Twenty-first century perspectivism: The role of emotions in scientific inquiry

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People aren't good at doing things they dislike. Asking [George W. Bush] to support government intervention is like asking me to judge the Miss America contest — if your heart's not in it, you don't do a very good job.
~ United States Representative Barney Frank, 13 May 2008

Abstract: How should emotions figure in scientific practice? I begin by distinguishing three broad answers to this question, ranging from pessimistic to optimistic. Confirmation bias and motivated numeracy lead us to cast a jaundiced eye on the role of emotions in scientific inquiry. However, reflection on the essential motivating role of emotions in geniuses makes it less clear that science should be evacuated of emotion. I then draw on Friedrich Nietzsche's perspectivism to articulate a twenty-first century epistemology of science that recognizes the necessity of emotion to inquiry but aims to manage the biases that emotions can introduce. Twenty-first century perspectivism is both social and (temporally) distal, helping it to overcome a paradox of self-critical inquiry.

Introduction

How should emotions figure in scientific practice? We can distinguish three broad answers to this question, ranging from pessimistic to optimistic:

1) Emotions should be absent from science. To the extent that emotions direct or structure a scientist's line of inquiry, acquisition of evidence, analysis of evidence, or interpretation of evidence, the scientific credentials of her research are called into question. Call this the *austere answer*. The austere answer is represented by twentieth-century sociologists of science such as Storer (1966) and Barber (1962).
2) Emotions — or a proper subset of them — are epistemically allowable only at certain stages of scientific inquiry. For example, they are allowable in the context of discovery but not the context of verification (Reichenbach 1938). Alternatively, only members of (a subset of) the class of epistemic emotions (Morton 2010; see also Barbalet 2002) — which includes curiosity, fascination, intrigue, hope, trust, confidence, distrust, mistrust, surprise, doubt, skepticism, boredom, puzzlement, confusion, wonder, awe, and faith — are allowable in scientific inquiry, while other emotions such as disgust and contempt are beyond the pale. Call this the *permissive answer*.
3) Some or all emotions are required or at least recommended in scientific inquiry. According to this *enthusiastic answer*, some or all emotions contribute to the success of scientific inquiry. This might be because emotions motivate inquiry in virtue of the way they "capture and consume attention" (Brady 2013), thereby leading the people who embody them to investigate whether their fittingness conditions hold (e.g., fear leads one to look for and notice dangers and threats in the local environment). Alternatively, the usefulness of emotions in science could be due to their contribution to the "organized skepticism" (Merton 1973) that makes science reproducible and reliable.

In this paper, I offer a three-stage argument for a version of the enthusiastic answer. First, I explain the plausibility of the austere answer by pointing to the literature on confirmation bias (Nickerson 1998) and motivated numeracy (Kahan et al. 2013). Next, I offer an exemplarist (Zagzebski 2017) argument for the conclusion that at least certain emotions — among them some potentially ugly emotions like ambition and vanity — are ineliminable from some of the most celebrated scientific discoveries.

If this is right, then scientists face a dilemma: on the one hand, there are reasons to worry about the biasing role of emotions in scientific inquiry, but on the other hand, those same emotions sometimes contribute in positive and potentially irreplaceable ways to successful inquiry. This leads to the third stage of my argument: drawing on Friedrich Nietzsche's (1882/2001, 1887/1967) doctrine of perspectivism, I argue that it is possible to take strategic advantage of confirmation bias and motivated numeracy by distributing emotions both temporally and socially. Rather than idling in emotion-free doldrums, scientists and other researchers should systematically tack towards the truth by engaging now in inquiry motivated by one emotion then in inquiry motivated by a different, perhaps contrary, emotion.

