Epistemic Corruption and Manufactured Doubt: The Case of Climate Science

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Abstract. Criticism plays an essential role in the growth of scientific knowledge. In some cases, however, criticism can have detrimental effects; for example, it can be used to 'manufacture doubt' for the purpose of impeding public policy making on issues such as tobacco consumption and greenhouse gas emissions (e.g., Oreskes & Conway 2010). In this paper, we build on previous work by Biddle and Leuschner (2015) who argue that criticism that meets certain conditions can be epistemically detrimental. We extend and refine their account by arguing that such criticism can be *epistemically corrupting*—it can create social conditions that are conducive to the development of epistemic vice by agents operating within them.

Traditionally, criticism has been regarded as largely, if not wholly, beneficial for scientific progress, as it is essential for identifying biases and errors in hypotheses, methodologies, background assumptions, interpretations of data, and inferences. In his discussion of freedom of thought, John

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Stuart Mill (1859) argues that dissent from consensus views—even dissent that is epistemically flawed or misguided—can have epistemic benefits, as it can deepen our understanding of consensus views and their justifications. Philosophers of science from Karl Popper to Paul Feyerabend to Philip Kitcher to Helen Longino to Miriam Solomon have all, in various ways, highlighted the epistemic benefits of criticism.[1]

Although systematic criticism is certainly central to scientific inquiry, a growing number of scholars in science and technology studies, particularly in the area of agnotology, have begun to identify ways in which criticism can impede epistemic progress. Many of these studies focus on the motivated tendency of some stakeholders to "manufacture doubt" regarding the legitimacy of scientific findings for the sake of economic, political, or other partisan purposes. Proctor examines the ways in which the tobacco industry encouraged research that questioned the links between smoking and adverse health effects.[2] Oreskes and Conway show that many of the same techniques, employed by some of the same stakeholders and researchers, have been used to question the links between anthropogenic greenhouse gas emissions and global climate change.[3] In these cases, hypotheses were criticized *not* for the purpose of advancing knowledge but rather to impede knowledge production and policy making. In the now infamous words of a cigarette company executive, "[d]oubt is our product, since it is the best means of competing with the "body of fact" that exists in the minds of the general public. It is also the means of establishing a controversy."[4] Clearly, criticism of this kind—now usually called "doubt mongering"—can be detrimental; but the precise respects in which it is detrimental have not been fully investigated.

We might distinguish, broadly but usefully, between three main ways in which the artificial generation of dissent can be detrimental: *political*, *moral*, and *epistemic*. These are not rigidly distinct, but rather pull together in various ways; indeed, that is one reason why "doubt-mongering" can be so destructive and objectionable.

Some types of criticism can be *politically detrimental* in that they can impede the ability of political institutions to function effectively. For example, criticism from "climate skeptics" or "denialists" has almost certainly impeded the ability of the U.S. Congress to function effectively with regard to climate policy making. In this way, such criticism can delay policy development and/or implementation. Criticism that has this effect can be *morally detrimental*, in that it can inhibit policy making that could prevent harm to individuals—e.g., policies that could reduce harms from tobacco use or facilitate capabilities to adapt to global climate change. Criticism can also be morally detrimental in a more direct sense; in some cases, criticism of individual scientists can amount to a kind of character assassination, in which case it directly harms the targets of criticism. Furthermore, some types of criticism can be *epistemically detrimental* in at least two senses. The most commonly recognized way is that it can impede public understanding of scientific or technological issues, as in the case of human-induced global climate change. But there is another, less recognized, way in which criticism can be epistemically detrimental—it can impede knowledge production *within the relevant expert communities themselves*.

The claim that some types of criticism can be epistemically detrimental in this latter sense has been defended recently by Justin Biddle and Anna Leuschner (2015). In the present paper, we will elaborate and build on their account by arguing that criticism that meets certain conditions can be *epistemically corrupting*—where *x* is epistemically corrupting if it creates social conditions that are conducive to the development and exercise of epistemic vice by agents operating within them. The aim is, thus, to extend and broaden Biddle and Leuschner's account by combining it with virtue epistemological considerations. It will turn out that adding the concept of epistemic corruption to the discussion will allow for a more adequate, complete picture of the situation. The majority of our examples will come from climate science, as this is an area in which epistemic corruption is rife; however, we believe that our discussion of epistemically detrimental criticism applies to other scientific fields as well. Our examination of the manufacture of doubt in terms of epistemic corruption and epistemic vice both clarifies and deepens our understanding of the harms of "doubt-mongering."

The inductive risk account of epistemically detrimental dissent
Biddle and Leuschner attempt to identify conditions that help to distinguish between dissent or criticism that is epistemically detrimental from the more typical cases of beneficial criticism.[5] (Their focus is on dissent from consensus views, but their account also applies to criticism generally, whether or not the criticism is of a consensus view.) Central to their account is the concept of inductive risk, which is the risk of wrongly accepting or rejecting a hypothesis on the basis of evidence.[6] They argue that the following conditions are jointly sufficient (though not necessary) for picking out epistemically detrimental dissent from a hypothesis *H*:

1. The non-epistemic consequences of wrongly rejecting *H* are likely to be severe.
2. The dissenting research that constitutes the objection violates established epistemic standards.
3. The dissenting research involves intolerance for producer risks at the expense of public risks.
4. Producer risks and public risks fall largely upon different parties.

