

How to behave virtuously in an irrational world

MASSIMO PIGLIUCCI

ABSTRACT

It is no secret that we inhabit an increasingly irrational world, plagued by rampant pseudoscience, science denialism, post-truths and fake news. Or perhaps, human nature being what it is, we have always lived in such a world and we are now simply more keenly aware of it because of easy and widespread access to social media. Moreover, the stakes are higher, as pseudoscience in the form of the anti-vax movement imperils the lives of many, while climate change denialism literally risks a collapse of the human ecosystem. So how do we deal with the problem? How do we talk to otherwise perfectly reasonable and functional people who nevertheless espouse all sorts of nonsense — and vote accordingly? In this paper I will explore a couple of real life conversations among many that I have had with believers in pseudoscience, and then present and discuss virtue epistemology as one approach to ameliorate the problem. No silver bullets are available, unfortunately, but it is our intellectual and moral duty to keep, as Carl Sagan famously put it, the candle of reason lit even when surrounded by the darkness of unreason.

WORK TYPE

Article

ARTICLE HISTORY

Received:

13-April-2019

Accepted:

10-June-2019

Published Online:

24-November-2019

ARTICLE LANGUAGE

English

KEYWORDS

Pseudoscience

Science Denialism

Aristotle's Rhetoric

Virtue Epistemology

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Disputatio. Philosophical Research Bulletin
Vol. 9, No. 13, Jun. 2020, pp. 0-00
ISSN: 2254-0601 | www.disputatio.eu

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§1. Introduction: the problem with pseudoscience is not that people are stupid

IHAVE BEEN ACTIVE IN THE AREA of science popularization, and in particular in public outreach about pseudoscience, since the mid 1990s, when I started one of the first "Darwin Day" celebrations¹ in response to yet another attempt by the Tennessee legislature (I was then a faculty at UT–Knoxville) to pass a law that would mandate equal teaching of evolution and creationism in public schools.

As a young evolutionary biologist I initially approached the problem like most of my colleagues did, assuming that I was dealing with a bunch of country bumpkins, ignorant or stupid people, who just needed a few well presented scientific facts to see the light, so to speak, and reject their medieval nonsense. It quickly became clear that it was a bit more complicated than that. Here is what I mean, by way of a few select examples.

A study conducted on upper secondary school students in Sweden (Lundstrom 2007) quantified the relationships between general science education, education about human biology, and skepticism about pseudoscientific beliefs. While the first two items, predictably, turned out to be correlated (i.e., students with higher science knowledge also had more knowledge of human biology), neither of them was statistically associated with skepticism, implying —under the assumed causal hypothesis— that more science knowledge (either general or specialistic) does not, *per se*, make students more skeptical.

Then again, surveys in the United States consistently find an (inverse) relationship between acceptance of pseudoscientific beliefs and general level of

¹ <https://darwinday.org/>

education (Goode 2002). For instance, when asked whether they agreed with the following statement: "God created human beings pretty much in their present form at one time within the last 10,000 years or so," 58% of respondents without a high school degree replied in the affirmative. But that number dropped to (a still disconcerting) 24% when respondents had some postgraduate education. Similarly, 92% of people without a high school degree say that Heaven is a real place, with the number going down a bit, but only to 73%, for people with postgraduate education. A whopping 56% of respondents with less than high school education think that the Devil sometimes possesses people, while 22% of people with more than college education think so.

The same author, however, also reports that there is no consistent relationship between education and non-religious types of pseudoscientific beliefs. For instance, the percentage of people believing in UFOs is about the same regardless of whether they do not have a high school education or have carried out postgraduate studies. A different survey, also reported by Goode, found that about the same number of people with some college education believed in UFOs compared to those without high school education (51% vs 48%), with the numbers going down significantly (39%) only at the postgraduate levels. This is disturbing news: even if we assume the (largely untested) causal hypothesis that education influences belief (as distinct, for instance, from the effect of self-selection, or that of a common underlying factor), not only it is simply not a reasonable strategy to get everyone into PhD programs in order to challenge their pseudoscientific beliefs, it doesn't even work too well, as 4 people in 10 still retain them!