Confirmation bias and motivated numeracy

Confirmation bias is the tendency to ask questions, seek evidence, interpret evidence, and remember evidence and conclusions in a way that confirms one's prior beliefs, hypotheses, or expectations. Wariness of this bias has a long and distinguished pedigree. For example, Francis Bacon (1620, p. 79) argued that "human understanding when it has once adopted an opinion […] draws all things else to support and agree with it. And though there be a greater number and weight of instances to be found on the other side, yet these it either neglects or despises." In the same vein, Charles Darwin (2009, p. 44) wrote in his autobiography that, in order to force himself to be fair-minded, he adopted the following rule: "whenever a published fact, a new observation or thought came across me, which was opposed to my general results, to make a memorandum of it without fail and at once; for I had found by experience that such facts and thoughts were far more apt to escape from the memory." One plausible explanation of the phenomenon of confirmation bias is that people enjoy positive emotions (e.g., confidence, pride, smugness) when their prior beliefs are confirmed but suffer negative emotions (e.g., frustration, confusion, anger, shame) when their beliefs are challenged or disconfirmed. To the extent, then, that people tend to put themselves in situations that they expect will elicit positive emotions and not elicit negative emotions, their inquiries will be driven by confirmation bias (Oswald & Grosjean 2004).

More recently, Kahan et al. (2013) investigated the interaction between numeracy and emotionally-motivated cognition. Numeracy is a well-studied construct that includes aspects of quantitative intelligence and a disposition to engage systematically and effectively with data represented in the sorts of graphs and figures that often accompany scientific publications and serious journalism. If numeracy were independent of emotion- and value-based influence, then people who score high in numeracy should do equally well interpreting data that supports their convictions and data that runs contrary to their convictions. To set the stage, Kahan et al. asked a large number of participants to read the following summary of a hypothetical medical trial:

> Medical researchers have developed a new cream for treating skin rashes. New treatments often work but sometimes make rashes worse. Even when treatments don't work, skin rashes sometimes get better and sometimes get worse on their own. As a result, it is necessary to test any new treatment in an experiment to see whether it makes the skin condition of those who use it better or worse than if they had not used it.
>
> Researchers have conducted an experiment on patients with skin rashes. In the experiment, one group of patients used the new cream for two weeks, and a second group did not use the new cream.
>
> In each group, the number of people whose skin condition got better and the number whose condition got worse are recorded in the table below. Because patients do not always complete studies, the total number of patients in each two groups is not exactly the same, but this does not prevent assessment of the results.
>
> Please indicate whether the experiment shows that using the new cream is likely to make the skin condition better or worse.

	Result	
	Rash Got Better	Rash Got Worse
Patients who did use the new skin cream	223	75
Patients who did not use the new skin cream	107	21

What result does the study support?

- People who used the skin cream were more likely to get better than those who didn't.
- People who used the skin cream were more likely to get worse than those who didn't.

This task is deceptively simple. The majority of participants perform worse than chance (i.e., more than 50% choose the wrong answer and would do better simply to flip a coin). This is because correctly answering the question requires the participant to compare not the absolute numbers in any of the cells but the *conditional probabilities* of the rash getting better given one or another treatment. The probability that the rash got better given that the patient used the cream equals the number of people who got better after using the cream (223) divided by the number of people who used the cream (223 + 75 = 298): 223/298 = 74.83%. The probability that the rash got better given that the patient didn't use the cream equals the number of people who got better after not using the cream (107) divided by the number of people who didn't use the cream (107 + 21 = 128): 107/128 = 83.59%. This contingency table therefore supports the conclusion that, even though more people who used the cream got better than people who didn't use the cream, the cream does not help with the rash and may in fact make it worse.[1]

This is not yet a test of confirmation bias or motivated numeracy. We don't know whether the participants generally expect experimental medical treatments to be effective, so we don't know what they believed or expected before they looked at the contingency table. To control for this, Kahan et al. included a second condition in which the labels of the columns of the contingency table were switched, meaning that the data now suggested that the cream was effective in treating the rash. In general, participants were slightly more likely to give the correct answer when the data suggested that the cream was effective, but the difference between conditions was small. And regardless of whether the data suggested that the cream was effective, the more numerate the participants were (as measured by an independent test), the more likely they were to answer correctly.

The results described so far should not be particularly surprising or worrisome. However, the other two conditions in Kahan et al.'s study point in the direction of problematic motivated numeracy. The basic idea here is that, when the question they are answering bears on their values and their emotional set, highly numerate people may be inclined to engage or accept the deliverances of their cognitive powers only if the data support their prior commitments. It's one thing to examine a contingency table for evidence of whether a hypothetical cream successfully treats a hypothetical rash. It's something very different to examine a contingency table for evidence of whether a favored political policy is effective. To this end, Kahan et al. presented further subjects with the same contingency table, except that this time the results were said to represent the effectiveness (or not) of gun control policies in reducing crime.