The terminology of "producer and *public* risks" is a variant on that of "producer and *consumer*" risks.[7] Biddle and Leuschner spell out epistemically detrimental dissent in terms of inductive risk, because they argue that criticisms of *H* that meet these conditions contribute to a hostile environment for scientists who defend *H*, and that this hostile environment can inhibit scientific progress. They are careful to argue that the conditions are not *necessarily* related to the inhibition of knowledge production (i.e., there is no analytic connection between the satisfaction of these conditions and the inhibition of knowledge production); instead, the connection is contingent, due to the ways in which scientific research is increasingly organized and the power that these organizational arrangements give to private interests in science. Biddle and Leuschner refer to their account as the "inductive risk account of epistemically detrimental dissent", which we will abbreviate as IndRA.[8]

Criticism that meets the IndRA conditions has, as Biddle and Leuschner demonstrate, at least two epistemically detrimental effects. The first is *resource-wasting*, namely, "forcing scientists to respond to a seemingly endless wave of unnecessary and unhelpful objections and demands"[9]—such as demands for the release of private email correspondence, repetition of refuted objections, and so on. The second is *intimidation*, "creating an atmosphere in which scientists fear to address certain topics and/or to defend a hypothesis as forcefully as they believe is appropriate."[10] Intimidation can be the aim and consequence of many different types of strategy. Some, like being subjected to unjustified demands for the release of private email correspondence, are shared with strategies for resource-wasting, but others might include legal challenges, being charged with professional malpractice, and complaints to journal editors or university administrators or funding agencies. A depressingly large literature exists documenting both the resource-wasting and the intimidation that the manufacture of dissent typically entails.[11]

To see why criticism that meets the IndRA conditions has these effects, consider the hypothesis of anthropogenic climate change (H_{acc}), and notice first that the risks of wrongly accepting H_{acc} fall largely upon industries that produce greenhouse gases (GHGs) by extracting and burning fossil fuels, while the risks of wrongly rejecting H_{acc} fall largely upon the public (especially on current populations in developing countries and on future generations).[12] Suppose that a group of scientists puts forward a dissenting hypothesis, and suppose that this dissenting research violates established scientific standards—by, for example, manipulating data sets in an *ad hoc* manner, as some climate change deniers have done.[13] This dissent should be considered bad science. Now suppose that the dissenting research, in addition, displays a systematic intolerance of false positives at the expense of false negatives. When we recognize that the production and dissemination of much scientific research today is heavily influenced by powerful industrial interests—interests that

can structure and disseminate research in particular ways and can marshal numerous resources to undermine their opponents and skew the course of debate—we can see that such dissenting research can be mobilized to stifle, rather than to advance, scientific progress. It can, for example, be used to force mainstream scientists to respond repeatedly to misguided objections or demands for private email correspondence, and the like, thereby waste resources, and it can be used to attack in various ways scientists who defend H_{acc}, thereby creating a toxic atmosphere in which to both perform research and communicate research results to the public. Because of this, criticism can both slow down the progress made by targeted scientists, and it can help to create social conditions that lead scientists—not only those who are directly targeted, but all scientists in the community—to moderate their claims more than they otherwise might. In some cases, it can prevent junior scientists from joining the discipline and dissuade scientists from pursuing particular research questions in the first place. In a worst case scenario, such effects can spread to other scientific disciplines and communities.

As an example, Biddle and Leuschner discuss the "hockey stick graph" of Michael Mann, Raymond Bradley, and Malcolm Hughes, which displays the rising average temperature in the northern hemisphere over several centuries, and the criticisms of this graph by Stephen McIntyre and Ross McKitrick.[14] The dissent by McIntyre and McKitrick was seriously flawed, and it reflected an intolerance of false positives at the expense of false negatives. Despite its flaws (and partly because of its intolerance of false positives), it was disseminated widely, including through influential conservative media outlets such as the *Wall Street Journal*, and eventually used by conservative U.S. Congressional leaders to harass Mann and other climate scientists.[15] For example, Joe Barton, a conservative Congressman who at that time was the leader of the House Energy and Commerce Committee, sent letters to Mann and other climate scientists demanding extensive materials—including all of his emails for his entire career—requiring lengthy and extremely time consuming responses. Mann has also had to appear before Congress to defend himself against allegations made by other conservative politicians, such as James Inhofe, a noted climate denialist and author of a book whose title announced that global warming is *The Greatest Hoax*. The research of McIntyre and McKitrick represents an example of dissent that meets the conditions of Biddle and Leuschner's inductive risk account, and it was used to attack scientists in such a way as to retard scientific progress. More specifically, it impeded scientific progress by wasting time and resources—for example, Mann's time and energy would have been better spent doing research than defending himself against baseless allegations—and by fostering an atmosphere in which climate scientists might reasonably fear to present results as strongly as they believe is appropriate.

The Mann case is not an isolated one within climate science,[16] and while the focus of our paper is climate science, it is useful to note that there are numerous examples of criticism that meets the IndRA conditions in other scientific fields as well.[17] One additional example comes from research on the environmental effects of genetically engineered crops. In 2007, Emma Rosi-Marshall et al. published a study in the *Proceedings of the National Academy of Sciences* (*PNAS*) concluding that byproducts from Bt (Bacillus thuringiensis) corn (e.g., leaves, stalks, pollen) can enter streams and have unintentional consequences on stream ecosystems.[18] They performed laboratory studies that suggest that such byproducts can reduce growth and increase mortality of beneficial species such as caddisflies. The authors did not draw definitive conclusions from their study, noting that it was preliminary and needed further research. Despite this, immediately subsequent to publication, the study and its authors were attacked—sometimes viciously—by proponents of genetically engineered crops, some of whom accused the authors of misconduct and contacted *PNAS* and the National Science Foundation, which funded the study, demanding that the authors' funding be removed.[19]

While there were several points of contention,[20] one of the most important was the argument by critics that it is unjustifiable to extrapolate the results of their laboratory study to the field. Rosi-Marshall and her colleagues acknowledged as much, however, noting (again) that their

results were preliminary and required further research.[21] According to Emily Waltz, who covered this story for *Nature*:

> Scientists who were not involved in the debate over Rosi-Marshall's paper say the results were preliminary and left some questions unanswered, but that overall the data are valuable. "The science is fine as far as I'm concerned," says Arthur Benke, an aquatic ecologist at the University of Alabama in Tuscaloosa, who called the strong language in some of the criticisms "inappropriate".[22]