But perhaps what is relevant in order to combat pseudoscience is not the kind of factual knowledge of science that is so often taught at both the pre-college and even college levels. Perhaps what makes a difference is a better conceptual understanding of the nature of science. A study carried out by Johnson and Pigliucci (2004) tested precisely this hypothesis, and the results were, once again, not at all encouraging. The authors found a mild (statistically significant) correlation between factual and conceptual knowledge of science (though of a modest magnitude: a pairwise Spearman's correlation of +0.27). But there was no relationship between *either* factual or conceptual knowledge of science and belief in a number of indicators of pseudoscience (with Spearman's correlations, respectively, of -0.18 and -0.06).

Walker et al. (2002) had found similar results after conducting a study at three undergraduate universities in the United States. They measured the students' degree of science knowledge using questions from a national teachers'

exam. They also rated students' belief in a number of pseudoscientific claims, ranging from the ability to predict the future to the healing power of magnets. As the authors put it:

We were interested in whether science test scores were correlated with paranormal beliefs. For each sample, we correlated the participant's test score with their average belief score. Across all three samples, the correlation between test scores and beliefs was non-significant. In other words, there was no relationship between the level of science knowledge and skepticism regarding paranormal claims (Walker et al. 2000).

And things get worse, much worse. Kallery (2001) has investigated the attitudes of early-years *teachers* toward astronomy and astrology in Greece. The results indicated that an incredible 60% of the educators surveyed subscribes to astrological principles. About the same percentage (59%) viewed both astronomy and astrology as scientific, i.e. they could not distinguish between science and pseudoscience. No wonder their young students are confused, and will likely become adults that will carry such confusion into the next generation. Similarly discouraging results had been found in the Unites States by Eve and Dunn (1990), when it came to teachers' beliefs in psychic powers, astrology, and creationism.

§ 2. The real problem: not just logos, but ethos and pathos

Aristotle, in his work on rhetoric², pointed out what apparently a good number of contemporary scientists and science popularizers have a hard time wrapping their mind around: people, being people, are not going to be persuaded just by arguments and evidence (logos). Two additional things are needed: the speaker or writer has to establish herself as a credible, reliable source (ethos); and she has to connect emotionally to her audience (pathos), making clear why the topic at hand is of personal interest to them. When following the two specific examples discussed in the next section, the reader will easily see how arguments played the prominent role, with credibility a distant second, and emotional connection essentially non-existent.

In my experience, most colleagues focus on the logic, thinking it sufficient for the task at hand. At most, they reduce the ethos to the simple rattling off of pertinent credentials ("PhD from the University of So-and-So"). And they positively disdain the pathos, thinking that going that route amounts to the

² <http://classics.mit.edu/Aristotle/rhetoric.html>

despicable practice of emotional manipulation, fit for Sunday preachers, not for serious intellectuals.

Well, the joke's on them, since Sunday preachers —as well as purveyors of pseudoscience— do emphasize both the ethos and the pathos, even though, ironically, they lack in the logos. Take, for instance, antivax leader Jenny McCarthy. Her position on the safety of vaccines clearly shows that her logos is screwed up. But she presents herself to her audience as a fellow concerned mother (ethos), and of course has no trouble connecting emotionally with people who, like herself, are parents, whose primary concern is the health and safety of their young children (pathos). It's a non-starter to go against someone like McCarthy on the strength of a PhD in biomedical research from a prestigious university. Indeed, it will likely backfire, since the target audience will be immediately suspicious of egg-headed intellectuals who pretend to tell them how to take care of their children.

Aristotle's intuition that human psychology is far more complex and subjective than what one might expect from "the rational animal" (ironically, Aristotle's own phrase) has been confirmed by the modern psychological literature. Sinatra et al. (2014), for instance, discuss epistemic cognition, motivated reasoning, and conceptual change within the context of addressing the challenges raised by public (mis)understanding of science. Stanovich et al. (2013) have investigated the so-called "myside bias," which occurs whenever people evaluate or even generate evidence in a manner that is biased toward their *a priori* opinions. Intriguingly, they found no relation between the propensity to engage in myside bias and quantitative measures of intelligence. Again, stupidity has little or nothing to do with it.

