties, or that which is perceived could potentially influence the overall perceptual experience. Thus, it is possible not to perceive something that does exist (e.g., the visually impaired or the hearing impaired) much the same way it is possible to perceive something that does not exist. It is concordance or discordance among the one perceiving, their sense organs, and respective faculties employed that determine the overall perceptual experience.

In addition, the status of existence of that being perceived is what will allow one to distinguish an actual perception from that of a hallucination. Unfortunately, viewing a recording would not be considered another perception of a single event; this would be two events with one perception each. The actual occurrence of the event that was perceived cannot be confused with watching a recording of the event that occurred. The once-removed relationship places both the event and the perceiver in different locations as well as at various times. That is, even though the event may be fixed on the recording, which may also seem to freeze the time coordinate of the event, the perception occurs at a different time. Unless the recording of the event fixed in time may be perceived by the same person at the same time that it actually occurred, but later in the office, which is not possible, there still is no way for the perception-event unit of analysis to be different yet allow the same event to be perceived multiple times. Moreover, the differences as issues are not just locative and temporal, but dimensional, which implies ontological as well. The discordance due to the lack of engagement of at least two potentially relevant faculties related to empirical perception (i.e., smell and touch) in addition to the status of existence of the event

proper, viz., that it is not occurring, more than suffice to substantiate why it is that the experience of observing the recording cannot be equated with the perception of the event as it actually happens. Therefore, viewing the recording will not permit multiple perceptions of the same event to occur, which implies that each perception-event may only occur once and is unique. It is for this reasons that there exists a one-to-one correspondence for perception-events.

Approach to the Argument Against the PHS Definition of Falsification

On the basis of my interpretation of the formulation of a scientific theory and the argument presented as justification for belief in the existence of a one-to-one correspondence of perception-events, I have established a basis for my argument against falsification as currently defined by the PHS concerning research misconduct. As for the approach to the argument, mathematical induction is employed. Specifically, letting b be a given integer and P(n) be a statement that is defined for all integers $n \geq b$: if it can be demonstrated that P(b), in which theories formulated based on a base number of perception-events b is tentative, and that for all numbers n that are $\geq$ the base number b, if true that P(n) in which a theory based on n perception-events is tentative, then P(n + 1) is true, it may be then be asserted that for all $n \geq b$, P(n), or a scientific theory based on all values of n perception-events is tentative, is true. Although it may seem as though too obvious a claim to make, providing the argument for it is crucial for the claim I am making with regard to the definition of falsification as research misconduct. In particular, based on establishing that scientific theories are tentative regardless the number of perception-events that occur, those theories result from actual occurrences of falsification as research misconduct according to the PHS definition and those in which falsification does not happen are tentative. Important to emphasize is that, unlike the probability of the outcome of a fair coin-toss in which one may quantify the potential for a certain outcome such as "heads,"

tentativeness does not have magnitude. Probability is neither a measure of, nor the same as, certainty itself; a 50% probability that a coin will be "heads" is not equivalent to being 50% certain of "heads" as an outcome. That is, I argue that anything percentage of "certainty" that one may attempt to express that is less than 100% is uncertain. Because of this, it would then be possible to show that, given every theory is provisional when generated based on the set of all perceptions made from the events that occurred such that the number of perceptions may be represented by any integer, if the set of all data obtained may only come from the set of all perceptions, and the set of all data used may only originate from the set of all data obtained, then the theory formulated that is based on the set of all possible data used from the data obtained is tentative. By demonstrating that a theory generated is tentative when based on the set of all data used from that obtained, it conveys the idea that whatever amount of scientific data available for use is strictly determined by the number of perceptions made conducting research, but that the amount of data for use is irrelevant because even having made all possible perceptions from which data used may come results in a theory that is tentative. In other words, this should obviate the "what if one more perception were perceived" line of questioning regarding the tentativeness because the universal qualification (i.e., all) of perceptions is nonspecific applying equally to 1 of them as it does to 1,000,000,000 of them rendering one more perception meaningless. Additionally, for emphasis, it may be shown that, if there exists a scientific theory such that the theory was formulated based on the set of all possible data used is tentative, then when the number of all possible data used is represented by any integer, then the theory is tentative.

Argument Against the PHS Definition of Falsification as Misconduct

Successfully demonstrating the provisional status of scientific theories will allow it to be convincingly argued that the manipulation of data by deletion or discriminating should not be considered fraud, falsification, or research misconduct. The reason that it should not be considered fraud, falsification, or research misconduct is that the theories formulated as conclusions that are drawn based on failing to use all data obtained from all perceptions comprising the research conducted and theories formulated as conclusions drawn based on using all data obtained will ultimately be equally tentative. Regardless of the number of events that may occur, how many perceptions are made of events that took place, or the amount of data that may be obtained from the perceptions made of the events that occurred, theories will be tentative.

Furthermore, it makes no difference how much data is used from the data obtained from the perceptions made of the events that happened; the scientific theories formulated as conclusions that are drawn from any amount of data will be equally tentative to theories that used all data. It seems as though theories are always tentative regardless of whether or not falsification (i.e., research misconduct), as it is defined currently, occurs. Therefore, the manipulation of data by deletion or discrimination should not be considered fraud, falsification, or research misconduct since using all data obtained results in theories that are equally tentative.

Proof for Argument by Induction

Let the following apply: Scientific Theory (T), Events that occur (E), perceptions (S), Data Obtained (B), and Data Used (U). Given that it is proposed that T is tentative, and it is aimed to provide proof of this, it will facilitate the process to employ logical, or mathematical, induction to do so. Induction serves as a way to substantiate the truth of statements through the

use of numerical representation and concepts in the form of proof (Cunningham, 2012). As Cunningham (2012) suggests, the relationships between the properties of numbers, such as integers, for example, may be used to establish that a statement is true for every integer, n, that is greater than or equal to a particular integer, b. For the present case, it suffices to prove that a scientific theory is tentative for any number of events, perceptions, data obtained, or data used in its construction that is ≥ b. Thus, it will suffice to firstly prove the base case (BC) for a statement in which S = b, i.e., a particular integer as number of perception-events, then secondly to show that when n ≥ b, if it is the case for S = n where n is any number of perception-events, then it is also true for S = (n + 1). If successful, then it may be concluded that the statement is true regardless of the number used. (BC) If T is formulated based on the set of all S such that S = b number of events that occurred, where only one S is possible per event to result in b perception-events, then T is tentative, AND (IC) For all n ≥ b, if there exists a scientific theory such that the theory formulated based on the set of all S such that S = n is tentative, then T is tentative when S = (n + 1). Therefore, for every integer n where n ≥ b, the statement T formulated based on S = n is tentative is true.

