



## Objectivity is a myth that harms the practice and diversity of forensic science

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“I found that trying to examine human nature through a scientific lens was a painful process: human experience can be neither replicated nor recorded with accuracy ... I began to look at myself as the scientific instrument through which the experience of others would be conveyed. However, unlike an Erlenmeyer flask, I could not be sterilized before each experiment—my own life experiences would always contaminate the way I perceived the experiences of others.”

-Breeshia Wade [1] in *Grieving While Black: An Antiracist Take on Oppression and Sorrow*.

### 1. Introduction

Forensic scientists have long held that objectivity is a core tenet of our analyses and the expert-witness statements that can result. Certainly, the rhetoric of objectivity holds an undeniable allure given the fact that we, unlike many other scientists, may testify to our results in a court of law. However, our faith in objectivity is complicated by the facts that: 1.) pure scientific objectivity does not exist; and 2.) espousing the myth of objectivity is neither neutral nor benign. We will consider both points herein, before concluding with recommendations for a strong, realistic, and ethical practice of forensic science that does not require faith in a dangerous myth.

### 2. Objectivity does not exist: forensic science data and conclusions are theory-laden

Typically presented as the dichotomous opposite of subjectivity, following the Enlightenment-era tradition of Cartesian analytical dualisms (e.g., nature vs. culture; subject vs. object), the epistemology of *objectivity* maintains that scientists are separate from the concrete phenomena that form the objects of their study [2–4]. Objective scientists, then, should be capable of dispassionately observing evidence and extrapolating data on this unitary and external reality with neutrality

and impartiality, completely unaffected by bias.

Since many scientists strive to be objective, they may maintain that they approach their analyses and reach conclusions without influence from their own backgrounds, experiences, beliefs, or values. However, the Cartesian dichotomy also acknowledges *subjectivity*: the interaction between scientists and their objects of study, holding that reality exists, but that our varying perceptions of it are culturally situated and contextually dependent. The more subjective of scientists, then, acknowledge and accept that they are inherently embedded in a specific cultural context, noting that the theories and values shaped by that context necessarily infuse and shape their scientific analysis and conclusions.

Beginning in the 17th century and continuing through the early 20th, most scientific endeavors pursued pure objectivity, utilizing an explicitly empirical, allegedly distanced approach often termed *positivism* [5, 6]. Francis Bacon, laying down the foundations of modern science over 400 years ago in his book *Novum Organum* [7], aspired to remove subjectivity from science altogether. He developed a doctrine wherein subjective obstacles act as ‘false idols’ that prevent us from making accurate observations and achieving understanding. According to Bacon and the generations of positivist scientists who would follow him, these idols distort the objective truth and thus obscure the laws that explain all biological, chemical, and social phenomena.

Starting in the mid-20th century, however, scholars from multiple disciplines began to question the idea that scientists could separate themselves, and their backgrounds, biases, and experiences, from the phenomena under study. *Philosophy of Science* scholars began to emphasize that science is a social construct that is inherently culturally embedded, context-dependent, and human-created [8–10]. The *Social Studies of Science* and *Science and Technology Studies* movements highlighted the idea that scientific facts and laws do not simply exist in a vacuum, waiting to be discovered by objective science. Rather, it is human scientists who create these facts and laws, which are necessarily embedded within the scientists’ values and theories—as well as within their cognitive architecture and constraints—both implicit and explicit [11–13].

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Research began to emerge from the disciplines of *Cognitive Science* and *Psychology* indicating that humans are often unable to determine the factors that bias them or to what extent they are being influenced [14–16]. The idea that scientific objectivity is unattainable and scientific data are inherently *theory laden* [17] began to sway researchers in disciplines including anthropology, history, philosophy, and other social sciences. Through the end of the 20th century and into the current one, bodies of theory in multiple disciplines began to shift, as scientists explicitly acknowledged their own subjectivities, admitted the possibility of bias, and allowed that multiple interpretations of the same data could be equally valid [4,18,19]. These biases, and ‘noise,’ influence all humans and impact all experts doing scientific work—including forensic scientists [20].