Of course, we all think that it is *others*, certainly not *us*, who are biased. That particular bias itself has a name —the bias blind spot (Pronin et al. 2002)— and has been studied. West et al. (2012) have shown that bias is easy to recognize in others, but very difficult to spot in ourselves. Crucially, the authors found that the bias blind spot is not reduced, and in fact it is possibly augmented, by increased cognitive sophistication. And our biases are often emotionally motivated, as argued by Correia (2011), whose research lends support to the notion that people's tendency to arrive at desired conclusions hinges on their ability to construct plausible justifications for those conclusions. It seems that, *pace* Aristotle himself, we are better characterized as the rationalizing, rather than the rational, animal.

Nevertheless, Aristotle's framework can rather straightforwardly be connected with the results of modern empirical research into human reasoning

(or failure thereof). For instance, motivated reasoning is clearly related to pathos, given that the bias is defined as “a form of implicit emotion regulation in which the brain converges on judgments that minimize negative and maximize positive affect states associated with threat to or attainment of motives” (Western et al. 2006). Or take the halo effect, in which certain characteristics of a person (e.g., physical attractiveness, confidence, etc.) are — without further evidence— taken to be indicative of other desirable characteristics, such as trustworthiness, or intelligence (Lachman et al. 1985). It is easy to see the relevance of this bias to considerations of ethos.

§ 3. Two illuminating examples

While systematic studies on cognitive biases are useful, and so are philosophical analyses of logical fallacies, nothing drives the point home as clearly and forcefully as having actually encountered, in real life, the sort of people we are here concerned with. Let me therefore briefly turn to two examples of interactions I have had recently with intelligent and educated people who nevertheless hold (forcefully, I might add) onto clearly pseudoscientific notions. I will briefly comment on what I learned from these two (rather typical, in my experience) instances, before we move on to a general discussion addressing the title of this essay: how to behave virtuously in an irrational world³. As the attentive reader will appreciate, issues surrounding logos, ethos, and pathos lurk throughout these two episodes.

The first example recounts a somewhat surreal discussion I had with one of my relatives —let’s call her Ostinata— about pseudoscience (specifically, the nonexistent connection between vaccines and autism), conspiracy theories (about the 9/11 attacks on New York’s Twin Towers), politics, and much, much more.

The pattern of Ostinata’s arguments is all too familiar to me: she denied relevant expertise (you know, scientists often get it wrong!), while at the same time vigorously —and apparently obliviously to the patent contradiction— invoking someone else’s doubtfully pertinent expertise (the guy is an engineer!). She continually side-tracked the conversation, bringing up irrelevant or unconnected points (thereby committing the informal logical fallacy known as a red herring) and insisting we should look “beyond logic,” whatever that means. I was getting more and more frustrated, as neither I nor

³ An earlier version of this and the next section appeared in my *Nonsense on Stilts: How to Tell Science from Bunk*, Chicago: University of Chicago Press, 2018.

Ostinata had learned anything or even hinted at changing our mind. Why was I not persuading her? There must have been something I was missing.

It was at that point that another of my relatives, observing the discussion and very much amused by it, hit the nail right on the head. He invited me to consider whether Ostinata was simply confusing probability with possibility. I stopped dead in my tracks, pondered the suggestion, and had a Eureka! moment. That was exactly what was happening. Pretty much all of Ostinata's arguments were along the lines of "you say so, but isn't it possible that . . ." or "but you can't exclude the possibility that . . ." And of course she was right. It is possible (though very, very unlikely) that the 9/11 attacks were an inside job. And no, I cannot categorically state that vaccines never, ever cause autism. But so what?

I changed strategy and explained to Ostinata that she was racking up a number of rhetorical victories, nothing of substance. Yes, I conceded, it is true that for most things (in fact, for any statement that is not mathematical or purely logical) there is always the possibility that one is wrong. But usually we don't make decisions based on possibility; instead, we use the much more refined tool of probability (estimated to the best of our abilities).