Proof (BC). Since one may not concern oneself with events (E) that have not yet occurred, it will be assumed there is a T formulated based on making all S for every E that has happened such that all possible data is obtained B, and all data is used U. Nonetheless, when the next E concerning, or supposedly governed by, T occurs, for T to be based on making all S, this S must be made as well. While making this newest S, it is noted that the E witnessed was uncharacteristic, or anomalous[3], and could neither have been foretold nor explained by T in its current formulation. As a result of the latest anomalous E being included in all S, one cannot use

[3] For a discussion of the author's usage of an anomalous event, please see the classic, Structure of Scientific Revolutions, by Thomas Kuhn (1970).

T to explain all S of the occurrences of E. Based on the findings, T must, therefore, be either at worst completely wrong, or at best partially incorrect and in need of adjustment in order to reconcile the anomalous E that comprises the most recent S with the rest.

There is no way to know for certain whether T is completely erroneous. Furthermore, even if T were determined to be partially wrong yet could be salvaged, should someone propose a newly adjusted 4 T that accounts for all the S for every E (Dusek, 2006), including the latest S and E, unfortunately, this newly adjusted T will be in precisely the same predicament as the previous T that was formulated on every S made of each E that heretofore occurred. In other words, the next T, and every subsequent T to be generated by making all S for every E is just as vulnerable to either complete erroneousness or partial incorrectness needing adjustment, as the last.

Due to the uncertainty that exists either from 1) the perspective of being in a situation in which a T satisfactorily constructed according to all S before an anomalous E is perceived, or whether one will be perceived, or 2) the perspective of realizing that an unsatisfactory T exists that was generated by making all S after and including a single anomalous E is perceived most recently, or 3) from the perspective of a newly adjusted and again satisfactory T based on making all S after and including a single anomalous event is perceived no longer considered uncharacteristic, which is equivalent to perspective 1), either T is uncertain itself, or if T is certain, it is not possible to be certain that T is certain from one's perspective, which means that T is uncertain from that perspective as well. Making all S cannot ever imply that T is certain from one's perspective. Thus, regardless of the number of S that occur corresponding to the occurrence of events, the uncertainty of T as the scientific theory governing the case in question

means that by its very nature, T is tentative. Also, there is a corollary that has an implication concerning falsification: *that one cannot be confident that a scientific theory is false*.[4]

Proof of Corollary: Thought Experiment Concerning Scientific Theory

Thought experiment – let there be three entities in this universe: a scientific law (w) causing events but is unaware and cannot communicate directly with a scientist's theory (t) about the law and the scientist's theory (t) is unable to communicate directly with the scientific law (w). There is also an onlooker (o) who can see both simultaneously at all times and is strictly as a perceiver without interfering.

Let's suppose that w has caused events all of which were perceived by the scientist who gathered data and *used all of it* to formulate t to represent accurately (i.e., be true regarding) what the law is. The t is based on the scientist only having viewed the events that happened, and w only may learn of the theory formulated. Now, o is the only perspective that may be certain whether t is accurate with respect to w. What can be deduced?

Regardless of what w may be, w is certain of itself. That is, if w is the law of the universe that governs the events in question, then it is certain that w is the law of the universe that governs the events in question. It may be claimed that another law may lead to E, but it is not plausible for many distinct laws to govern the same event; the seemingly multiple laws together would be expressed in one comprehensive law that explains the event. Thus, one need not be certain of other laws because, at the very least, the law certainly is equal to itself, w = w. Moreover, w's being equal to itself characteristically as well as numerically is tantamount to a basic principle of

[4] The author's corollary here challenges the Falsification Criterion suggested to test scientific hypotheses and theories, as proposed by Karl Popper (1959). The author argues that, if a theory is tentative, because whether it is true must not be possible to be certain about, even when falsifying does result in an anomalous event, although seemingly counterintuitive, that the theory is not true (i.e., false) must not be possible to be certain about either since determining falsehood requires certainty regarding truth. Thus, it must not be concluded that the theory is false.

relation in philosophy known as identity (Noonan & Curtis, 2014).5 The t formulated by the scientist's perspective from all the perceived events will either be accurate with regard to w, or not be accurate; if t = w, then there is no way for the scientist to be certain t = w, and if t = w, then there is no way for the scientist to be certain t = w also. So, regardless whether t = w or t = w, from the perspective of the scientist, the scientific theory is uncertain (i.e., tentative), as was proven and expected. Furthermore, if the theory is tentative, then since the scientist is uncertain that t = w or uncertain t = w even in the case that all perceptions and events may be explicated, it must be impossible from the perspective of the scientist to be certain that t = w. Therefore, if there is uncertainty about a scientific theory's truth, then it must not be possible for there to be certainty regarding this theory's falsehood because implicit in the denial of something (i.e., being certain that something is false) is an affirmation (i.e., being certain that something is true).

To be confident that "an x is not a spoon (i.e., certain that 'an x is a spoon' is false, not just that the statement is false)," it must be possible to affirm what a spoon is. Otherwise, it is not possible to be certain in one's declaration of what a spoon is not. Moreover, this also has a rather counterintuitive implication that it is not possible to successfully falsify theories,6 but not because of the ability to modify hypotheses or assumptions that comprise them according to the Duhem-Quine Thesis (Dusek, 2006); it is not possible to falsify theories because it is not possible to be certain that theories are true. Proof (IC). To prove (IC), let $n \geq b$ and suppose that there exists a scientific theory such that the theory constructed based on a set of all S such that S = n is tentative. This assumption is called the inductive hypothesis (IH) (Garson, 2014; Cunningham, 2012). The BC already proven demonstrates that T is tentative even in the case that T is constructed based on the set of all S where S = b. Because $n \geq b$, the assumption may have n substituted with b and results in S = b, which allows the IH to be established. In addition, since it

was stated earlier that it is from S that data is obtained (B), and that, in order not to be considered falsification, the data that may be used (U) can only be retrieved from the data obtained (B), it should be clear that one might be justified in making the assumption of IH as the premise for the proof of IC. Nevertheless, if the reason is not immediately evident, it need not be; the argument may still assume IH because as long as the assumption does not lead to a contradiction, consistency will have been maintained and accomplish the goal. What is of concern at this point is showing that T is tentative when formulated on the set of all S such that S = n perceptions corresponding in a one-to-one fashion to all of the events that have occurred supposedly governed by the theory. Since any number will suffice for this purpose if all S in the case of BC such that S = n where n is the integer 1, then S = (n + 1) would mean that an additional perception had occurred. While any integer could have been chosen, this decision is practical. The selection of any larger integer for n, such as 2, 2002, or 2,000,002 to construct the argument, could have just as easily been done without affecting the truth of the provisional status of T. Thus, T formulated on S = (n + 1) is tentative. The IH states that there exists a scientific theory such that the theory constructed based on a set of all S such that S = n is tentative. Since $n \geq b$, there is no need to repeat the work to prove this, as it has already been done in the BC. If T was based on all S where S = n, then there is no way to know whether the next event related to T that occurs will be anomalous, which renders T to be uncertain. Furthermore, if another event does occur, then it will result in the addition of either an anomalous event to the set of all S such that S = (n + 1) or an event that T predicts will be added to the set all S increasing all S to S = (n + 1). Moreover, since it has been proven that T is tentative when made based on the set of all S such that S = n after an anomaly occurs, as well as that T is tentative even when made based on the set of all S such that S = (n + 1) before an anomaly because it is no different from the set of all S

where S = n without an anomaly, whatever the value may be of the set of all S on which T is based, T is tentative. Since it has been shown that the statement is true for S = b and that for all n ≥ b, if the statement is true for S = n, then it is true for S = (n + 1), T is tentative for all S = n whatever the value n assumes; therefore, T is always tentative.

