

Scratching where it doesn't itch: science denialism, expertise, and the probative value of scientific consensus

Rascando donde no pica: el negacionismo científico, la experticia y el carácter probatorio del consenso científico

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Abstract: In recent years, several strategies have been proposed to tackle social controversies about topics in which science is settled, among which one of the most influential is that of Elizabeth Anderson, who argues that any lay person with access to the Internet and basic education can reliably assess the acceptability of various claims involving expert knowledge. In particular, the author shows that this procedure can be successfully applied to the case of anthropogenic global warming. In this article we will try to argue why, even if we concede that Anderson's proposal is satisfactory in that particular case, it fails to generalize when applied to other controversies. In

Resumen: En los últimos años, se han propuesto diversas estrategias para enfrentar las controversias sociales sobre temas en los que la ciencia está saldada, entre las cuales una de las más influyentes es la de Elizabeth Anderson, que sostiene que cualquier persona lega con acceso a Internet y educación básica puede evaluar confiablemente la aceptabilidad de distintas afirmaciones que involucran el conocimiento de personas expertas. En concreto, la autora muestra que este procedimiento puede aplicarse con éxito al caso del calentamiento global antropogénico. En este artículo intentaremos demostrar por qué, incluso concediendo que la propuesta de

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this article, we illustrate it with the cases of flat-Eartherism and anti-vaxxerism.

Keywords: Anthropogenic global warming denialism, anti-vaxxerism, flat-Eartherism, Anderson, Elizabeth.

Anderson sea satisfactoria para ese caso concreto, fracasa cuando intentamos generalizarla. En particular, intentaremos mostrar que la propuesta no funciona cuando se aplica al terraplanismo y el movimiento antivacunas.

Palabras clave: Negacionismo del calentamiento global antropogénico, antivacunas, terraplanismo, Anderson, Elizabeth.

1. Introduction and outline

The existence of doubts in society about the efficacy and safety of vaccines (Mallapaty, 2021) and the anthropogenic global warming (AGW) (Björnberg et al., 2017; Strozewski, 2021) – or about the obvious implausibility of astrology and flat Earth beliefs (Cowie, 2019) – are examples of the gap between what the scientific community considers reasonably corroborated or refuted, on the one hand, and what outside the scientific community is seen as «controversial», on the other. In other words, we face *social* controversies which stand in tension with *scientific* consensus.

It is interesting to note that this phenomenon overlaps with the previously known crisis of *public trust in the testimony of scientific experts* (Almassi, 2012; Haerlin & Parr, 1999; Hendriks et al., 2015). In other words: we are not dealing only with the fact that the public may not accept certain propositions (such as «there is an anthropogenic global warming taking place», or even «the Earth is roughly spherical»), but with the fact that the public does not take *scientific experts* (or at least the right ones) as reliable sources, *as a consequence of which* it fails to accept the propositions in question. Given that, as Elizabeth Anderson writes, «[m]ost laypersons cannot directly judge the merits of most scientific claims», they, instead, «mostly judge what to believe by judging whom to believe» (Anderson, 2011, p. 145). Now, if this is so, then it is reasonable to expect that laudable epistemological analyses aimed at the problem of what experts to trust, such as Alvin Goldman's (2001) and the one proposed by Anderson (2011) herself (much more applied to the laypeople's perspective) will *ipso facto* provide the right keys to counter these scientifically illegitimate controversies. In Anderson's own words, «the solution to our problem is therefore to show that laypersons have the second-order capacity to judge trustworthiness and consensus, and access to the information needed to make such judgments» (Anderson, 2011, p. 145).

In particular, according to Anderson, following a series of simple steps, any layperson with access to the Internet and basic education can reliably assess the acceptability of different claims involving expert knowledge. She attempts to show that this procedure can be successfully applied to the case of AGW. She demonstrates that, on the basis of simple resources, laypeople can corroborate that there is a *consensus of the trustworthy* regarding AGW—and that dissenting voices, such as the signatories of the Oregon petition, are in fact false experts, therefore not trustworthy, therefore not a threat to the existing consensus. The discursive pattern of AGW denialists involves implicitly acknowledging that scientific consensus is actually probative, and this is why their strategy consists of confounding laypeople by claiming that there is in fact no such consensus about AGW—in a way very similar to the strategy deployed by the tobacco industry regarding smoking and lung cancer. These cases of the so-called

«tobacco strategy» (Oreskes & Conway, 2011, p. 6) presuppose attributing a probative value to scientific consensus—and this is, in fact, what makes them radically different from other denialist strategies, such as the ones deployed by flat-Earthers and anti-vaxxers. These other forms of scientific denialism claim, on the basis of conspiracy theories, that a scientific consensus actually *exists*, but is simply the outcome of a massive malevolent deception. In this article we will try to show why, although Anderson's proposal could be successfully applied to cases of the «tobacco strategy», it simply does not work when trying to apply it to flat-Eartherism and anti-vaxxerism. The strategy, so to say, *scratches where it doesn't itch*.