My relative's view of the world seems to be based on the notion that all events have equal probability. Not literally—she does understand that some outcomes are more likely than others—but in practice, since she considers mere logical possibilities, however improbable in reality, to be worthy of the same attention as outcomes that are much more likely. It would be as if you asked someone to join you for dinner, and she replied, in all seriousness, "I'd love to, assuming the earth doesn't fall to an alien attack before then." Needless to say, the real world doesn't behave like that: some outcomes have much higher probabilities than others, and while aliens may attack earth before dinner time, the possibility is remote, far too slight to preclude your making firm plans with your friends.

Newly conscious of this aspect of Ostinata's reasoning, I resumed my discussion with her by mentioning Enlightenment philosopher David Hume's famous statement, to the effect that a reasonable person proportions her beliefs to the evidence⁴, a principle restated two centuries later by astronomer Carl Sagan, in the context of discussions of pseudoscience: extraordinary claims require extraordinary evidence. A modern version of this principle is what is known as Bayes's theorem (Bertsch McGrayne 2012), which proves

⁴ In "Of miracles," part of *Enquiry Concerning Human Understanding*, <https://davidhume.org/texts/e/10>

mathematically that the probability of a theory *T*, given the available evidence *E*, is proportional to two factors: the probability of observing evidence *E* if theory *T* were true, multiplied by the probability that *T* is true based on initial considerations (the “priors”).

The beauty of Bayes’s theorem —as is well known— is that it updates its estimates in a recursive fashion, as new evidence becomes available⁵. The result one gets each time one applies the theorem is called the posterior probability and is obtained —conceptually speaking— by updating the priors in proportion to the newly available evidence. Not only that, the fact is that no matter what the initial priors are (i.e., your initial assessment of the likelihood that theory *T* is right), after a sufficient number of iterations the posteriors converge toward the true value of *T*. This makes Bayes’s theorem a formidable tool for practical decision making and, indeed, for the rational assessment of pretty much everything. As a metaphor, it serves as a good guide for assessing beliefs — which, as Hume advises, should stand in proportion to the (ever changing) evidence.

I concluded my explanation to *Ostinata* —inspired by Bayes’s theorem and probability theory more generally— by suggesting that when we make an assessment of any given notion we are basically placing a bet. Given the best understanding I have of the vaccine–autism controversy, for instance, I bet (heavily) that vaccines do not actually cause autism. Do I know this for certain? No, because it isn’t an a priori truth of mathematics or logic. Is it possible that vaccines do cause autism? Yes, that scenario does not involve a logical contradiction, so it is possible. But those are the wrong questions. The right question is: is it likely, on the basis of the available evidence? If you had to bet (with money, or with the health of your kids), which way should you bet? I’m not sure I made a dent in the convictions of my relative, but I did my best.

My encounter with *Ostinata* is a perfect example of what Aristotle was talking about. She was clearly deficient in the pertinent *logos*, but my significantly better grasp of it did not matter in the least, because I failed to address the other two components: in terms of *ethos*, I was simply not a reliable, trustworthy interlocutor, so far as she was concerned. The fact that I have graduate degrees in the relevant areas was either irrelevant or insufficient. As for *pathos*, I obviously failed to make whatever emotional connection might

⁵ That said, my reference to Bayes’ theorem is not meant to imply that “Bayesianism” is an entirely satisfactory philosophy of science (see, for instance, Chalmers 2013, ch. 12). Also, there is dispute in the literature as to whether the recursive updating of priors is effective when arbitrary (subjective) priors are used (but see Sprenger 2018).

have mattered in our intercourse, though I suspect that that aspect of the problem was very much along the lines of my second interlocutor, to whom we turn now.

The next episode I wish to briefly mention and that gave me another first hand chance to observe how people fail to think properly, took place a few months later, in the course of another conversation about science and pseudoscience. This exchange lasted several days, on and off on social media, interacting with someone I've never met and likely never will meet. The range of topics this time was much narrower than with *Ostinata*, and far closer to my own areas of expertise: evolutionary biology and philosophy of science. I felt, therefore, that I really knew what I was talking about, providing not just a reasonably intelligent and somewhat informed opinion, but an expert one, based on more than three decades of studying the subject matter at a professional level.