While the factors that led the critics to respond so intensely are complex, one of the most important was explicitly political in nature—namely, the belief that genetically engineered crops are already overregulated and a fear that any kind of criticism of these crops could fuel a regulatory agenda of anti-biotech activists. According to Henry Miller, a researcher at the conservative Hoover Institution and one of the critics of the paper, "agricultural biotech has been so horrendously, unscientifically regulated and so over-regulated and so inhibited over the past 30 years that to have these pseudo-controversies stirred up unnecessarily does a disservice to everyone and everything".[23]

At the time, Rosi-Marshall was an untenured assistant professor; this was her first foray into research on genetically engineered crops, and the acerbity of the attacks shocked her. "These are not the kind of tactics we're used to in science".[24] "She looked hammered", says Brian Federici, an insect pathologist at the University of California, Riverside, one of those who commented on her work. "I felt really sorry for her. I don't think she realized what she was getting into".[25] Other researchers who have studied genetically engineered crops have received similarly intense criticisms of their work. According to David Schubert, a cell biologist at the Salk Institute, such tactics make "public discussion very difficult…. People who look into safety issues and pollination and contamination issues get seriously harassed".[26] Many worry that this sort of harassment is inhibiting scientists from investigating these questions in the first place. According to Ignacio Chapela, a microbial ecologist at the University of California at Berkeley: "I have a very long experience now with young people coming to me to say that they are not going into this field precisely because they are discouraged by what they see…. When scientists become afraid to even ask the questions ... that's a serious impediment to our progress".[27]

Objection and reply

We have argued so far that there are different strategies for manufacturing dissent, including personal attacks, constant denial of properly warranted scientific findings, and concerted doubt-mongering. These have two main effects: resource-wasting and intimidation. This line of argument is in agreement with Biddle and Leuschner's IndRA.

While there are a number of potential objections that could be raised against the IndRA account, there is one in particular that should be discussed here—namely that criticism that meets the IndRA conditions need not be epistemically detrimental because even doubt mongering can have epistemic benefits.[28] Consider, for example, the recent criticisms of the hypothesis of anthropogenic climate change on the basis of a supposed "warming hiatus"—that since 1998 there has been a decrease in the rise of global mean surface temperature, despite continued increases in greenhouse gas emissions. While these criticisms are misguided—examining 15-year periods is misleading, given the considerable global mean surface temperature decadal variability, and beginning with the year 1998 is particularly misleading, given the record high temperatures of that year—they nonetheless spurred research that deepened our knowledge of global climate change; natural variability such as solar, oceanic, and volcanic influences and gaps in the datasets were explored at greater depth than they previously had been, leading to studies examining, for example, the effects of deep ocean temperatures.[29]

With regard to this specific example, there are many climate scientists who argue that the studies conducted in response to the "hiatus" arguments of climate skeptics do "not have a huge

impact on the scientific assessment and [do] not alter the basic facts."[30] Moreover, one might wonder whether such "side effects" are significant in Kitcher's sense, given the political urgency to respond to the skeptics.[31] In any case, the more general point is that, as we have shown above, the problem is not just that communities that are targets of manufactured doubt have to expend resources responding to these criticisms—resources that could have been spent on other, arguably more significant, research. If this were the only effect of manufactured doubt, then it would indeed be difficult to show that manufactured doubt is epistemically detrimental, because it can be very difficult to predict the consequences of expending resources responding to doubt mongering. As we have argued, there is another effect of manufactured doubt besides resource wasting—namely, intimidation. But perhaps even intimidation can be epistemically beneficial? For example, perhaps intimidation can force scientists to be more critical of their own work than they otherwise would be and, thus, prevent them from being overconfident.[32]

This objection is a seemingly Millian response to the IndRA account, emphasizing that even misguided criticism can have epistemic benefits. Mill, however, argued that the epistemic benefit of free discussion is bound to rules of fair discussion such as not arguing sophistically, not suppressing facts or arguments, not misstating the elements of the case, nor misrepresenting the opposite opinions.[33] Yet these rules are broken in many arguments by climate skeptics, including in the "hiatus" case. Additionally, one of the features of the IndRA account, and arguably of Mill's account itself, is the acknowledgement that we do not live in a free marketplace of ideas; rather, scientific research is, in fact, conducted and disseminated in situations characterized by stark power differentials. As Alexis de Tocqueville observed in *De la Démocratie en Amérique*, it is often the loudest or the most provocative voices, not the wisest or sanest, that tend to prevail in public fora: power, status, and celebrity matter.[34] To take a modern case, one of the notable results of Oreskes and Conway's *Merchants of Doubt* is just how much power the conservative think tank, the George C. Marshall Institute, has in structuring debates over global climate change in ways that are conducive to the Institute's political and economic interests. Stakeholders with sufficient power have the capabilities of disseminating criticisms that they deem to be in their interests in ways that have important social epistemological effects—for example, in creating social conditions that are conducive to epistemic vice (which we discuss in the next section). This, we argue, is the primary effect of criticism that meets the IndRA conditions. Yes, there can be epistemic benefits that result from such criticism, but these are better seen as "side effects" of manufactured doubt. The overall effect of such criticism, again, is epistemically detrimental as it is not restricted to wasting resources but also means that scientists become intimidated. However, it still seems largely unclear how this intimidation works. We continue, therefore, by adding a virtue-epistemological analysis of the social conditions that are conducive to the development and expression of epistemic corruption and epistemic vice.