The tentativeness of all scientific theories, as it has been shown, implies that, according to falsification as research misconduct how it is currently defined by the PHS, the results of research in the absence of falsification are not any more an "accurate representation" than would result from an instance of legitimate falsification. The reason this was possible to prove was that of the flawed circular reasoning of the notion of falsification as misconduct. That it may be demonstrated at least once means that one must not rely on the current definition if one is to be confident in distinguishing actual cases of falsification as misconduct from cases in which it did not indeed occur. While competitor sabotage may at least partly account for the data and findings regarding falsification based on the studies in the literature, there is an alternative theory that is equally plausible. Others have undoubtedly expressed their incredulity concerning the falsification as research misconduct. That notwithstanding, the author theorizes based on this work that the flaw in the concept of falsification as defined contributes to the trends perceived in the evidence obtained from the literature. Therefore, based on the evidence, reasoning, and arguments herein presented, the reason falsification is the most common type of fraud as misconduct alleged yet the rarest to be determined to occur may be explained by the fact nobody, including both the expert committees in charge of oversight and scientists themselves, really knows or agrees on what constitutes an occurrence of it, which facilitates the strategic use of allegations by rivals to attempt to sabotage their competitors with nearly as much damage regardless whether or not evidence to substantiate the accusations exists.

PART ONE SUMMARY AND CONCLUSION

Having discussed the potential repercussions of allegations, it may be concluded that the manner in which they function in general is extremely problematic. The most problematic aspect from a defendant's perspective is that the sole recourse that they may have is to attempt to sue for libel. Nonetheless, suing for libel is not feasible when it is thoroughly considered due to the supposed fail-safe incorporated into due-process. That is, on the one hand, if the accused is found guilty of the allegations, then no "good character" can be said to have been ruined.

Equally, if acquitted, being cleared from guilt is supposed to ensure that the reputation of the accused remains intact. Because damage has been found to occur to defendants, as was the case in the UK despite the absence of evidence, it may be understood to happen to anyone accused whether he or she is convicted or exonerated. Unable to directly repair how allegations operate, an indirect approach to addressing allegations as an establishment was decided upon in this paper and carried out through the critique of aspects concerning the definition of research misconduct.

The approach to allegations was attempted in such a manner because doing so could provide new understanding, which would facilitate reshaping how people framed suspected instances. Ability to reframe how suspected misconduct was perceived from different perspectives has the potential to prevent allegations from being made frivolously, or due to honest ignorance, thereby saving money, time, and damage to all possible parties that would have been involved.

As components of the definition of research misconduct, fabrication, falsification, and plagiarism (FFP) appear to be categorized into de facto groups according to the level of perceived gravity, as it relates to the conduct of research. In the conduct of research, it is only the

more severe offenses of fabrication and falsification that are considered to be fraud. The reason that fabrication and falsification are traditionally considered fraud is likely to be that they are, or result, directly from the actions or behavior of the researcher during the course of conducting research.

While extremely unethical as well, plagiarism does not occur in the conduct of research; it is the misappropriation and misrepresentation of another's work as one's own. Furthermore, with respect to plagiarism, because the misconduct need not occur while performing research, it, therefore, technically would not qualify as research misconduct in those instances. Within the domain of fraud, the research problem was limited to the definition of falsification that is currently established by the Public Health Service (PHS). Nonetheless, the PHS definition appears to be inadequate based on the findings of the studies concerning the frequency of allegations, convictions, and severity herein considered. If the PHS, or any definition of falsification, were adequate, then it would not allow allegations to be so easily made given the potential for being falsely found guilty of something that studies have revealed occur the least yet are the most severe.

Part one of this critique attempted to address adequacy through the exposure of flaws in the definition of falsification as research misconduct. Dealing with adequacy through flaw exposure is the initial step in determining the requisite components of a sound definition of falsification. Ultimately, adequacy comprised of soundness and completeness of the definition of falsification could affect deterrence, allegations, and prevention of false convictions. As an aspect, deterrence refers to preventing the crime of research misconduct from actually occurring, which may be achieved more readily in the presence of an adequate definition because it is only

possible to know what is not falsification (i.e., a denial) if what qualifies as an instance of falsification is established (i.e., affirmation).

Allegations connote claims of wrongdoing in the absence of evidence. Again, because no consistent definition is in place so anything could be falsification, which is why allegations of it may occur so routinely. However, once established, the reframing of the concept will provide more guidance delineating what may or may not be an instance so that people are less apt to make allegations. Lastly, prevention of false convictions relates to the avoidance or minimization of being found guilty of wrongdoing in the absence of proof. The reconstruction of the definition of falsification will also act as an added measure of protection for the accused if they are involved in a case in which the reformulated definition is cited. As a result of the restructuring of the definition, there was increased likelihood that only actual cases of falsification would lead to a conviction of falsification whereas those that are not true instances of falsification will not lead to convictions. *Deterrence*, *allegations*, and *prevention of false convictions* are just three ways the present undertaking may contribute significantly to the field, as well as be applied to ethics as a discipline.

Although it is plausible for discrepancies in the percentages to exist and be significant due to the distinction between allegations and the truth, the difference in percentages may be somewhat reflective of a certain level of embarrassment on the part of self-reporters and exuberance on the part of those reporting on the behavior of colleagues. Various perspectives may provide additional insight into the essence of the perceived phenomenon of misconduct. The credibility associated with witnessing suspected cases of fraudulent misconduct that occur in a researcher's work environment can be even greater than hearsay.

Despite being obtained from different studies, we saw a discrepancy between percentages related to the reporting of misconduct by colleagues. However, the Gallup (2008) study would yield findings that are closer to the actual value sought for the following reasons: 1) meta-fraud or meta-falsification is significantly minimized because participants are not answering for themselves, which eliminates both the fear of potentially self-incriminating embarrassment and the incentive to falsify responses, 2) one participant per department being allowed to provide an answer to the question minimized potentially duplicating the reported cases perceived, and 3) there was the direct witnessing requirement as a condition of the report of a colleague, which further minimized the occurrence of falsification/fabrication in responses because respondents own credibility is being challenged indirectly. The perspectives involve the one reporting the misconduct witnessing it occur by either committing the fraud, witnessing another commit the fraud with or without participating in the study or participating in the study in which the fraud occurred. Moreover, various perspectives on suspected research misconduct are analogous to those involved in triangulation procedures used in an assessment of similarity. In the studies that were considered, the proximity of the results to one another likely reflects the actual prevalence of research fraud. That notwithstanding, due to the inherently ironic nature of an inquiry into falsification, meta-falsification is an aspect that one must consider when interpreting any of the results as true. Accepting the information regarding FFP on authoritative grounds, the following propositional aspects about falsification may be asserted: 1) falsification is considered the most serious form of misconduct, 2) it is the rarest form of misconduct, and 3) it is the most frequent form of misconduct reported in allegations. Theories do exist that would maintain consistency among Propositions 1 through 3. One such explanation is that making enough allegations against people will eventually result in someone accused being found guilty. In other words, +8

falsification is the gravest and, despite being known as the rarest to occur, is the most common allegation because the absence of an evidence requirement makes allegations one of the best strategic maneuvers for the accuser.