Predictably, it didn't help. Not in the least. My interlocutor —let's call him *Curioso*— is an intelligent man who has read a lot of stuff on evolution in particular and science more generally. He has also read several of my blog posts, watched some of my debates, and even bought one of my books on evolution. He discovered me by way of reading creationist Michel Denton's *Evolution: A Theory in Crisis*, which cites me several times as a "reluctant" critic of evolutionary theory —one of those people who know that there is something seriously wrong with Darwinism, yet somehow can't let go of the orthodoxy and embrace the revolution.

My actual position on the topic is easy to check on and off-line, in several places (Pigliucci 2009), and it boils down to this: evolutionary theory has evolved by way of several episodes, from 1859 (original Darwinism) to the 1930s and '40s (the so-called Modern Synthesis) through current times (what is known as the Extended Synthesis), and it will likely continue to do so. There is nothing wrong with Darwin's original twin ideas of natural selection and common descent, but in the subsequent century and a half we have added a number of other areas of inquiry, explanatory concepts, and of course empirical results.

Not according to *Curioso*. He explained to me that Darwinism is a "reductionist" theory, apparently meaning something really bad by that term. I replied that reductionism is a successful strategy throughout the sciences and that when it is properly done, it is pretty much the only game in town in order to advance our knowledge of the world. It really amounts to saying that the best way to tackle big problems is by dividing them into smaller chunks and

addressing one chunk at a time, properly aligning small pieces of the puzzle until the full picture comes back into view.

But, countered Curioso, how do you then explain the bacterial flagellum? This was a reference to “Darwin’s black box” a book published by intelligent design creationist Michael Behe. You know, Behe is a scientist! With a PhD!! Working at a legitimate university!!! How do you explain that, Professor Pigliucci? Well, I said. If you wish I can walk you through several papers that have proposed likely, empirically based scenarios for the evolution of the bacterial flagellum. As for Behe himself, you will always find legitimate academics who position themselves outside of the mainstream. It’s a healthy aspect of the social enterprise we call science. Occasionally, some of these people range far from consensus opinion, into territory that is highly questionable, or even downright pseudoscientific. Some consider themselves rebels or mavericks. Some tend to put their ideology (usually religious, but sometimes political) ahead of reason and evidence. The latter is the case for Behe, a fervent Catholic who simply can’t wrap his mind around the conclusion that life originated and differentiated through purely natural means, no gods required.

Ah!, continued Curioso, if that’s the case, how come there is so much disagreement among scientists about evolution, and even the origin of life? Well, I replied, let’s begin by distinguishing those two issues. First, there is no widespread disagreement about Darwinism among evolutionary biologists. Pretty much all professionals I know accept the idea. There is disagreement, but it is over the shape of the current theory, just as in other disciplines. Physicists, too, disagree on cutting-edge questions — but not about Newton or Einstein. Second, the reason there are indeed many theories about the origin of life, and truly no consensus, is that the information available is not sufficient for us to zero in on one or a small subset of hypotheses (Smith and Morowitz 2016). We don’t have, and likely never will have, fossils documenting what happened at the onset of life. The historical traces are, unfortunately, forever erased, which means that our ideas about those events will remain speculative. Even if we were one day able to recreate life from scratch in a laboratory, we will have no guarantee that the path we followed under controlled conditions was the one historically taken by nature on our planet. But so what? Science never promised to answer every question, only to do its best. Sometimes its best is not good enough, and the wise thing to do is to accept human epistemic limitations and move on.

Not at all satisfied, Curioso shifted topic again: haven't you heard about Roger Penrose's quantum mechanical explanation of consciousness? Doesn't that imply that consciousness is everywhere, that it is a holistic property of the universe? Hmm, I said, with all due respect to Sir Roger (a top-notch scientist), I doubt physicists have a clue about consciousness, which so far as I can see is a biological phenomenon, whose explanation is hence best left to biologists. Besides, I told him, beware of any "explanation" that invokes quantum mechanics for anything other than quantum phenomena, even when proffered by a credentialed physicist like Penrose. At any rate, I concluded, even if Penrose is right, what does that have to do with Darwinism and its alleged failures? And so on and so forth. My exchanges with Curioso continued, becoming increasingly frustrating and eventually downright useless, until I politely pointed out that we were going in circles and perhaps it was time to call it a day.