[For readers unfamiliar with contemporary policy debates in the United States: gun control is a highly polarized controversy. Generally speaking, Americans who identify as liberal, left-wing, or Democratic (the party, not the political ideology) favor gun control as a means to reduce crime and violence, whereas Americans who identify as conservative, right-wing, or Republican (again, the party, not the political ideology) oppose gun control as ineffective in reducing crime and violence — and potentially even counterproductive. All participants in this study were American adults.]

As in the cream/rash conditions, some of the participants in the gun-control/crime conditions saw a contingency table that suggested that gun control policies led to a reduction in crime while others saw a contingency table that suggested that gun control policies led to an increase in crime. Participants were also independently tested both for political ideology and

[1] To establish this more definitively one would have to use more sophisticated statistical tests, such as chi-squared or Fisher's exact test.

numeracy. Most liberal (conservative) participants presumably came into the study with the prior belief that gun control policies reduce (increase) crime. This study therefore presented an opportunity to test whether highly numerate liberals and conservatives would effectively engage their numeracy regardless of what the evidence suggested, or only do so when the evidence pointed in the direction of their prior commitments.

Whereas political ideology had almost no effect on how effectively participants interpreted the cream/rash contingency table, it had a large effect on how effectively they interpreted the gun-control/crime contingency table — which, I must emphasize, contained exactly the same numbers. Highly numerate liberals were almost certain to choose the correct interpretation when the table suggested that gun control policies led to a reduction in crime, but they were barely above chance when the table suggested that gun control policies led to an increase in crime. Similarly, highly numerate conservatives were very likely (though a bit less than guaranteed) to choose the correct interpretation when the contingency table suggested that gun control policies led to an increase in crime, but they were below chance when it suggested that gun control policies led to a reduction in crime. Similar patterns held, though with smaller partisan gaps, for moderately numerate and innumerate liberals and conservatives.

Taken together, the literatures on confirmation bias and motivated numeracy spell trouble for the role of emotions in science. Of all people, scientists most need both to be highly numerate and to effectively exercise their numeracy — regardless of whether the evidence supports their pet hypotheses. While Kahan et al.'s study used lay participants rather than professional scientist participants, we should not expect that scientists are somehow immune to the kinds of biases demonstrated in this this study. Indeed, given that the partisan gap was larger among highly numerate participants, there is reason to worry that scientists may be even more susceptible to motivated numeracy than their lay counterparts. Essentially, they have more effective tools ready to hand when it suits their non-scientific interests to use them, and they can opt not to use those tools when doing so would undermine their antecedent commitments. Furthermore, as Kahan et al. point out, policy-makers who rely on scientific advisors for guidance (a laudable minority of policy-makers at best) are in an even tougher position. They tend to be less numerate than the scientists they rely on, and they too are presumably susceptible to the same biases as everyone else.

If this is right, we have a strong reason to favor the austere answer. When scientists and those they advise find themselves in the lucky position of having evidence that supports what they already think and does not run contrary to their emotionally-backed commitments, they are likely to interpret the evidence correctly (perhaps even more likely to do so than scientists with other commitments or no relevant commitments). However, when they find themselves in the all-too-familiar position of having evidence that undermines what they already think or runs contrary to their emotionally-backed commitments, they are likely to misinterpret the evidence in a way that makes them almost indistinguishable from the innumerate masses. In the next section, I argue that, despite this concern, evacuating scientific inquiry of emotion may prevent or make less likely significant scientific achievements.