Epistemic corruption
The idea of corruption finds precedent in recent studies of the epistemology of climate skepticism and in social and virtue epistemology more widely. Patrick Gardiner's book *A Perfect Moral Storm* outlines the forms of *moral* corruption that attend climate denial, but in an appendix one finds an interesting discussion of the related phenomenon of "epistemic corruption." Gardiner defines this as a badly-motivated tendency to behave badly epistemically by "invok[ing] … scepticism selectively against climate science."[35] Such selective application of epistemic norms and standards is hardly exclusive to climate science but has a special significance there owing to its practical and political urgency. This claim has been developed by Axel Gelfert, who extends the worry by tracing out the "corruption of scientific due process" that can occur when ideological commitments are allowed to interfere with reflection on and engagement with scientific evidence.[36] A standard way by which people attempt to reduce cognitive dissonance is by "reframing" unpleasant experiences as more pleasant ones. Gelfert argues that at least some of the more extreme denialists "frame" climate change in ways that preserve, even amplify, ideological commitments in the face of cognitive

dissonance—for instance, framing it as a defense of individual liberty in the face of intrusive scientific and governmental interference.[37]

Similar rhetorics of the socially mediated corruption of epistemic agents echo throughout social and virtue epistemology—in, say, Miranda Fricker's claim that structurally sexist social systems prevent their members from developing certain epistemic virtues, specifically epistemic justice.[38]

Our claim about epistemic corruption is different from these: it is broader than Gardiner's—for we see a tendency to selectively invoke skepticism as one among many possible forms of corruption. It also has a different focus from Gelfert's: where he focuses on the corruption of scientific methods and procedures, we focus on the corruption of scientists qua epistemic agents (which, of course, has effects, again, on the quality of scientific methods and procedures). Moreover, our claim relies upon a very general background conviction. Typically, our epistemic characters are a messy cluster of epistemic dispositions—some good, some bad; some developed, some not—and their development is affected by a complex plurality of factors (such as will, discipline, education, and so on). But these factors include the social conditions that shape not only an agent's actions, but also the development of their epistemic dispositions into the robust forms we call virtues and vices.

The crucial point is that it is possible to manipulate these social conditions in ways that can and often will affect the epistemic characters of agents thus situated—in effect, interfering with what Fricker calls their "epistemic socialization" through what Heather Battaly has called "epistemic engineering".[39]

We suggest that the manufacture of doubt is epistemically corrupting in the sense that it creates social conditions conducive to the development of epistemically vicious dispositions. Such corruption is naturally worse if that is the explicit *aim* of engaging in corrupting actions. If so, it is bad for the character of inquirers and therefore for the conduct of inquiry; as such it is distinct from worries about "character assassination" or the destruction of reputations.

Inquiry, virtue, and vice
The idea of epistemic corruption can be profitably understood within the framework of virtue epistemology. Central to this lively discipline is the conviction that inquiry has a "robustly *active* dimension," since it consists of a set of activities—researching, measuring, arguing, questioning—that necessarily makes "personal demands" on inquirers.[40] There are many general forms that these demands can take, including the demands required for motivation, evaluation, and endurance, to take just three, and these are "inquiry-relevant demands." If and how an inquirer responds to these demands is at least in part a matter of that agent's epistemic character, which consists of a set of *epistemic character traits*.[41] These are dispositions to act in certain ways in the context of the various activities of inquiry, whether in everyday quotidian contexts or specialized domains such as scientific research or legal practice. Consider, for instance, one standard feature of the life of any inquirer, indeed of any human being, namely, *responding to criticism*. Obviously people can respond to criticism in many different ways—some are open, receptive, and welcoming, cheerfully engaging productively with the criticism in a spirit of open, ongoing enquiry; but others become defensive, aggressive, and antagonistic, resisting the criticism in forceful, even hostile ways. The epistemic character traits that are conducive to inquiry are *epistemic virtues*, while those that *impede* inquiry are the *epistemic vices*—for instance, a detective needs to be able to identify salient features of a crime scene if their inquiries are to go well, so their virtues must include attentiveness (such that inattentiveness, at least in a detective, is a vice).[42]

The core claim of virtue-based inquiry epistemology is that if inquiry is to go well, then one thing it needs are inquirers with various appropriate epistemic virtues, dispositions, or character traits. But the claim is not that if one is virtuous, that one's inquiries *will* succeed, for any number of external factors could thwart inquiry—such as a lack of material resources, insufficient time, and so on. Nor is the claim that epistemic virtue is *all* that good inquiry needs—again, one also needs resources, infrastructure, and so on. What does matter, for the virtue-epistemologist, is the point that if inquiry does fail, the character of the inquirers will not play a role in explanations of those

failures. It is therefore imperative that inquiry proceeds within social environments that provide not only the material and other conditions that are requisite for inquiry, but also conditions conducive to the exercise (and, if necessary, cultivation) of the relevant epistemic virtues.

There are several ways that a social community of inquiry could shape the development of the epistemic characters of its constituent inquirers, of which we will here offer just three. First, a social community could *acknowledge* certain character traits as virtues and as vices, specifying those that are desirable and creditworthy and castigating those that are vicious. The codes of conduct of many scientific professional associations can be understood in this sense.[43] Second, a community can *encourage* inquirers to develop certain virtues by establishing systems and norms that make exercising virtues easier, perhaps by facilitating truthfulness by establishing a system of random auditing that periodically checks the accuracy of self-reporting. This would vary by virtue—an effective way to encourage attentiveness, for instance, is to reduce the length of a shift. Third, a community can also actively *idealize* epistemically virtuous inquiry, although not necessarily using those terms, by promoting and celebrating exemplars of virtue. If the leading figures of one's profession are praised, at awards ceremonies and conferment of honors, for their humility, tact, and so on, then inquirers are presented with an idealization of virtue to aspire to. Underlying these and other strategies is the ideal of *edification*, of establishing conditions receptive to the cultivation and exercise of virtue.[44] The idea here is that the social and material organization of a community should make living and acting virtuously easy, attractive, and imperative.

With these remarks on character and corruption in place, we can now explain how they relate to the manufacture of dissent.

Dissent, harassment, and timidity
Can the manufacture of dissent be epistemically corrupting? Recall the argument by Biddle and Leuschner (2015) that criticism that meets the IndRA conditions tends to result in *resource-wasting* and/or *intimidation*. The question then becomes:

> *Does the manufacture of dissent using these strategies create social conditions that encourage the acquisition and exercise of epistemically vicious dispositions?*

We think that every act that seeks to hinder scientific progress involves, directly or indirectly, some kind of intimidation—for example, doubt-mongering can lead to public discussions about the competence and reliability of scientists (or scientific communities). Thus, even if the manufacture of dissent does not directly imply a deliberate decision to intimidate specific scientists (as it was the case with Michael Mann) it has indirect intimidating effects on the community. There can be forms of low-level intimidation that can become more intense and acute, developing into higher-level forms: the subjection of leading climate scientists to attacks and other actions intended to intimidate is a movement from low-level to high-level intimidation.