Understanding sources of error and potential biases are of paramount importance for scientists who provide opinions related to criminal investigations and testify in a court of law. Still, in contrast with scholars in other scientific disciplines, many forensic scientists have resisted the idea that our own values, theories, and experiences might bias the analyses we conduct and the conclusions to which we testify. This commitment to the ideology of pure objectivity continued within the forensic sciences for decades past the post-positivist movements in other fields—until a wave of studies turned the lens, clearly and specifically, on *us*. In disciplines from anthropology and pathology to fingerprint and DNA analysis, cognitive neuroscientists and psychologists demonstrated, time and again, that forensic science findings can be not only influenced by the expectations of the experts but also biased by the contextual information they receive (e.g. Refs. [21–26], for reviews, see: [27–29]).

Among other sources of bias, forensic scientists are influenced by: personal experiences which conceive individualized prejudices and preferences; the theories and methods of the discipline in which they practice; and the social environment they occupy [30]. In any forensic domain, there are myriad ways in which these three sources of bias might impact casework analyses and conclusions. A few examples from various forensic science disciplines are provided to illustrate each of the categories listed above.

- 1.) *Individualized, experience-based biases.* A forensic anthropologist may expect decedents recovered from particular contexts to have particular biological profile traits, if their previous crime-scene recoveries have shown these associations. Similarly, past experiences in death determinations may bias forensic pathology decisions [22]. Just as an archaeologist may not consider the possibility of a Viking warrior being a female [31], a forensic scientist tasked with recording an individual’s gender may not ascribe transgender or gender-nonbinary determinations if their medicolegal community has consistently de-emphasized these decedents over the course of their career (i.e., a type of base-rate bias; [32]).
- 2.) *Theories and methods.* A forensic anthropologist may preferentially use one approach over another (e.g., a craniometric vs. macro-morphoscopic approach to population affinity) based not on empirical evidence of its accuracy but on knowledge inherited from mentors or training programs. A crime-scene analyst may inadvertently de-prioritize horizontal and vertical scene data (i.e., provenience) if they choose a crime-scene recovery method that does not utilize archaeological protocols. Testing strategies in forensic analytical chemistry, and decisions on when to stop testing, may be impacted by biases informed by the methods and theories of the discipline.
- 3.) *Social environment.* A forensic scientist may harbor uninterrogated, implicit prosecutorial biases if they frequently consult in a law-enforcement context or work within and for a specific side (e.g., the allegiance effect and myside bias; see Refs. [33,34]). Alternately, a practitioner’s research and publications may actively engage with ideology and issues of social injustice if they themselves have experienced social marginalization.

Because biases also affect sampling and testing strategies, these biasing influences have the potential to impact not only interpretations of data (i.e., conclusions), but also the data themselves (i.e., observations) [28,32,35]. Biasing effects are further heightened when the quality of the evidence being examined is fragmented, degraded, or otherwise not pristine; when methodological inadequacies are present; when methods rely in large part on subjective human interpretation; and/or when the data are ambiguous or difficult to interpret [36,37]. Further, while some scientific disciplines are inherently more subjective than others, these differences manifest on a continuum, not in the traditionally perceived dichotomy of objectivity vs. subjectivity—and even at the objective end of the continuum, pure objectivity remains unattainable [10,38–40].

The consensus that emerges from this body of research is clear. Forensic science data are theory laden. Pure scientific objectivity is a myth. These consensus determinations hold true even though, as we explore further below, the pursuit of *mitigated objectivity* should remain a goal not only in the forensic sciences, but throughout scientific pursuits.