From the standpoint of the accuser, maximizing the potential for benefit regardless whether evidence is uncovered while minimizing potentially self-inflicted damage is a win-win situation, which is due in part to the lack of a requirement of proof to make allegations. The institution of some form of preliminary evidence requirement may remedy the situation by placing the burden of evidence either solely on the accuser, or at least equally on the accuser and the accused. In this fashion, the awareness that the accuser will at least be put through similar scrutiny to the accused should significantly reduce the number of allegations of falsification by discouraging research misconduct allegations, as a strategic move while encouraging and restoring more ethically motivated reporting.

Considering the roles of social, political, religious, or interpersonal pressures in the scientific enterprise that are themselves admittedly nonscientific, one may wonder to what extent, and what role, actual science itself plays in contributing the final knowledge of the process of science. According to some scholars, nonscientific aspects are as important as the scientific ones. Nevertheless, scientific aspects themselves have been under scrutiny as well. In fact, some have claimed that induction, inference, and the scientific method do not exist because they believe that no justification allows one to go from instances of occurrence to generalizations in the form of theory. Furthermore, the periodic nature of scientific and theoretical frameworks coming into prominence and falling out of favor also supports the position that there is a pattern to the revolutions concerning scientific knowledge that consists of much more than just the science itself.

Interpretation and feelings at the time of the perception are crucial to the potential there may be to solve any problem: the theoretical framework of the scientist serves as the foundation for framing the research problem. In the best possible world in which a hypothetical researcher has obtained data from observing every event whenever it has been known to occur, the generation of theory using data from all perceptions in the absence of any single anomaly may only result in the theory being uncertain, or tentative. A feature of there being such uncertainty is that science only seems right until it is wrong. That a theory may only be tentatively correct or incorrect at best was demonstrated through the use of mathematical (logical) induction (Garson, 2014), which proved this regardless the number of perceptions from which data may be obtained, or the amount of data used from what may have been obtained from the perceptions by the researcher. Furthermore, the demonstration revealed the flaw in the research misconduct definition of falsification as inaccurate representation through the manipulation of data.

Such a revelation concerning the flaw in defining misconduct should have convinced the reader that the manipulation of data in science, fraud as falsification, and research misconduct as a whole are not as self-evident as many would like to believe. Falsification as an inaccurate representation of research through deletion or failure to include data should not be considered research misconduct because it is not a significant departure or deviation from standards of practice in the community and does not influence the accuracy of the results concluded from the research. However, this is not to be misconstrued as the position that falsification cannot ever be considered misconduct. Falsification may, in fact, be considered misconduct providing that a satisfactory definition can be proposed according to which an actual instance of falsification results in significantly impacting the accuracy of the scientific conclusions obtained. As it is currently defined, however, falsification is not acceptable.

The major flaw is that the current definition of falsification uses circular reasoning. To use a word to define an idea or concept, the very idea or concept that is to be defined cannot be used anywhere in the definition. Doing so is analogous to circular logic in which one assumes in the premises of an argument the conclusion that is to be proven. Accuracy is, in essence, correctness; correctness should be interpreted in relation to something representing another thing faithfully. Therefore, semiotically, the complete definition based on the analysis of falsification, as it pertains to research misconduct, is about actions being done to something (i.e., deleting data), or actions that result from something being done (i.e., omitting data being deleted), in such a way as to make that thing, or make of what that thing is a part, not true. However, there is a corollary that, in order for one to be certain, or have the knowledge, that falsification has occurred (i.e., that something was done that made another thing not true), one must be certain, or have knowledge of, what is true. That is, to say, to successfully make one's case that another is guilty of falsification, there is no way to provide evidence of falsification (i.e., that something resulted in being not true from actions) without implying that one has knowledge of what is true; implicit in denial is an affirmation.

With respect to scientific theories and their formulation, there is a nested relationship from which they are derived according to the following: the universe of discourse is comprised of discrete events that may occur, a corresponding perception made for each of the events that occur, data obtained from the perceptions that are made, and data that may be used to formulate a scientific theory from that which was obtained. The slightest discontinuity in the occurrence of either the event or the perception suffices to render events separable. In other words, if any aspect of the perception-event unit is different, which includes time of occurrence, location, the person observing, how they perceive, or the event perceived, then the whole unit must be different.

There can be no way to conceive of a different whole consisting of a conglomeration of coordinating facts as being comprised of any of the same parts of a different perception-event whole. In other words, there can be no multiple perceptions of the same event to occur, which implies that each perception-event may only occur once and is unique. If it can be proven initially in both the case of one perception (i.e., base case where S = b) and the case of two perceptions (i.e., inductive case where S = b + n), then one may conclude that for all scientific theories, both those resulting from research misconduct due to falsification and those that are not the result of misconduct via falsification, these theories are equally tentative . The amount of scientific data available for use is strictly determined by the number of perceptions made conducting research, but that the amount of data for use is irrelevant because even having made all possible perceptions from which data used may come results in a theory that is tentative. In other words, this should obviate the "what if one more perception were perceived" line of questioning regarding the tentativeness because the universal qualification (i.e., all) of perceptions is nonspecific applying equally to 1 as it does to 1,000,000,000 of them rendering one more perception meaningless. *Therefore, the manipulation of data by deletion or discrimination should not be considered fraud, falsification, or research misconduct since using all data obtained results in theories that are equally tentative.*

Additionally, w's being equal to itself characteristically as well as numerically is tantamount to a basic principle of relation in philosophy known as identity. Therefore, if there is uncertainty about a scientific theory's truth, then it must not be possible for there to be certainty regarding this theory's falsehood because implicit in the denial of something (i.e., being certain that something is false) is an affirmation (i.e., being certain that something is true). Moreover, this also has a rather counterintuitive implication that it is not possible to successfully falsify

theories, but not because of the ability to modify hypotheses or assumptions that comprise them according to the Duhem-Quine Thesis (Dusek, 2006). It is not possible to falsify theories because it is not possible to be confident that theories are true, which was a challenge to the Falsification Criterion suggested to test scientific hypotheses and theories. The author argues that, if a theory is tentative, because whether it is true must not be possible to be certain about, even when falsifying does result in an anomalous event, although seemingly counterintuitive, that the theory is not true (i.e., false) must not be possible to be certain about either since determining falsehood requires certainty regarding truth. Thus, it must not be concluded that the theory is false.