As we have argued so far, there are different strategies of manufacturing dissent (each of them alone and all together), which lead to two different epistemically detrimental effects: resource-wasting and intimidation.[45] These effects, again, are in a dynamic relation: e.g., doubt-mongering intimidates scientists and imposes new demands upon them, namely that they must now actively defend themselves, qua agents and qua community, against strategies of intimidation—an imposition of new demands which itself wastes further resources. Moreover, strategies that directly "merely" entail resource-wasting become corrupting if they degrade climate scientists' virtues of motivation or erode their curiosity and inquisitiveness. Intimidation, again, directly and indirectly fosters a culture that is conducive to the development and exercise of vicious dispositions: e.g., during and after the "Climategate" incident, Phil Jones of the Climate Research Unit at the University of East Anglia reported that his curiosity and love for his work was being undermined by constant attacks on his character and work.

The testimonies by climate scientists suggest that one plausible candidate vice is what one might call *epistemic timidity*. It is broadly similar to accounts, by other virtue epistemologists, of epistemic cowardice; but we prefer 'timidity' since it chimes better with the vocabulary of 'intimidation' that runs through the climate denial literature. We define it thus:

> *A person with the vice of epistemic timidity characteristically fails to persist in or with an intellectually appropriate but threatening state or course of action, because an aversion to, or desire to avoid, risk of harm has an unwarranted precedence in their motivational structure over a concern for epistemic goods such as truth*[46]

An epistemically timid person might still *value* epistemic goods, like truth, but not enough to persist with activities or courses of action that might generate, promote, or otherwise contribute to epistemic goods—as scientific study of climate change certainly will, making that research intellectually appropriate. The threats and risks can be diverse—physical (like injury) or professional (like ruining one's reputation) or financial (like burdensome legal costs) and so on. Appraising a person's epistemic timidity is a complex matter, of course, and will be highly sensitive to the specifics of particular individuals and the context in which they are working. In what follows, we want to set up the possibility of understanding the effects on climate scientists' of their subjection to intimidation in terms of this vice of epistemic timidity. Are the attacks on climate scientists leading to them to develop—against their will—the vice of epistemic timidity? Or is something similar, but subtler, occurring?

Consider two well-known examples, the first being the climate scientist Michael Mann's account of the impact on him of vociferous legal demands by Joe Barton, the chair of the House Energy and Commerce Committee.[47]

As Mann recalls:

> Barton's letters appeared intended to send shivers down our spines, and certainly did succeed to an extent. Moreover, he sidelined us with vexatious demands, the response to which both proved a major time sink and required us to solicit legal advice and representation. Needless to say, I would have rather been spending my time meeting my teaching, advising, and professional obligations and advancing various scientific research projects.[48]

Being subjected to aggressive and forceful demands by a politically influential person with an obvious hostile agenda is an obvious and effective form of intimidation. Another example is an anecdote told by Oreskes and Conway in *Merchants of Doubt*, a rich source of examples of strategic intimidation:

> At a recent conference, a colleague told one of us that in IPCC discussions, some scientists have been reluctant to make strong claims about the scientific evidence, lest contrarians "attack us". Another said that she'd rather err on the side of conservatism in her estimates, because then she feels more "secure."[49]

A reluctance to make strong claims that one feels are in fact epistemically justified and so to tend towards conservatism as a strategy of security can both be hallmarks of epistemic timidity (although, of course, there may be other reasons for such conservatism).[50] The wider systemic consequences of agential timidity might include the well-established conservatism of the IPCC estimates for climate change, "erring on the side of least caution," as a quartet of authors put it—a confirmation of the efficacy of strategies of intimidation.[51]

The criticism is, to clarify, not of climate scientists for failing to "stand up for themselves," but rather of the fact that social conditions have been deliberately manipulated such that behaviors

reflective of epistemic timidity have become psychologically and professionally reasonable ways to act. Climate scientists who opt not to act in epistemically timid ways could thereby put many things that matter to them at risk—their mental health, career prospects, personal relationships, and so on—and open themselves up to attack, legal challenges, and other forms of aggression. Within an environment suffused with strategies of intimidation, it can be highly reasonable to pre-emptively and self-consciously understate the claims one makes about the rate, causes, or consequences of climate change.

That there is such systematic understatement in climate science becomes visible in at least two ways. One is the growing body of anecdotal evidence, such as that just mentioned. Another are the comprehensive empirical studies which confirm that IPCC reports have constantly underestimated global warming, sea level rise, and CO_2 concentrations in the atmosphere.[52] Of course, there are also other potential explanations for this trend. First, there could just have been an improvement of the evidence, particularly of measurement data from and knowledge about the respective social systems and ecosystems.[53] Second, as Brysse *et al.* put it, there is a general tendency of scientists to "err on the side of least drama," stemming from "the scientific values of rationality, dispassion, and self-restraint".[54] We agree that these points—the improvement of scientific information and the scientists' tendency to err on the side of least drama—are likely a part of the explanation for the trend of underestimating climate change and its impacts. However, this does not suffice as a full explanation, as Brysse et al. acknowledge.[55] Another factor is the continual attacks of climate skeptics, that are surely intended, at least in part, to exploit the tendency to 'err on the side of least drama'—an example of what Gelfert called the corruption of scientific practice.[56]

The dissent-manufacturers are engaging, consciously and intentionally or not, in well-funded and well-organized strategies of intimidation that create social conditions in which it becomes reasonable to act in the ways characteristic of epistemic timidity. The problem therefore lies with an engineered social and professional environment, and those who actively engineer it, rather than the climate scientists thus affected. Indeed, the social conditions of contemporary climate science are now such that it is better, as Raymond Bradley puts it, to "keep a low profile and go with the flow."[57]