Scientific exemplarism as a vindication of emotion-motivated inquiry

In light of the literature on confirmation bias and motivated numeracy, we have a strong reason to favor the austere answer. In this section, I argue that we have even stronger reasons to allow at least some emotions — including some rather ugly emotions — in scientific practice. First, the literature on the demarcation between science and pseudo-science, along with the literature on scientific revolutions, is peppered with the language of emotion — especially epistemic emotion. Karl Popper (1963) talks of a scientist's attitude to their hypotheses as one of "hope" rather than belief. He distinguishes science from pseudoscience by sneering at the "faith" characteristic of the latter and praising the "doubt" and openness to testing of the former. He argues that the "special problem under investigation" and the scientist's "theoretical interests" determine her point of view, framing some parameters and potential connections as worthy of investigation and most others as unworthy. Imre Lakatos (1978) contrasts scientific knowledge with theological certainty that "must be beyond doubt." Thomas Kuhn (1962) says that the attitude scientists have towards their paradigms is one of not only belief but also "trust." He claims that scientists received the discovery of x-rays "not only with surprise but with shock […] though they could not doubt the evidence, [they] were clearly staggered by it." This suggests that at least some emotions are acceptable and even essential in scientific practice.

My main argument, however, relies on the fact the geniuses who have achieved many of the most significant scientific advances were motivated by their emotions, and the depth of that motivation suggests that emotional influence was essential to their achievements. Deprived of their emotional resources, these exemplary scientists would most likely have wasted their time and capabilities. If this is right, then, to the extent that we accept exemplars as guides to the mental and moral states and dispositions we should strive to embody, emotions are vindicated in scientific inquiry.

Despite Linda Zagzebski's (2017) attempt to put a twenty-first century veneer on it, exemplarism is a doctrine that dates back at least to Thomas Aquinas (Doolan 2008). In her version of the doctrine, theorizing about virtue should be guided by identifying one or more exemplary and admirable individuals, then investigating which traits distinguish these individuals from others. Those traits count as virtues, no matter what they turn out to be. This approach reverses the direction of analysis employed by many virtue theorists. Instead of starting with a (structured) list of virtues or a general definition of virtue, then asking of particular individuals whether they embody virtue, Zagzebski urges philosophers to start with individuals about whom we are certain and then ask what makes them so admirable. Zagzebski's own work focuses on three generic types of exemplars: the saint (who exemplifies charity), the sage (who exemplifies wisdom), and the hero (who exemplifies courage). She mentions the genius as a fourth potential type but rules it out because genius allegedly depends too much on "natural talent" rather than acquired dispositions. However, given her commitment to admiration-based exemplarism, Zagzebski has nowhere to stand in making this argument. If geniuses are generally admired — and it seems that they are — then whatever traits make them admirable count as virtues according to exemplarism, regardless of whether they are acquired or innate.[2]

When it comes to scientific inquiry in particular, ruling the genius out of hand is especially unattractive. Furthermore, Zagzebski (2017; see also Zagzebski 2010) insists that exemplars should enjoy near-universal admiration. In this way, they serve as publically-recognized normative landmarks. However, Zagzebski's own list of exemplars is more than a little controversial. She considers Mother Teresa a saint, but others have plausibly argued that she was a moral monster who took a perverse pleasure in the suffering of those she cared for (e.g., Hitchens 1995). Disagreement over exemplars extends further. In an obituary published in its newsletter *Dabiq* (May 2015), the Islamic State celebrated Hudhayfah al-Battāwī as a hero,

[2] And, I should further point out, it is not at all clear that genius is innate — or any more innate than other admirable dispositions. For more on this point, see Skorburg & Alfano (2017).

but Egyptian Copts remember him as a kidnapper and murderer. And as philosophers like to remind their students, Socrates' wisdom got him executed on the charge of corrupting the youth. Geniuses, by contrast, may be easier to agree about.