Based on the evidence, reasoning, and arguments herein presented, the author claims that the reason falsification is the most common type of fraud as misconduct alleged yet the rarest to be determined to occur may be explained by both the expert committees in charge of oversight as well as the scientists accused of it themselves lacking perspicuity regarding what constitutes an occurrence of it. Furthermore, the absence of such perspicuity due to circular reasoning inherent in the current definition of falsification that may allow allegations to be liberally made by rivals in an effort to sabotage the competition with nearly as much damage occurring whether or not evidence to substantiate the allegations exists.

In the first part of the present geometrical study, the majority of the effort was devoted to deconstructing the concept of research misconduct through the form categorized as the worst known as fraud. Although fraud consists of research misconduct comprised of both fabrication and falsification, because they both usually occur together, the focus has been restricted predominantly to the latter in making the conscious decision only to consider falsification. The choice to limit ourselves only to falsification was substantiated with the evidence presented from the literature regarding the severity of punishment in findings of research misconduct due to

falsification, the fact that falsification is the rarest form of misconduct to actually occur, and that falsification is the most common form of misconduct to be alleged.

By initially performing the analytic portion of the work, it was established what the necessary aspects of falsification were as currently defined. These aspects were what allowed for the discovery of an inherent flaw, which was then used to argue the case that the PHS definition of falsification in present use is 1) circular in its reasoning, therefore fallacious, and 2) because of 1), anything may be proven to be falsification, such as how it was demonstrated that a scientific theory based on research in which falsification has occurred is equivalent to a theory that is based on research in which falsification has not occurred.

While ironic yet unsurprising that falsification is fallacious, this discovery allowed no recourse but to abandon the definition, which was the source of the problem. In order to resurrect the notion of falsification that can seriously contend as adequate to assist in defining a legitimate occurrence of research misconduct, one must reconstruct a definition of the word relying on concepts or ideas that lie outside of the meaning of the word itself to avoid circular reasoning and convincingly make its case. All of these findings provide us with both a definite purpose in mind and guide in hand that facilitates the task of either establishing, at the very least, a viable framework for a new definition of falsification or, at best, a new definition itself should be amenable to completion.

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THE VIOLATION IMPERATIVE PART TWO: A PHILOSOPHICAL CRITIQUE OF THE PUBLIC HEALTH SERVICE'S DEFINITION OF FALSIFICATION AS RESEARCH MISCONDUCT

Abstract

The purpose of this paper is to critique the definition of falsification as research misconduct according to the Public Health Service (PHS) in order to better understand what it entails. In support of this purpose, the approach decided upon for analysis was philosophical including framing the issue borrowing from both mereological and epistemological perspectives. Through the consideration given to parthood relations of mereology, we gained insight from a cognitive imperfection standpoint about similarities that exist between the epistemic constraints on knowledge and the nature of violations concerning research misconduct. Findings from the examination of a case study include the significance of accuracy in representation in falsification as misconduct and the core dimensions comprising an instance of falsification, which are *Deliberateness, Alteration, and Inclusion*. Given that either behavior or actions *must* occur that violate these three aspects in order to qualify as an instance of misconduct under falsification, the author proposes that, at a minimum, any revisions made to the definition of falsification stipulate what he refers to as *the Violation Imperative.*

Keywords: *The Violation Imperative, Responsible Conduct of Research (RCR), Research Misconduct, Science, Definition of Falsification, Philosophy, Ethics*

Analysis of Falsification and Research Misconduct Through Case Study

In consideration of the severe nature of the consequences that may potentially result from involvement in suspected cases of falsification as misconduct, elaboration and refinement of the definition of falsification as fraud under the rubric of research misconduct is warranted and would likely reduce the number of new allegations and convictions. After considering allegations and fraud in Part 1 of this series, one way to progress from this point is to challenge our preconceptions related to research misconduct through the careful study of a hypothetical case from Macrina (2014). We will begin to examine the essence of the problems surrounding the way falsification as misconduct is currently defined according to the Public Health Service (PHS). Through examination, we should be able to derive some sense of core aspects common among instances of falsification as misconduct what an adequate definition ought to entail. The case that has been selected involves two fictional characters, Joshua and Ellen, and their particular ethically and suggestive behavior.

Case Study Background

Joshua has obtained unexpected results from his research and underexposed the image to conceal them. The purpose of concealing the results was so that others (i.e., competitor advantage) would not have an opportunity to use what he believes to be clues. Joshua must first thoroughly investigate to where they lead before anyone else because he believes the outcome will be groundbreaking. Joshua also does include a statement with the doctored image admitting that he removed the unexpected results, but Ellen believes that Joshua was misguided. She then recommends that he eliminate the areas showing the unexpected results entirely by cropping the image instead.

The most important fact of this case, in the author's opinion, would be the admission by Joshua that the image that he used had been intentionally modified from its original state, which he does not dispute. In addition, if adopting the PHS definition of research misconduct and applying it to this case, in order to make a convincing argument that Joshua is guilty of research misconduct, the onus will be on us to prove that Joshua's action was either one of fabrication, falsification, or plagiarism *in* proposing, performing, or reviewing research or reporting results. We will have to compare Joshua's actions to those that Ellen suggested in order to determine whether significant characteristic differences between them exist that would substantiate the labeling of either, both, or none as a legitimate case of research misconduct.

To accomplish that goal, one must build a case starting with detailing the definition of research misconduct that is considered and explaining the way in which the PHS definition is being interpreted. Next, a framework for interpretation will be presented that provides the context and perspective that was used for interpretation, which will then be followed by an explanation of the reasoning that reveals the link to substantiate both the framework the author used as well as the manner in which the definition was interpreted. Lastly, as the discussion tapers toward the end, violation types are considered in relation to their accuracy comparing outcomes with what occurred. Additionally, a prescriptive argument for what aspects ought to be required to conclude falsification and misconduct have occurred will be presented.

The case will challenge preconceptions regarding actions or behaviors considered research misconduct and require the scrutiny of even the minutest of details. Although at least superficially initially, it may seem to be evident who would be wrong and why they would be if this were a real, one must exercise caution in relying on intuition or gut feeling. From each person's perspective, possible courses of action and their respective outcomes will be carefully

considered. Ultimately, because of the suspicion we expressed concerning the circularity in the existing PHS definition, instead of relying solely on the definition of falsification as the unit of analysis to guide us in determining what ought to qualify as misconduct, the evaluation will focus on the suspected violation itself as an instance and attempt to understand why (i.e., applied, not theoretical).

Concentrating on the violation in question will provide additional information that may not otherwise be derived as to *what* aspects it is that makes the suspected falsification misconduct and *why* that might be the case.[5] Once those aspects have been identified, we may then reconfigure them into a possible definition. In so doing, a reconfigured definition developed should provide a clear and more comprehensive notion of what ought to qualify as falsification under the rubric of research misconduct.