It is important to note, however, that this behavior is not always the result of conscious decisions: as Lewandowsky *et al.* have shown, the skeptics' strategies also influence scientific practices and debates due to often unconscious psychological mechanisms such as stereotype threat, pluralistic ignorance, and the third-person effect. While timidity can be an epistemically useful, in that it can counterbalance overconfidence (as already discussed above with respect to the "hiatus" case), there are two provisos that should be noted. One is that whether timidity has this epistemically productive counterbalancing effect is contingent and conditional. The other is that producing it strategically often leads to an undermining of confidence that is epistemically detrimental: "it seems reasonable to conclude that the pressures of climate contrarians has contributed, at least to some degree, to undermining the confidence of the scientific community in their own theory, data, and models, all of which permit—and indeed expect—changes in the rate of warming over any arbitrarily chosen period."[58] Denialist claims, as Lewandowsky *et al.* conclude, lead to an overstatement of uncertainty, under-communication of knowledge, and a misguided attribution of credence to erroneous claims.[59]

The manufacture of dissent can therefore be detrimental in the specific sense that it creates social conditions conducive to the development and exercise of epistemic timidity, both for actual and for anticipated victims of intimidation. For of course, intimidation and harassment work whether you experience them or only live in fear of them, which is the ugly truth in Mann's remark that the strategy of "doubt-mongers" is to "intimidate climate scientists through public campaigns of ridicule and harassment," and to "thereby serve notice to other scientists of what will be in store for them if they speak out on the topic of human-caused climate change."[60] That being so, strategies of intimidation, ridicule, and harassment are corrupting because they create communities and cultures in which acting viciously is encouraged, incentivized, and rewarded.[61]

The diversity of strategies of intimidation and the variety in their effects might suggest that we ought to think in terms of a cluster of closely related vices. 'Epistemic timidity' might be better understood not as a single vice, but as a family of vices that share certain features in common. There are at least two ways to identify such vice-clusters. One is to try to 'couple' sub-vices to specific activities—for instance, Baehr distinguishes several different activities that epistemic courage can pertain to, including the endorsement of a proposition and the communication and transmission of epistemic goods.[62] Perhaps what we called epistemic timidity is a sub-vice specifically associated with the transmission of epistemic goods, with other vices of cowardice attaching to other activities.

Another way to generate a vice-cluster is to look at other accounts of epistemic virtues with a plurality of associated vices. A good candidate is epistemic humility, which has a plurality of vices of deficiency that typically include arrogance, dogmatism, and hubris.[63] Our aim is not to offer an account of the various vices of epistemic cowardice here; instead, it is simply to suggest that the subjection of climate scientists to intimidation, in its many forms, might be more accurately understood as resulting in a whole set of vices. If so, the causes and effects of epistemic corruption can be understood more fully and accurately.

Epistemic corruption, revisited
We propose that the analysis of epistemic corruption can be further developed if a distinction is drawn between *corruption* and *corruptibility*. Recall that a policy or activity is corrupting insofar as it creates social conditions conducive to the development and exercise of epistemic vice by agents thus situated. But it is also useful to introduce the closely related concept of *corruptibility*, defined as the vulnerability of an agent or community to efforts by others at corruption.[64]

Specifically, *p* is corruptible if the values, norms, practices, and other features that would enable it to resist external strategies of corruption are absent, diluted, or otherwise ineffective. Imagine a community that lacks a collectivist political will that might rally its members around efforts to corrupt them or an organization whose auditing and monitoring systems have been deliberately dismantled. Corruption can be and often is intended both to create and exploit and to exacerbate and entrench the corruptibility of a person, community, or organization. To say that a person or collective is corruptible is not to say that there is any desire for or toleration of their corruptible status, which is why it is useful to think of corruptibility in terms of *vulnerability* to corruption.

There are many ways in which one could increase the corruptibility of a social community. An obvious way is to attack and drain its resources—time, money, morale—either by cutting them off at the source or forcing them to be wasted, as "doubt-mongers" do; or by attacking that community's wider public and political support. Corruptibility is akin to being softened up prior to attack and can be understood by extending what Mann calls the "Serengeti strategy": one can target and try to "pick off" the "weaker members of the herd"—such as junior climate scientists—but one can also work hard to weaken the herd itself, by starving or exhausting it by constant attack and impoverishment of its environment.[65]

We suggest that we think about attacks on climate science as strategies aimed at creating and exacerbating the corruptibility of climate science, preparatory for its corruption. Epistemic timidity is a case in point. "Doubt-mongers" can attack the conditions that protect against epistemic timidity, by removing trust in respect for science by political leaders, or trust that any attacks on science will elicit a defense, or trust that attacks will be censured and punished. At the same time, one can create conditions that encourage epistemic timidity—a "track record" of intimidation of peers, part of a pattern of unpunished intimidation, or a sense of the political power and status of attackers. This is why Gelfert is absolutely right to say that it is crucial to "call to account those who engage in epistemic corruption and confronting irresponsible ideologies head-on."[66] Crucially, ensuring the corruptibility of the social conditions of climate science serves the purpose of the corruption of climate scientists, in both the short and the long term.

The distinction between corruption and corruptibility can serve a further purpose of special relevance to the case of climate science, intimidation, and epistemic timidity. There are at least two

reasons to worry about the claim that climate scientists who submit to intimidation—for instance, by muting their claims—are guilty of epistemic timidity. One is that this might seem to be 'kicking them when they are down', seemingly attacking rather than supporting the climate scientists who are the victims in these cases. Another is that it may seem to play into the hands of the 'doubt-mongerers': for now they can describe climate scientists not only as incompetence, deceptive, or ideologically motivated, but also as *corrupt*.