### 3. Faith in objectivity is neither neutral nor benign: the inherent danger of pure objectivity

At best, portraying our analyses as purely objective may be seen as inaccurate, overly optimistic, and naïve. At worst, portraying the rhetoric of objectivity can be dangerously misleading [41]. If forensic scientists imply that our results are scientific certainties—facts rather than interpretations—we contribute to misconceptions by jurors and other members of the public and potentially mislead the court from administering justice ([42]:2129; [43,44]). This not only runs counter to Daubert [45] and National Academy of Sciences [46] recommendations for bias, error and uncertainty analyses, but also espouses an outdated, positivistic idea of science as monolithic and scientists as omniscient [47].

Espousing the rhetoric of objectivity can have even more insidious effects. In the forensic sciences, the Cartesian conceptions of objectivity and subjectivity gain another definition, in which objectivity is often conceptualized as separation from the case under analysis, with subjectivity entailing loss of that scientific distance through acts of prejudice or advocacy [48]. Traditionally, we hold up the former as the goal, while we discourage the latter. This rejection of ‘subjective advocacy’ in favor of ‘objective neutrality’ plays a particular role in a sociopolitical climate in which race, racism, and social injustice are at the forefront of our consciousness [49]. Specifically, it allows forensic scientists to disengage from social issues. In our teaching, mentorship, and leadership, forensic scientists frequently assert that our commitment to scientific objectivity prevents us from standing in solidarity with members of socially marginalized communities or explicitly denouncing racism and other forms of violence that disproportionately impact them. Yet, due to well-documented inequities in social systems worldwide, forensic casework is disproportionately practiced on individuals who experience social marginalization [50–52]. The very communities our casework should be serving are the same communities our mythic “objectivity” prevents us from supporting.

This commitment to scientific objectivity thus betrays extreme privilege. Eschewing passion, empathy, and advocacy in the name of ‘remaining objective’ veils a deeper goal to maintain the status quo. Those forensic scientists who believe themselves to be impartial and detached observers of casework individuals and evidence are in reality taking a position: neutrality, in this context, is itself a subjective stance. These “objective” forensic scientists are typically not the ones experiencing the effects of systemic oppression and injustice. Meanwhile, the “subjective” forensic scientists they critique are frequently those without the privilege to disconnect from the reality of biased and repressive systems. While there are many reasons why a forensic scientist may not hold the privilege of “objectivity,” practitioners identifying as Black, Indigenous, Hispanic and Latinx, Asian, and persons of color, in particular, are forced to reconcile their existence as humans affected by oppressive systems and an

ability to remove this truth in forensic settings.

The very existence of forensic scientists of color embodies advocacy and activism, as social conditions have forced them to fight for their lives and their opportunities every day. When leaders, mentors, and colleagues in the forensic science community inform these practitioners that objectivity is a necessary quality of a forensic scientist, and that their advocacy or activism undermines their objectivity, they thus deny these practitioners status as legitimate forensic scientists. As such, the rhetoric of objectivity is inherently exclusive. When we espouse it, we run the risk of alienating the practitioners that forensic science disciplines most sorely need.

The experiences of persons of color do not detract from their abilities to practice good science; rather, they allow nuance and a coveted grasp of intersectionality that are rare and valuable within historically homogenous forensic sciences disciplines [53–55]. The contexts in which intersectional identities might positively inform a practitioner's analyses are nearly innumerable. However, a few examples from our discipline—forensic anthropology—can illustrate these points: an immigrant or immigrant-descended forensic anthropologist conducting casework and advocacy in a border context; a forensic anthropologist from a local population leading international teams investigating past human-rights abuses in a particular region; a forensic anthropologist of color contesting *WEIRD* (*sensu* Ref. [56]) narratives of race and ancestry by crafting anthropological knowledge of population-affinity-estimation method and theory [53,57,58]. The 'traditional' practice of a forensic anthropologist—often conceived as medical-examiner consultation casework (i.e., biological profile, trauma, and taphonomic analyses) and subsequent testimony [59]—is but one role we fill. In many of our diverse roles, intersectionality, and the access to diverse spaces and perspectives it affords, proves an asset, not a detriment. There is a current shift within our field and, we expect, many others, as we are moving from technical expertise to a more nuanced practice that embraces its position as impactful and capable of enacting societal change.