The PHS Definition of Research Misconduct

There have been several iterations of definition for research misconduct within the area of responsible conduct of research (RCR). Certain aspects of the notion of misconduct are integral to defining it and are included in the chosen definition which will be referred to in the present case. The definition of research misconduct referred to is that of the Public Health Service (PHS). Accordingly, research misconduct will be understood for the present purposes as "*fabrication, falsification, or plagiarism (FFP) in proposing, performing, or reviewing research, or in reporting research results (PPRR),*" which is the definition found in the Public Health Service (2005) addition to the Code of Federal Regulations (CFR).

[5] This analogous use of "what" and "why," or qualification and reasoning, for falsification and violations of misconduct refers to a later discussion that will be had in the third and last paper. In that paper, Part III, we consider the Sociology of Scientific Knowledge (SSK) and its association with the content of scientific knowledge. Definitions and actions relating to falsification are subject to debate, and it is through the SSK that one asks "what makes the content science?" and "why that is the case?" in earnest.

Each of the three aspects of the definition may be reduced to the following explanations: (a) *Fabrication* consists of making up data or results (i.e., the commission) and recording or reporting them (either provide results [committed] for which there is no data [omitted], or provide data [committed] for which there is no record [omitted]); (b) *Falsification* may be understood as manipulating research materials, equipment, or processes, or changing or omitting (i.e., the *commission*) data or results such that the research is not accurately represented in the research record (i.e., the omission); and (c) *Plagiarism* is the appropriation of another person's ideas, processes, results, or words (i.e., the *commission*) without giving appropriate credit (i.e., the omission) (Public Health Service, 2005). Crucial to acknowledge is that honest mistakes *do not* count as instances of research misconduct (Public Health Service, 2005), which was a significant concern for some regarding earlier attempts to define that has been resolved by the addition of this clause. As we begin, the definition of research misconduct will be critiqued from a philosophical framework including mereology and that of epistemology. Keywords, ideas, and relationships will each be identified, and an argument shall be presented that justifies the author's decision to interpret the definition mereologically.

Mereological Interpretation of the Definition of Research Misconduct

The keyword with respect to the provided definition is the locative and prepositional "in." Being locative and prepositional, this usage of this word would lend credibility to the decision to interpret the definition as a mereological concern. Mereology deals with parthood relations, or the relationship of a part to the whole (Stanford Encyclopedia of Philosophy, 2016). The framework from which the author approached this problem was philosophical. From such a philosophical perspective, mereology seemed appropriate for framing the problem itself, as the

author found the definition of research misconduct as the whole to be comprised of two distinct parts in FFP and PPRR.

The Role of Prepositions in Establishing the Parthood Relationship

In the case of the definition of research misconduct provided, although there may be other equally useful ways in which to interpret the prepositional "in," we have chosen two in which the word "in" makes the definition as unit coherent and appropriate as used in the definition. The main distinction between both interpretations lies in the dichotomous nature of the particular interpretation of the preposition "in." That is, the author views "in" as describing the parthood relation "materially" where the relation must exist between two material parts only. Conversely, "in" may describe an "immaterial" relation consisting of at least one immaterial part, but there may be two. When describing the parthood relation materially, both parts are miscible, and the relationship yields a composite, tangible whole. If the parthood relation is being described immaterially, at least one component must be immaterial in that it is incapable of incorporating or otherwise combining into anything.

Materially Prepositional "In." In the first, if "in" is to be understood in the literal material sense in which one thing is a part of another, then the FFP, or its proximate result, must have occurred as a part of Joshua's PPRR to complete the definition whole and make this research misconduct. That is, one's action or behavior must have directly led to *deceit by leading others to believe the opposite of what they would have otherwise* had one not engaged such action or behavior.

For instance, if, while reclining in a soft cushioned chair at waiting for Ellen to go over her critique, Joshua sees her from inside the store approaching the door before she sees him. Immediately he shuts his eyes and begins to make snoring sounds analogous to committing two

of three actions suggesting misconduct (i.e., he is making things up and not accurately representing himself [a.k.a., Fabricating and Falsifying]), then when she arrives at his side, she will believe that he is sleeping. Joshua's intentional eye-shutting and fake snoring *directly led* Ellen *being deceived into believing* he was asleep; however, believing he was asleep *is the opposite of what Ellen would have believed otherwise* (i.e., that Joshua is awake) *had Joshua not engaged* in eye-shutting and fake snoring *behavior*. Based on these facts, we would argue that because Joshua committed FFP in PPRR, he has satisfied both parts of the criteria with the true parthood relationship comprising the definition of research misconduct as a whole in this situation.

Immaterially Prepositional "In." On the other hand, "in" may be interpreted to represent an immaterial parthood relation such that FFP, or its proximate result, is a figurative part of the definition whole along with PPRR, but the relationship between FFP and PPRR may be temporal. With a relation being temporal, the act or behavior of FFP need only occur *during* (i.e., temporal aspect) the course of PPRR occurring *without* being a literal part of it (i.e., immaterially a part). However, it would not qualify as meeting the criteria for the definition of research misconduct in this circumstance.

For example, were Joshua to have disguised himself *while presen*ting a report, but no aspect of the report itself was in any way fabricated, falsified, or plagiarized (FFP), although Joshua may have been guilty of not accurately representing himself (i.e., falsification) the same cannot be said of the research. Since a disguise of one's face or hair is not capable of being incorporated into the research report, it would not matter. Joshua may have been dishonest about his appearance, but in this instance according to the current interpretation of the definition and understanding of prepositional "in," he has not committed research misconduct. Therefore, how

one interprets the parthood relation of the preposition within the definition whole is what appears to be the determining factor of whether research misconduct has been committed.

As to whether "in" is to be taken as a locative-literal material or figuratively immaterial sense, it is the literal material sense of the word appears to allow for better coherence among the parts. Although one can fabricate, falsify, or plagiarize in any number of ways, if it does not literally materially occur and relate mereologically the FFP part to the proposing, performing, reviewing, or reporting PPRR part comprising the research whole itself, then there is insufficient relevance or evidence to merit a determination of research misconduct being committed according to the definition whole.

The reader should keep in mind what the degree of relevance of the FFP and PPRR parts to the definition whole may be. Furthermore, it is also essential to determine whether what Ellen suggests is any different from Joshua's actions qualitatively. Nevertheless, to address this concern by determining whether qualitative differences exist, one must scrutinize precisely *what* was done and *how* it was done. In doing so in the following section of this paper, both the ontological (i.e., what) and epistemological (i.e., how) commitments will be made explicit concerning grievous violations to which I refer as errors of *commission* and *omission,* as it pertains to research misconduct according to the PHS guidelines (2005).

Errors of Commission and Omission: Violations Link to Cognitive Imperfection

Despite the existence of notions for violations as both errors of *commission* and *omission* concerning research misconduct, it is not evident, at least to the author, that the two ideas are distinct. Regardless of whether they are distinct, a consideration of the suspected violation for which Joshua is responsible ought to allow us to determine the types involved.