We are sensitive to this worry and our own sympathies lie clearly with the climate scientists. In response to the worry, we suggest—tentatively—that a distinction be drawn between *failures to manifest epistemic courage* and *manifestations of epistemic timidity*. It is not necessarily to endorse the principle that if a situation calls for a given virtue, and an agent fails to manifest that virtue, that the person manifests a corresponding vice. Many climate scientists are not exercising epistemic courage, but neither are they necessarily acting timidly or cowardly. (Some, of course, like Mann, are acting courageously). Perhaps a climate scientist with superior social and other resources—like tenure, stature, and so on—is in a more optimal position to exercise the virtue of epistemic courage. But that is a privileged position that other climate scientists—junior ones, say, or ones from less supportive institutions—lack. In those cases, exercising courage would be *epistemically heroic*, but that is an exceptional achievement that we ought not expect as the norm; the problem, in these cases, is not that people are not being heroically courageous, but that social conditions are so corrupted that acting courageous becomes a *heroic* act, rather than an attainably everyday one.[67] A climate scientist working in a highly corruptible community may be working in conditions that are unreceptive to the exercise of epistemic courage; but that does not entail, in itself, that they are condemned to epistemic timidity. It simply reiterates the old truth that virtue is exercised through practices and within social contexts shaped by traditions that are differentially hospitable to virtuous agency—a point vigorously made in other recent studies of epistemic virtue and vice, most obviously Miranda Fricker's *Epistemic Injustice*.[68]

Conclusion

We have argued that certain types of criticism—specifically, criticism that meets the conditions laid out by Biddle and Leuschner—are epistemically detrimental, in the sense that they impede knowledge production within expert communities themselves. While Biddle and Leuschner have already identified the two epistemically detrimental main effects—resource wasting and intimidation—we have elaborated their findings by analyzing specifically, in terms of virtue epistemology, how intimidation is epistemically corrupting: it creates social conditions conducive to the development and exercise of epistemic vice—specifically that of *epistemic timidity*, a disposition to consciously and preemptively understate epistemic claims due to reasonable anticipation of intimidation or threat. A reasonable response to these conditions is to (attempt to) avoid subjection to intimidation by adopting for oneself, and also encouraging in others, such as graduate students, the epistemically timid disposition to consciously and pre-emptively understate epistemic claims. If so, the manufacture of doubt is corrupting, at least as concerns the vice of epistemic timidity, the result being restrained scientific discussions, prejudiced choices of hypotheses, or biased risk assessments.

Worse still, "doubt-mongers" aim to ensure that their practices of corruption can continue by striving to achieve and exacerbate the corruptibility of climate science. The corruption of epistemic character is a latent theme of critical discourse about the negative effects of manufactured dissent, but is worth drawing out, since it affords a new and unwelcome dimension to criticisms of "doubt-mongers."[69]

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Notes

[1] See Popper, *Logic of Scientific Discovery*; Feyerabend, *Problems of Empiricism*; Kitcher, *Advancement of Science*; Kitcher, *Science, Truth, and Democracy*; Longino, *Science as Social Knowledge*; Longino, *Fate of Knowledge*; Solomon, *Social Empiricism*.

[2] Proctor, *Golden Holocaust*.

[3] Oreskes and Conway, *Merchants of Doubt*.

[4] Proctor, *Golden Holocaust*, ch. 17.

[5] Biddle and Leuschner, "Climate Skepticism and the Manufacture of Doubt."

[6] See Churchman, *Theory of Experimental Inference*; Hempel, "Science and Human Values;" Rudner, "The Scientist *Qua* Scientist Makes Value Judgments".

[7] Biddle and Leuschner follow Shrader-Frechette in using the phrase 'public risks' instead of 'consumer risks,' because there are consequences that fall primarily on the public, even if they do not result from the consumption of a specific product. For example, the consequences of wrongly rejecting the hypothesis of anthropogenic climate change fall largely on the public, even though these consequences have nothing to do with the consumption of any specific product. See Shrader-Frechette, *Ethics of Scientific Research*, 108.

[8] See Biddle and Leuschner, "Climate Skepticism and the Manufacture of Doubt." In more recent work, Biddle and Kukla have suggested that the concept of inductive risk has been applied too broadly and that the concept of 'epistemic risk' is, in many situations, more appropriate. See Biddle, "Inductive Risk, Epistemic Risk, and Overdiagnosis of Disease" and Biddle and Kukla, "The Geography of Epistemic Risk." In this paper, however, we will ignore these considerations.

[9] Ibid., 269.

[10] Ibid.

[11] See Bradley, *Global Warming and Political Intimidation*; and Mann, *The Hockey Stick and the Climate Wars*.

[12] This is not to say that the risks of false positives and false negatives in this case fall completely on different parties. For example, wrongly accepting H_{acc} would not only have consequences for GHG-producing industries but also on publics that benefit in various ways from those industries. Despite some overlap, however, the consequences fall largely upon different parties; publics that benefit from GHG-producing industries, for example, could receive most if not all of the same benefits from industries that rely upon alternative energy sources.

[13] See Biddle and Leuschner, "Climate Skepticism and the Manufacture of Doubt;" Oreskes and Conway, *Merchants of Doubt*, 186–190; and Weart, "Global Warming: How Skepticism Became Denial."

[14] See Biddle and Leuschner, "Climate Skepticism and the Manufacture of Doubt," section 3.

[15] Mann, *The Hockey Stick and the Climate Wars*.

[16] See, again, Bradley, *Global Warming and Political Intimidation*; and Mann, *The Hockey Stick and the Climate Wars*.

[17] See, for example, McGarity and Wagner, *Bending Science*.

[18] Rosi-Marshall et al., "Toxins in Transgenic Crop Byproducts May Affect Headwater Stream Ecosystems."

[19] Waltz, "Battlefield."

[20] See Waltz, "Battlefield", for further details.

[21] An anonymous reviewer has questioned whether the criticisms of Rosi-Marshall et al. meet the IndRA conditions—in particular, whether they involve violations of established epistemic standards. We believe that at least many of the criticisms do, in that they attribute to Rosi-Marshall et al. claims that they did not make. Many of the criticisms, again, attribute to Rosi-Marshall et al. the claim that their laboratory experiments justify conclusions about behavior in the field; not only did Rosi-Marshall et al. not make this claim, but they were explicit that further research would be required to draw conclusions about interactions outside of the laboratory. These criticisms, thus, commit the 'straw man' fallacy.

[22] Ibid., 30.

[23] Quoted in Waltz "Battlefield," 30.

[24] Ibid, 29.