What can we learn from this exchange? A number of things, none of them boding well for the advancement of rational discourse and public understanding of science. But we need to face reality for what it is, not what we would like it to be. First, let me remind you that Curioso is a smart, well read, and genuinely curious person. Second, because he reads widely, he is exposed not only to what I write—and what truly eminent evolutionary biologists like Stephen Jay Gould write—but to fluff put out by the Behes and Dentons of the world. And he has no way to discriminate, since all of these people have PhDs and affiliations with reputable universities. Third, while we always assume that knowledge is an unqualified good, it turns out that a bit of knowledge may do more harm than complete ignorance. When someone as intelligent as Curioso thinks he understands enough to draw conclusions, he will not hesitate to do so, rejecting expert opinion outright in the name of making up his own mind as an independent thinker. When this has to do with the status of evolutionary theory, not much harm is done. But when it has to do with, say, climate change or the safety of vaccines, that's an altogether different, and far more dire, story.

Fourth, Curioso has fallen for the well-known technique of spreading doubt about mainstream science, to the extent that people genuinely cannot make up their minds about what is going on. This was the deliberate strategy of the tobacco industry in its absurd (and lethal, for many people) denial of a link between smoking and cancer, well described in the book and documentary *Merchants of Doubt* (Oreskes and Conway 2011). The same approach has been used by other partisans to sow doubts about climate change, vaccines, and so forth. And of course it has also been the main strategy behind the so-called intelligent design movement.

Fifth, and rather ironically, Curioso has absorbed and internalized the vocabulary of skeptical (i.e., pro-science) organizations, accusing me and others of perpetrating all sorts of logical fallacies, a convenient shortcut that saves him the trouble of actually engaging with my arguments (on the overuse of fallacies, by both skeptics and supporters of pseudoscience, see: Boudry et al. 2015). For instance, when I pointed out —reasonably, it seemed to me— that Discovery Institute fellow Jonathan Wells is a member of the Sun Myung Moon’s Unification Church, and that his antipathy toward evolution is entirely ideological in nature, I was accused of committing an *ad hominem* attack. When I pointed out plenty of reliable sources on evolutionary theory, I was demonstrating confirmation bias. And so on. Lastly, Curioso’s spirited discussion with me was clearly fueled by his pride in taking on Big Science and its Orthodoxy, in favor of open-mindedness and revolution. He saw himself as David, and I was the Goliath to be slain.

Again, the Aristotelian perspective is helpful here. Curioso had done a lot of research, and genuinely thought his logos was better than mine, in terms of the topics discussed. Concerning the ethos, he did trust some sources, just not me. And when it comes to ethos, as I commented above, I surmise that he has a strong emotional attachment to the notions of challenging authority (which happened to be instantiated by me, in this case), as well as to the idea that everyone should be able to arrive at his own conclusions, even about complex technical matters. The question, then, is how do we push back effectively against his take on both the ethos and pathos components. The logos would then likely simply follow.

It is going to be difficult to change the minds of the Ostinatas and Curiosos of the world. If —and it’s a big if— they ever manage to get their heads clear about what is and is not legitimate science, they will have to do it of their own initiative, painfully and slowly. However, the necessary resources are readily available, at their disposal. The issue is that they often have no psychological incentive to take advantage of them. As a general strategy, meanwhile, defenders of science ought to act at two levels. To engage in public outreach aimed at those who are not as far gone as Ostinata and Curioso, hoping to retain them and even strengthen their resolve to support sound science. And to do a far better job than we do now with the next generation. It is children we should target primarily —as our antagonists know well. It is no coincidence that creationists write lots and lots of books for the young. Unfortunately, there is little incentive for scientists and science popularizers to do so, because children’s literature is seen as somehow inferior to that aimed at adults (even though it is arguably harder to pull off), and because we won’t see the results

for decades. Science, and reason in general, thus remains—in the beautiful metaphor proposed by Carl Sagan—like a candle in the dark (Sagan 1997). Our urgent job is to prevent its being snuffed out by the forces of darkness.