The *falsification*, or inaccurate representation, concerning our case has occurred because Joshua both *performed* the act of deleting entries (i.e., *committed)* and *failed to include*, or *omitted*, the entries in the research record. Upon closer inspection of the alleged act of falsification that occurred, the *commission* may be interpreted as the "*how*" of the violation whereas the *omission* may be construed as the "*what*." The characteristics mentioned concerning the questionable behavior suggested that, as a framework for comprehension to be used in this section, *cognitive imperfection* may facilitate clarifying it conceptually.

Existing in a state of cognitive imperfection as we do, epistemologically speaking, the ability to claim factual knowledge, whether it be considered subjective or objective, is impaired. As a result of the impairment given the realm of actual things to be known, humankind will always have deficiencies in knowledge due to the manner in which we come to know through *sensory perception*. Regardless of how pristine the condition of the particular faculties responsible for providing one with information on which to rely for *justification of knowledge* claims, perspective necessarily filters or skews what is known to a degree.

Whatever the degree is to which perspective on a knowledge claim is filtered, it is guaranteed that due to an inability to perceive without perspective some of what one comes to know will be imperfect. Thus, any cognitive activity that is based on such incomplete knowledge guarantees that errors will inevitably occur. When these errors do occur, they will be either of two types: errors of *omission* or errors of *commission* (Rescher, 2003).

Error, from Latin errare" means “to stray, err” according to Oxford Dictionaries (2019). When straying, one is moving *away* from the *right* or *correct* path. In the case of responsible conduct of research, that *right, correct or honorable* path away from which one can stray is ethical behavior as outlined in the regulations given by governing organizations such as the PHS.

Failure to adhere to guidelines that have proscribed individuals in particular professions from engaging in certain behaviors or conduct results in *violations*. As is true of erring of any kind, violations may be understood to result from *omission* or *commission* when related to suspected cases of research misconduct.

Joshua's suspected violation, *per se,* is considered the unit of analysis with which we are concerned. As the unit of analysis to evaluate or assess research misconduct under the guise of *falsification*, it should be recognized that the suspected violation consisted of both acts of *commission* as well as *omission*. Since both types of the act were involved in the same violation, it becomes necessary to inquire whether in all legitimate instances of error or violations of both types must be concurrent comprising the same case of misconduct.

Acts of commission and omission are analogous to the *process* that resulted in the violation and the outcome of the *process* as the *product* that led to the violation, respectively. Given the nature of the relationship between a process and a product, even in the case of a *process* that has as a *product* the *process* itself, could it be possible for a violation of commision/process/"the how" to exist without a corresponding violation of omission/product/"the what" and *vice versa*?

While it would seem possible to violate through either *commission* or *omission* solely, we shall determine whether this is the case. An *omission* focuses on the aspect of "what" that led to the violation. Nonetheless, there can be no what without a preceding how. Acts of commission, conversely, concentrate on the aspect of "how" that lead to violations. Although perhaps not simultaneously occurring, both types of act necessarily occur together and in sequence. It is through the commission of some act an omission of some sort is implicit and by omission of

something a commission of some sort is implicit, as well. Thus, it seems as though each entails the status of existence of the other by its own.

Dimensions of *Deliberateness, Alteration*, and *Inclusion Characterize a Misconduct Violation*

In comparing both Joshua's actions with those suggested by Ellen, was there a significant difference between modifying what is included in an image and cropping it so as not to include a portion? Both alternatives it could be argued are considered deliberate and alterations. As a result of such deliberate alteration, pertinent visual data were excluded from the research reported that was obtained *during* the experimental process. Therefore, the author argues that there is no qualitative difference between Joshua's actions and Ellen's suggestion. Ellen's suggestion is as unethical as Joshua's despite being accomplished by different means.

Responsible Conduct of Research (RCR) consists of four main areas related to subjects, the research itself, the environment, and fiscal responsibility (Macrina, 2014). According to Macrina (2014), deviations from the standard through both violations of *omission* and *commission* may occur with equally grave consequences for the researcher (p. 18). *Violations of omission* and *commission* fall under the rubric of falsification in research misconduct, as defined previously to relate to the manipulation of research rendering an inaccurate representation of the record of research (Macrina, 2014). When not a result of an honest mistake, a *violation of omission* refers to leaving out information or data obtained whereas a *violation of commission* occurs when an act or behavior is performed, executed, or otherwise done that results in the transgression (OUP, 2019).

Joshua's infraction consisted of an act to *deliberately alter* an image of the research record to display the expected results *only* but not the unexpected ones. It was this decision to deliberately alter an image made by him that rendered his work an inaccurate representation even

though the explanation had been provided in the legend. Because both results occurred in the same experiment and may ultimately be equally important, selecting which results to report visually or verbally in one's research while leaving out or concealing others neither accurately represents the findings in the record of investigation, nor does it allow for the importance of unanticipated findings to be determined by the research consumer. This is just one perspective from which this case may be interpreted as tantamount to *falsification*. Furthermore, the *falsification* was comprised of both an *act of commission* and an *act of omission* in Joshua's case that together demonstrated the essence of falsification as fraud under research misconduct.

Ellen's suggestion of cropping the image to eliminate the unexpected findings while leaving only the expected ones, she claims, is better presumably because doing so would avoid having to *deliberately alter the picture* and the subsequent need to explain. Although the difference is that Ellen's suggestion avoids the need to explain, unfortunately, the similarity is that cropping the image of the linear array of amplified DNA fragments in the gel would be both *deliberate* and an *alteration*, which is precisely what characterizes Joshua's situation.

Joshua violated through *commission* (i.e., deliberate alteration of something included) whereas Ellen could be argued to have suggested he should violate through *omission* (i.e., not including something). That notwithstanding, the author claims that this distinction between Joshua's and Ellen's actions is merely apparent and in no way render Ellen's suggestion any less unethical in that the intentional cropping of the image to exclude unexpected results would be *at least as deliberate* an *alteration* as the underexposure of the image by Joshua was.

Although Ellen's suggestion would be *at least as deliberate an alteration* as Joshua's actions, this does not imply equivalence. Might there exist another factor that would allow us to definitively determine whether any of the two actions would be considered the worst case of

research misconduct and why? Yes. While Joshua may have *deliberately altered* the image, he *included* what he changed. Ellen, however, suggested that he *deliberately* modify the image (by cropping) but would then have him *fail to include* the altered portion. Therefore, it appears that *inclusion* is the one significant difference that distinguishes between both Joshua's and Ellen's *deliberate alterations.* Taken collectively, satisfying the set consisting of dimensions of *deliberateness, alteration, and inclusion are what ought to be* required for falsification as fraud under research misconduct to have genuinely occurred and comprise what the author refers to as *the Violation Imperative.*

It may seem pedantic, but, in fact, this one detail concerning inclusion is an example of what I refer to as a *relevant dichotomy* (Carroll, 2019). A *relevant dichotomy* may be defined as *a significant aspect, quality, or factor the sole presence or absence of which can be used to consistently discern two or more seemingly identical things from one another*. By consistently, it is meant that the aspect used as a *relevant dichotomy* both *accurately* and *reliably* performs when used. In other words, not only must a relevant dichotomy achieve its goal accomplishing what it was intended to, but it must do so each *time*.