[25] Ibid, 27.

[26] Ibid., 27–28.

[27] Ibid., 32.

[28] Some objections to the account were raised by Inmaculada de Melo-Martín, Kristen Intemann, and others at a workshop on the epistemic role of manufactured dissent in climate dissent, held at the Karlsruhe Institute of Technology in October 2015. In the interests of space, we focus on what we take to be the most important of these, which is that even doubt mongering can have epistemic benefits. De Melo-Martín and Intemann have written on dissent and consensus in science (including climate science), though their aims are different from our own. See de Melo-Martín and Intemann, "Scientific Dissent and Public Policy," "Are There Limits to Scientists' Obligations to Seek and Engage Dissenters," "Who's Afraid of Dissent?."

[29] For example, Balmaseda, "Distinctive Climate Signals in Reanalysis of Global Ocean Heat Content."

[30] Dennis Hartmann, Professor of Atmospheric Sciences at the University of Washington and coordinating lead author of the IPCC's fifth assessment report, quoted in Mooney, "Who Created the Global Warming 'Pause'?." For more detailed information on the hiatus case, see also Lewandowsky *et al.*, "Seepage".

[31] See Kitcher, *Science, Truth, and Democracy*, 63–82.

[32] In a much-discussed paper, John Ioannidis argues that most published research findings are false. An anonymous reviewer has suggested that intimidation could help to prevent the overstatement of research results. We are grateful to the reviewer for raising this point.

[33] See Mill, *On Liberty*, chapter 2.

[34] De Tocqueville, *De la Démocratie en Amérique*.

[35] Gardiner, *A Perfect Moral Storm*, 46.

[36] Gelfert, "Climate Scepticism, Epistemic Dissonance, and the Ethics of Uncertainty."

[37] Our thanks to Axel Gelfert for discussion of his position.

[38] Fricker, *Epistemic Injustice: Power and the Ethics of Knowing*.

[39] Personal conversation with Ian James Kidd, September 2, 2015. See further Battaly 2016.

[40] Baehr, *The Inquiring Mind*, chapter 1.

[41] See Cassam, "Vice Epistemology."

[42] The varieties of epistemic vice are described and analyzed by Heather Battaly. In particular, her 'personalist' characterization affirms that a person can develop an epistemic vice without being culpable for that vice. See Battaly, "Varieties of Epistemic Vice," and "Epistemic Virtue and Vice." See further Kidd, "Charging Others with Epistemic Vice."

[43] See Scarre and Scarre, *The Ethics of Archaeology*, part II.

[44] See Kidd, "Educating for Intellectual Humility."

[45] Of course, we don't rule out there being other strategies with other negative effects.

[46] This account of the vice of epistemic timidity is modelled on Jason Baehr's account of the virtue of epistemic courage in *The Inquiring Mind*, ch.9. We thank Jason for patient, helpful correspondence.

[47] See Biddle and Leuschner, "Climate Skepticism and the Manufacture of Doubt",section 3.

[48] Mann, "The Hockey Stick and the Climate Wars," 151.

[49] Oreskes and Conway, "Merchants of Doubt," 264–265.

[50] An interesting visual testimony to the imposed timidity of climate scientists is the Australian photographer Nick Bowers's project *Scared Scientists*. Available at http://www.nickbowers.com/home/scared-scientists/, accessed February 5, 2016.

[51] Brysse *et al.*, "Climate Change Prediction."

[52] Cf., e.g., Rahmstorf *et al.*, "Recent Climate Observations"; UNEP, "Climate Change Science Compendium"; NRC, "Restructuring Federal Climate Research". Brysse *et al.*, "Climate Change Prediction.", discuss a number of additional studies confirming this trend.

[53] Cf., e.g., Smith *et al.*, "Assessing Dangerous Climate Change".

[54] Brysse *et al.*, "Climate Change Prediction", 327.

[55] Brysse *et al.*, "Climate Change Prediction", 333.

[56] See Brysse *et al.*, "Climate Change Prediction"; Freudenburg and Muselli, "Global Warming Estimates"; Lewandowsky *et al.*, "Seepage".

[57] Bradley, *Global Warming and Political Intimidation*, 137.

[58] Lewandowsky *et al.*, "Seepage", 9.

[59] Lewandowsky *et al.*, "Seepage", 10.

[60] Mann, *The Hockey Stick and the Climate Wars*, 200.

[61] Kristen Intemann asked whether 'vice' is the right word to use to describe a person who has developed negative character traits due to external oppression rather than failures of discipline or choice of their own. We are sympathetic to the worry, which merits further discussion, but a promising response is Battaly's (2015) 'personalist' conception of epistemic vice—the gist of which is that a person need not be *personally responsible* for their having developed a vicious character.

[62] See Baehr, *The Inquiring Mind*, pp.175-176.

[63] A set of studies of specific vices that mark a lack of humility include Taneseini, '"Calm down dear": Intellectual arrogance, silencing, and ignorance'; Roberts and W. Jay Wood, *Intellectual Virtues*, ch. 9 (on arrogance and dogmatism); Cooper, *The Measure of Things* (on the vice of hubris).

[64] In this paper we leave open the question of whether both individual and collective epistemic agents are potential targets of corruption, and the larger question of whether collective epistemic agents can be bearers of epistemic virtue and vice. See Fricker, "Can There Be Institutional Virtues?" and Lahroodi, "Collective Epistemic Virtues".

[65] Mann, "The Serengeti Strategy".

[66] Gelfert, "Climate Scepticism, Epistemic Dissonance, and the Ethics of Uncertainty," 208.

[67] We take the concept of 'epistemic heroes' from Medina, *The Epistemology of Resistance*, ch. 5.

[68] The connection between (moral) virtues, practices, and tradition was emphasized by MacIntyre, *After Virtue*. The contingency of a capacity to cultivate and exercise the virtue of epistemic justice is developed in Fricker, *Epistemic Injustice* and further developed by Anderson, 'Epistemic Justice as a Virtue of Social Institutions' and Medina, *The Epistemology of Resistance.*