And one good and honest way to see that we do our job properly is to embrace a relatively recent approach in philosophy known as virtue epistemology, to which I turn next.

§ 4. Virtue epistemology: dealing honestly with the irrational

Epistemology is the branch of philosophy that studies knowledge and provides the criteria for evidential warrant—it tells us when it is in fact rational to believe or disbelieve a given notion. Virtue epistemology (Axtell 2000) is a particular approach within the field of epistemology, which takes its inspiration from virtue ethics (Anscombe 1958). The latter is a general way to think about ethics that goes back to Aristotle and other ancient Greek and Roman thinkers.

Briefly, virtue ethics shifts the focus from questions such as “Is this action right/wrong?” to “Is the character of this person virtuous or not?” The idea is that morality is a human attribute, which has the purpose of improving our lives as individuals embedded in a broader society. As such, it does not yield itself to universal analyses that take a God’s-eye view of things, but rather starts with the individual as moral agent.

Similarly with science: contrary to widespread belief (even among scientists), science cannot aspire to a completely neutral view from nowhere, because it is by nature a human activity and therefore bound by the limits (epistemic and otherwise) that characterize human intelligence and agency. Because science irreducibly depends on specific human perspectives, it can provide us only limited access to the world-in-itself. We can observe and explore the world with increasingly sophisticated tools, but we will always have a partial view, and a distorted understanding, of reality.

That’s why both the scientist and the skeptic of pseudoscience can benefit from a virtue epistemological way of thinking: since scientific knowledge is irreducibly human, our focus should be on the human agent and the kind of practices, enacted by that agent, that make it possible for her to arrive at the best approximation of the truth that is accessible to us. In practice, this means that we should cultivate epistemic virtues and strive to avoid epistemic vices⁶.

⁶ A potential objection to my approach here is that while epistemic virtues are human, so are norms, principles, and institutions. Why, then, should we favor the virtue approach over, say, an institutional approach to good scientific practice? Because institutions are yet another human artifact, so ultimately

Here is a partial list of epistemic virtues: attentiveness, benevolence (principle of charity), conscientiousness, creativity, curiosity, discernment, honesty, humility, objectivity, parsimony, studiousness, understanding, warrant, wisdom. And here is a partial list of epistemic vices: close-mindedness, dishonesty, dogmatism, gullibility, naïveté, obtuseness, self-deception, superficiality, wishful thinking.

Staying away from those vices and pursuing those virtues is, of course, much easier said than done, something that Aristotle—a connoisseur of human psychology—understood very well. Which is why he said that virtue begins with realizing what one ought or ought not to do, but becomes entrenched only with much practice and endless corrections, allowing us to internalize its precepts. Moreover, it takes a certain ability to self-examine and accept constructive criticism not to fall into the easy trap of attributing the virtues to oneself and the vices to one's intellectual opponents. Looking back at my encounters with both *Curioso* and *Ostinata* I clearly see that I had been less than virtuous, perhaps at times dismissing too hastily some of their points, or glossing over possible deficiencies in my own arguments, not displaying sufficient humility, and so forth.

To bring things into sharper focus, let me briefly discuss an example where prominent skeptics of pseudoscience behaved in what is arguably an unvirtuous manner, and therefore definitely not in the way I am advocating we should navigate the somewhat irrational world we happen to live in.

Back in the 1970s, the *enfant terrible* of philosophy of science, Paul Feyerabend, wrote in defense of astrology. Not because he believed astrology has any merit, but in reaction to a famous manifesto against it that was initiated by philosopher and skeptic-in-chief Paul Kurtz and signed by 186 scientists. The anti-astrology manifesto read, in part⁷:

We, the undersigned—astronomers, astrophysicists, and scientists in other fields—wish to caution the public against the unquestioning acceptance of the predictions and advice given privately and publicly by astrologers. ... In ancient times people believed in the predictions and advice of astrologers because astrology was part and parcel of their

the way they are run boils down, again, to the character, decisions, and values of the individuals working within (or even building new) institutions.