An exemplar of a *relevant dichotomy* would be the use of fingerprints to distinguish identical siblings from one another. In otherwise genetically and physically identical siblings, the fingerprints of each one are unique. Due to their uniqueness, fingerprints both accurately and reliably discern any two such siblings from one another whether identical twins or the case of quadruplets.

Along with both *deliberateness* and *alterations*, the aspect of *inclusion* is both necessary and sufficient to consistently distinguish between both Joshua's actions and Ellen's suggestion. Unlike Joshua who included an explanation for the evident *deliberate alteration* that verbally

correlated with what was visually removed, Ellen's suggestion would result in a) it being nearly impossible to determine that the picture was manipulated at all, and b) not including an explanation of what was, and why it was, deliberately altered. Based on these facts, the author finds that Joshua's actions and behavior were not research misconduct. Furthermore, Ellen's suggestion would qualify as a case of failing to represent findings accurately in some form or other satisfying the criteria for falsification under the definition of research misconduct.

Accuracy in Representation

Representation is symbolic. In the case of the concept of eight, two multiplied by four, four multiplied by two, two times four, two x four, 4 x 2, 2 times 4, 2 x 4, 2 + 2 + 2 + 2, and 4 + 4 all symbolically represent the same thing. Despite the various ordering, using either symbols to represent numerals and mathematical functions, or words to describe the numbers and steps to be taken, it may be concluded that each way demonstrated that eight was an equally accurate representation of the same concept of eight. Nonetheless, if the author were to use this symbol 八 in relation to the same idea, then it may not be perceived as accurately representing eight. The reason it may not be perceived accurately is not merely because the author altered the symbol, but because *the person perceiving the symbol might not recognize it*. However, if the individual knows that the symbol is in Chinese for the concept of eight, then they will find that it was an accurate representation. **Thus, *familiarity with what is to be represented and with that used to represent it are required in order to claim there was an accurate representation.***

It may be noted that sometimes the symbols were identical in different expressions, while others they were not. However, **despite the differences or similarities to one another observed in the variety of ways in which the concept of eight was presented, the accuracy in representation determined based on the perception was not affected in this case.**

Therefore, ***it is not only possible, but there exist various ways in which to symbolize the same referent conceptually without affecting its accurate representation in any meaningful way.***

Joshua may not have *visually* shared the findings, but he did *verbally* share that they existed. Ellen, on the other hand, neither *visually,* nor *verbally* would share the entirety of her research findings by omitting the unexpected results, which the author would feel satisfies the criteria for falsification, as it relates to *failing to accurately represent one's research findings* (Public Health Service, 2005; Macrina, 2014). Therefore, many ways to accurately represent the conclusions from one's research exist and all of which in some way involve the alignment of multiple perspectives in order for the representation itself to be deemed accurate.

Discussion

Accurate representation is determined based on what is perceived equating with what is presented, which itself is conveyed without modification or manipulation. Ultimately, accuracy in representation relies on the faculties of sensory perception that assess how closely what is perceived matches what was supposed to be presented, unaltered. That is, sight, sound, taste, touch, and smell are relied on for accuracy of representation, which consists of a) presenting something as it is unaltered, and b) perceiving something as it is presented in an unaltered state. Nevertheless, there is potential for both criteria a) and b) to be met, yet the representation to still be considered inaccurate. In other words, if what is presented is unaltered and what is perceived is what is presented, then what is perceived is unaltered. It is possible to perceive what is unaltered as different than it was presented. The only way to reconcile this is by acknowledging that the subjective and interpretive step of perception via the faculties serve as lenses through which accuracy is framed.

Because perception is required, the sense organs are responsible for what is interpreted matching what is presented unaltered. If malfunctioning, or otherwise influenced, then the determination of accuracy in representation may be affected by how the organs operate. Thus, regardless how an unaltered color image of objects that a researcher claims if red is presented, to someone suffering from deuteranomaly/protanomaly colorblindness (Color Blind Awareness Foundation, 2017) since the color does not exist he or she will always accuse the researcher of not accurately representing research findings, which is the definition of falsification (Macrina, 2014). Nonetheless, however unlikely the analogous scenario may be to occur, that it is possible for both unaltered presentation from the researcher's perspective and perception of the unaltered presentation by another not accurately representing what the researcher claims illustrate the potential difficulty in consistently determining cases of research misconduct.

The only way to avoid problems is not to in any way modify what is being included. Nevertheless, cropping before inclusion results in a violation of *omission* that is difficult if not impossible to determine by anyone other than the guilty party. Although *omission* is as much a violation as is a *commission*, is it more acceptable because of the decreased likelihood of being caught? Moreover, it may be more important that what is omitted or committed is relevant. Was the *violation of commission* by Joshua pertinent to the research whole?

The written explanation that he provided may be adequate, and he did technically share, but the flagrant editing was not something that should have occurred. While Ellen's suggestion avoids the explanation, the cropping is still a *violation of omission* that is deliberate and results in alteration just as Joshua's action did. Both expected and unexpected results occurred in the same experiment and selectively deciding to include some, but not others, either by way of underexposing or cropping results is dishonest. Therefore, if Joshua is guilty of research

misconduct by his actions, then Ellen's suggestion would be at least as characteristic of research misconduct as Joshua's. If the author had the opportunity, then he would warn Joshua that Ellen's suggestion is to be avoided at all costs because it is either significantly and qualitatively different, or it is not; if it is not different, then there is no justification for taking her suggestion over what he has done, but if the suggestion is different, then the author would advise Joshua either to present the entire image or nothing at all.

Conclusion

Having experience with a hypothetical case revealed some of the challenges that one encounters concerning suspected research misconduct. Transitioning to challenging circumstances related to a real individual should facilitate the process of refinement. Such fine-tuning will occur in the context in which the *violation imperative* can be tested and explained. It should be understood that there is often a lack of agreement on what constitutes instances of falsification and research misconduct even when there is evidence that the aspects of *violation imperative* have been satisfied. Nevertheless, an exercise consisting of a case involving aspects of *deliberateness*, *alteration, and inclusion* as well as a Nobel Laureate will be beneficial. That benefit will be that the use of a high-profile case serves to remind the reader that at every level professionally people are subject to issues of ethical misconduct involving the aspects of th**e** *violation imperative***.** The aspects of the violation imperative are all directly related to the actions of the researcher and were also determined to have the potential to influence both the research results and the determination of guilt. Having established the *Violation Imperative* of which any possible definition of falsification or research misconduct ought to be comprised at a minimum, in the next paper, Part III, we will consider the suspected research misconduct case of Robert Millikan as presented by Pritchard & Goldfarb (2016).

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