If this is on the right track, one compelling way to evaluate the appropriateness of emotions in scientific inquiry is to examine the emotional lives of recognized geniuses such as Nobel laureates. In this vein, Paul Thagard (2002) mined James Watson's (1969) autobiographical account of the discovery of the double-helix structure of DNA for emotion terms. The most common terms related to interest and the joy of discovery, followed by fear, hope, anger, distress, aesthetic appreciation, and surprise. This is no exception, as Thagard (2006) shows: François Jacob (1988), another Nobel laureate, characterized his own research as motivated by "intense joy" and "savage pleasure" in discovery. Likewise, Thagard points out that Richard Feynman (1999), another Nobel laureate, described his inquiries as motivated by "the pleasure in finding a thing out, the kick of discovery, the observation that other people use [my work]." And Nobel laureate Santiago Ramón y Cajal (1999) claims that, among the emotions essential to success in biology are "devotion to truth," "passion for reputation," and patriotism. The latter two emotions don't seem to have much to do with truth directly; vanity and patriotic fervor hardly count as epistemic emotions. Likewise, the ambition that infamously drove James Watson to acquire Rosalind Franklin's Photograph 51 (Maddox 2003), which in turned enabled him and Crick to claim precedence in discovering the double-helix, was not an epistemic emotion. Unseemly disputes about priority in science date back at least to the jostling between Newton and Leibniz (Merton 1957). If Watson and Ramón y Cajal are to be trusted when they describe their own motivations, it seems that even ugly emotions may have a place in successful scientific inquiry. As Nietzsche (1882 / 2001) puts it in section 57 of *The Gay Science*, which he titled "*To the realists*," "aren't you too in your unveiled condition still most passionate and dark creatures, compared to fish, and still all too similar to an artist in love?" Despite the concerns raised in the previous section, reflection on the motivations of the most successful scientists should incline us towards the permissive or even the enthusiastic answer. In the next section, I argue for the latter.

Towards a twenty-first century perspectivism

If my arguments thus far are on the right track, we should worry about the role of emotions in science because they are liable to exacerbate confirmation bias and motivated numeracy, yet we should also endorse their role in science because they are essential motivators of some of the most celebrated geniuses. The fundamental puzzle, then, is how scientists should manage their emotional lives in such a way that they take advantage of the motivation that even ugly emotions furnish without falling into epistemic traps. In this concluding section, I argue that this tension can be resolved by accepting an updated version of Nietzsche's doctrine of perspectivism.

This doctrine is related to but more tactical than Coady's (1992, p. 205) point about interestedness and disinterestedness in inquiry:

> the disadvantages that may arise from the partiality of an interest may be counterbalanced by the disadvantages that lack of interest may create. After all, a strong interest in some issue makes one pay a lot of attention to what is going on; the attention may be biased by the strength of the interest but the observation will not suffer from the dangers attendant upon casual concern. Lack of a strong

> interest in the issue or the outcome is liable to produce unfocused attention and lack of observation.

Following Coady's implicit advice would help scientists to avoid an epistemic landscape in which, as W. B. Yeats put it, "the best lack all conviction, while the worst / Are full of passionate intensity." He contrasts unmotivated inquiry with inquiry motivated by partial interests. Nietzsche expands the set of options by drawing a three-way contrast: unmotivated inquiry (which he considers absurd), inquiry motivated by one-sided interests (which he also criticizes), and perspectivism. To give a better idea of what he means by perspectivism, I quote at length from *The Genealogy of Morality*, essay 3, section 12:

> But precisely because we seek knowledge, let us not be ungrateful to […] reversals of accustomed perspectives and valuations […]: to see differently in this way for once, to *want* to see differently, is no small discipline and preparation of the intellect for its future 'objectivity' — the latter understood not as 'contemplation without interest' (which is a nonsensical absurdity), but as the ability *to control* one's Pro and Con and to dispose them, so that one knows how to employ a *variety* of perspectives and affective interpretations in the service of knowledge.

Nietzsche denigrates the ideal of "contemplation without interest" here for the same reason that he scoffs at the "realists" in the passage from *Gay Science* quoted earlier. He holds that all inquiry is motivated in some way. Without motivation, the inquirer would sit idle. Without emotional engagement, the inquirer would not be in a position to filter the stream of perception and cognition for relevant and connected information (Evans 2002; Damasio 1994; Smith 2017). Whereas a similar observation leads Coady (1992) to settle for motivated inquiry as unavoidable, and to hope that its biasing effects will not be as detrimental as the effects of emotional uninvolvement, Nietzsche advocates disposing of one's "Pro and Con" in an effort to "employ a *variety* of perspectives and affective interpretations in the service of knowledge." In the next paragraph, he advises:

> let us be on guard against the dangerous old conceptual fiction that posited a 'pure, will-less, painless, timeless knowing subject'; let us guard against the snares of such contradictory concepts as 'pure reason,' 'absolute spirituality,' 'knowledge in itself': these always demand that we should think of an eye that is completely unthinkable, an eye turned in no particular direction, in which the active and interpreting forces, through which alone seeing becomes seeing *something*, are supposed to be lacking; these always demand of the eye an absurdity and a nonsense. There is *only* a perspective seeing, *only* a perspective 'knowing'; and the *more* affects we allow to speak about one thing, the *more* eyes, different eyes, we can use to observe one thing, the more complete will be our 'concept' of this thing, our 'objectivity,' be. But to eliminate the will altogether, to suspend each and every affect, supposing we were capable of this — what would that mean but to *castrate* the intellect?"

Leaving aside Nietzsche's colorful metaphors, the basic idea here is that, instead of either hoping that a single bias will not be too severe or attempting to side-step bias by avoiding motivated inquiry altogether, scientists (and other researchers) should aim to balance their biases by approaching the same object of inquiry from different emotional perspectives. If trust and confidence lead us to be too easy on a particular hypothesis, then approaching the same hypothesis with an attitude of doubt and mistrust will help to balance the scales. And it may even be necessary to include non-epistemic emotions in this process to achieve as synoptic a perspective as possible.

Achieving this kind of control over one's Pro and Con, over one's affective set, is easier said than done. This is why I now want to go beyond the hints provided by Nietzsche to articulate a twenty-first century perspectivism. My contention is that Nietzsche's recommendation is best implemented by, as I put it elsewhere (Alfano 2015), going social and going distal. To see why perspectivism would be well-served by going social and distal, we can analogize Nietzschean perspectivism to Moore's (1993) paradox. Moore famously pointed out that it is paradoxical to say, "It's raining right now, but I don't believe that it's raining right now." In his seminal analysis of Moore's paradox, Jaakko Hintikka (1962) made several important observations about this paradox. First, it only sustains an air of paradox when it is in the first-person. There is nothing odd about saying, "It's raining right now, but she doesn't believe that it's raining right now." Second, it only sustains an air of paradox when presented in the present tense. There is nothing odd about saying, "It was raining, but I didn't believe that it was raining." This is just a report of a false belief or of ignorance, which is common enough. Hintikka argued that these social and temporal constraints on Moore's paradox stem from the fact that it is an assertion, and that assertion expresses belief. When someone says, "It's raining right now," they express the belief that it's raining right now. And then when the same person goes on to say, "but I don't believe that it's raining right now," they report that they do not have the belief they just (seemingly) expressed. This is not an outright contradiction, but it verges on one. Changing either the person or the tense of the verb relaxes this tension. "It was raining," expresses a current belief about the past, which is not in any kind of tension with the report, "but I didn't believe that it was raining." Likewise, "It's raining, but she doesn't believe that it's raining" expresses the speaker's belief and then reports *someone else's* ignorance.

If they are not careful, researchers who try to follow Nietzsche's advice risk running aground on the inquiry version of Moore's paradox. They are liable to say things like, "The evidence suggests that *p*, but I doubt that *p*" or, "The evidence disconfirms *p*, but I hope that *p*." Combining beliefs and epistemic emotions in this way is psychological difficult, if not impossible. But, just as the tension in Moore's paradox can be resolved by shifting either the person or the tense, so can the tension in the paradox of perspectivism be resolved by going social or going distal. Going (temporally) distal allows a researcher to engage in hopeful motivated inquiry one day, followed by a bout of skeptical inquiry (about the same hypothesis) the next day.[3] For researchers in a publish-or-perish environment, such delays may be unpalatable. They may therefore prefer to go social: distributing positive epistemic (and non-epistemic emotions) between the researcher and other experts. Going social in this way enables a researcher to engage in hopeful motivated inquiry while facing opposition other researchers who approach the same hypothesis with skepticism and various other negative emotions. These

[3] Or, as recommended by Horace, delaying nine years — or even thirty-six years as Copernicus famously did with *De Revolutionibus Orbium Coelestium*.

strategies are mutually compatible, and if they work as I've suggested, they may enable researchers not to sail directly into the epistemic wind but to systematically tack towards the truth.

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