⁷ All quotes from: Kidd, I.J. (2016) "Why did Feyerabend defend astrology? Integrity, virtue, and the integrity of science". *Social Epistemology* 30: pp. 464–482. See also my response to Kidd: Pigliucci, M. (2016) "Was Feyerabend Right in Defending Astrology? A Commentary on Kidd". *Social Epistemology* 5:pp. 1–6.

magical world view. ... Why do people believe in astrology? In these uncertain times many long for the comfort of having guidance in making decisions.

Surprisingly, the famed astronomer and noted skeptic Carl Sagan declined to sign the manifesto, explaining:

I struggled with [the manifesto's] wording, and in the end found myself unable to sign, not because I thought astrology has any validity whatever, but because I felt ... that the tone of the statement was authoritarian. It criticized astrology for having origins shrouded in superstition. But this is true as well for religion, chemistry, medicine and astronomy, to mention only four. The issue is not what faltering and rudimentary knowledge astrology came from, but what is its present validity. ... Then there was speculation on the psychological motivations of those who believe in astrology. These motivations ... might explain why astrology is not generally given the skeptical scrutiny it deserves, but [are] quite peripheral to whether it works. ... The statement stressed that we can think of no mechanism by which astrology could work. This is certainly a relevant point but by itself it's unconvincing. No mechanism was known for continental drift ... when it was proposed by Alfred Wegener in the first quarter of the twentieth century to explain a range of puzzling data in geology and paleontology.

Feyerabend was even harsher than Sagan:

The learned gentlemen have strong convictions, they use their authority to spread these convictions (why 186 signatures if one has arguments?), they know a few phrases which sound like arguments, but they certainly do not know what they are talking about. ... [The manifesto] shows the extent to which scientists are prepared to assert their authority even in areas in which they have no knowledge whatsoever. .. It is interesting to see how closely both parties [i.e., astrologers and their critics] approach each other in ignorance, conceit and the wish for easy power over minds.

Neither Sagan nor Feyerabend were arguing that there is any substance to astrology—they both knew better than that—but that it matters how one approaches public criticism of pseudoscience. One must do it virtuously, by taking one's opponents' arguments seriously, engaging with them, and deploying logic and evidence against them. One must not simply attempt to use the weight of authority to squash a displeasing notion, because that would be intellectually unvirtuous. Although Sagan and Feyerabend did not use the language of virtue epistemology, they called for the scientists to behave better than the pseudoscientists, and rightly so.

So, where does this leave us? Skepticism of pseudoscience shares its core values with science, values that include intellectual honesty, humility, and the other epistemic virtues listed above. What is supposed to separate skeptics from creationists, climate change deniers, and all the rest is not that we happen to be (mostly, often, maybe) right and they aren't. It's that we seek the truth, whatever it may turn out to be. Which means we do the hard work of carrying out research, and don't just sit on our collective arse and pontificate.

To make sure of this, I present a handy checklist for aspiring virtuous skeptics to keep in mind whenever we are debunking the (alleged) nonsense *du jour*:

Did I carefully consider my opponent's arguments and not dismiss them out of hand?

Did I interpret what my opponent said in the most charitable way possible before mounting a response?

Did I seriously entertain the possibility that I may be wrong? Or am I too blinded by my own preconceptions?

Am I an expert on this matter? If not, did I consult experts, or did I just conjure my own unfounded opinion out of thin air?

Did I check the reliability of my sources, or just searched online whatever was convenient to throw at my opponent?

Having done my research, do I actually know what I'm talking about, or am I simply repeating someone else's opinion?

Virtue ethics is supposed to help us focus on improving ourselves as moral agents. So, most of all, let us strive to live by Aristotle's own words: "Piety requires us to honor truth above our friends" (*Nicomachean Ethics*, Book I, 1096a.16). I'll keep that in mind the next time I meet Curiosa and Ostinato.

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HOW TO CITE THIS ARTICLE

Pigliucci, Massimo (2020). «How to behave virtuously in an irrational world». *Disputatio. Philosophical Research Bulletin* 9, no. 13: pp. 00–00.