#### 4. Recommendations: advancing an inclusive forensic science

As Charles M. Blow notes, "One does not have to operate with great malice to do great harm. The absence of empathy and understanding are sufficient" (quoted in Ref. [60]:67). Accepting the reality that pure objectivity is a dangerous myth, and acknowledging both the effects of implicit bias and the validity of emotion, allow the opportunity for transparency about what happens in reality—and then for accountability. Practicing transparency and accountability does not ring the death knell of strong and defensible forensic science research and practice. In fact, in addition to showing the subjective nature of forensic science, the past several decades of research on cognitive bias have enabled the development of effective tools of quality control to constrain that subjectivity such that legitimate scientific conclusions can be drawn regardless of a practitioner's perspectives and implicit biases.

Peer review, external review, blind and blended-blind analysis, and the Linear Sequential Unmasking (LSU) of biasing case data all have the potential to reduce the observer effects that bias forensic scientists [32,61,62]. Strong, theoretically grounded, and continuously evaluated and updated methods can reduce the impacts of biases that do breach this first line of defense [63,64]. These methods can be developed and continuously strengthened utilizing a plurality of perspectives, including the voices not only of forensic scientists but also of non-scientist stakeholders with diverse experiences and access to spaces that are denied to practitioners. Rather than presenting their conclusions as purely objective facts, scientists can develop statistics that quantify the probability that their determinations are correct [65]. Scientific conclusions can be further strengthened when the analysts themselves are constrained by competency testing and standardized analytical protocols [47].

Some level of subjectivity is inherent in all human scientific pursuits, but the very process of science, iterative and continuously refined, can work to constrain it. In acknowledging and mitigating this subjectivity,

we also mitigate our vision of pure objectivity, working instead toward *mitigated objectivity*—a guarded but cautiously optimistic approximation of objectivity that acknowledges the theory-laden nature of data but attempts to constrain inaccurate interpretations by tacking back and forth among strong theory, sound scientific practice, and the existence of reality [4]. Mitigated objectivity allows us to be honest about our capabilities while enabling disciplinary critique and improvement [47]. Importantly, by practicing this more realistic approach to forensic science, we do not betray our ethical commitment to advancing social equity; we fulfill it. Mitigated objectivity enables both implicit and explicit biases to be foregrounded and constrained by sound method and theory.

To that end, we must reject the dangerous assumption that adopting a humanistic stance on social issues undermines a forensic scientist's "objectivity" with "political" advocacy. Supporting historically marginalized groups is not a political issue; it is a human rights issue. Politicization of identity is designed to maintain the power of those whose identities—and, in this case, whose scientific perspectives—are deemed neutral. There are indeed implicit and explicit prejudices (usually held against members of socially marginalized groups) that can contaminate scientific interpretations, and politicizing humanitarian advocacy distracts from the underlying, positive goal of reducing the effects of these prejudices in forensic science observations and conclusions.

Far from being impartial observers of a reality that we cannot change, forensic scientists exist in spaces armed with the potential to aid in dismantling these systems of injustice. If we wash our hands of engaging with issues of social injustice by remaining committed to a myth, we are choosing to side with systems of oppression. Thus, we ask, encourage, and expect forensic scientists to be full human beings that care for others and themselves, with the confidence in their abilities to perform science and defend their conclusions. Scientists can exist in a space allowing a human-rights perspective on issues of social relevance and equitable analysis of evidence.

#### 5. Conclusions

Espousing the myth of pure objectivity overstates forensic scientists' disciplinary capabilities and thus sets practitioners up for failure. When we contrast our alleged neutrality with the subjective stances of advocacy and empathy, we alienate practitioners who do not have the option of taking that privileged stance. We cannot continue to allow a dispassionate pursuit of "objectivity" to support the status quo. In our research, teaching, and practice, we must reject the myth of pure scientific objectivity once and for all, so that we can move on to more realistic, transparent, productive, defensible, inclusive, and ethical forensic science.

#### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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