In this article, we will proceed as follows:

- In *section 2*, we will introduce Elizabeth Anderson's proposal, according to which non-experts can appeal to a series of «proxies» to identify which experts are trustworthy, and whether there exists an expert consensus in a given area. As we will see, such criteria seem to be tailored for *one* specific controversy: that which refers to AGW.
- In *section 3*, we will comment on some general criticisms to which Anderson's proposal has been subjected and possible responses. However, as we will point out, it is not those general objections that will interest us most, but the problem of the applicability of the proposal beyond the specific case of global warming.
- With this purpose, we will show, in *section 4*, why Anderson's criteria function particularly well for that case. We will present evidence in favor of how highlighting the scientific consensus regarding climate change could function as a «gateway belief» for the laypeople, and how this makes it understandable that denialists of AGW, in turn, appeal to the «tobacco strategy» of denying the existence of such a consensus.
- In *section 5*, before turning to the question of how Anderson's criteria fare in relation to other denialist discourses, such as flat-Eartherism and anti-vaxxerism, we will discuss whether such criteria *should* be applicable to these discourses.
- In *section 6*, we will offer, first, a general presentation of the flat Earth and anti-vaccine movements, in order to show that some of their characteristics (which deviate from the «tobacco strategy») make Anderson's criteria fail when applied to them. Then, we will analyze in depth the case of the Flat-earthers and their notorious epistemological individualism and the case of the antivaxxers—from a historical perspective, with emphasis on the high-profile case of Andrew Wakefield's fraud, and from a contemporary analysis of the recourse to experts by one of today's most notorious antivaccine groups in social media, Médicos por la Verdad (Doctors for the Truth, DFT).

2. Anderson's proposal, and the case of climate change denialism

Elizabeth Anderson (2011) arrives at the problem of laypeople's assessment of expert claims in a more or less roundabout manner. Her starting point is the circumstance that a scientifically literate democratic society requires, on the one hand, the implementation of public policies susceptible of being legitimized by the support of the majority of the population, but which are, on the other hand, justified on the basis of scientific evidence. How can

decisions which appeal to highly specialized knowledge remain democratic if most people will necessarily lack such knowledge? To solve this problem of democratic legitimacy, Anderson argues that what laypeople can do, in spite of lacking specialized knowledge, is to evaluate, not the claims made by experts themselves, but the reliability of the experts as such—and thus only indirectly their claims. A layperson is not expected to be able to assess, say, the evidence supporting the claims made by the notorious «Oregon petition» (*Global Warming Petition Project*, 2007), but he or she can, instead, evaluate (a) the epistemic credentials of the signatories of the petition, and (b) whether or not the position they express is representative of the consensus in the area. «To make these judgments», according to Anderson, «we need criteria of trustworthiness and consensus» (Anderson, 2011, p. 145).

Concerning the question of trustworthiness, Anderson takes into account three different axes: expertise, honesty, and epistemic responsibility.

In the first place, the evaluation of expertise should focus, according to the author, on determining whether an alleged expert does indeed have specialized knowledge on the subject which he or she is tackling (Anderson, 2011, p. 145). Secondly, the lay assessment of the credibility of the expert testimony will have to focus on deciding whether the witness is not only an expert but also an honest one; that is, whether he/she expresses his/her opinions sincerely, and whether he/she refrains from inducing beliefs in third parties on the basis of selectively exposing the available evidence (Anderson, 2011, pp. 145–146). The third aspect of this assessment focuses on the epistemic responsibility of the presumed scientific authority: we are not only interested in whether they have expert knowledge and act honestly, but also in determining «whether the witnesses respond to the evidence, the reasoning, and the arguments that others raise against their beliefs», a condition that, paradigmatically, is not satisfied when they insist on repeating an opinion on the basis of ignoring the counterevidence and counterarguments raised by those who criticize it (Anderson, 2011, p. 146).

Regarding the first of the three axes for trustworthiness assessment, Anderson considers that, to the extent that «biographical and bibliographical information» about those who make scientific judgments is «available on the web», «it is easy for lay people to rank the expertise of virtually any testifier», using an eight-level scale:

- (a) Laypersons; (b) People with a B.S. degree, a B.A. science major, or a professional degree in an applied science specialty far removed from the field of inquiry in question; (c) Ph.D. scientists outside the field of inquiry; (d) Ph.D. scientists outside the field, but with collateral expertise (for example, a statistician who is judging the use of statistics in the field); (e) Ph.D. scientists trained in the field; (f) Scientists who are research-active in the field (regularly publish in peer reviewed scientific journals in the field); (g) Scientists whose current research is widely recognized by other experts in the field, and whose findings they use as the basis for their own research [...]; (h) Scientists who are leaders in the field – who have taken leading roles in advancing theories that have won scientific consensus or opened up major new lines of research, or in developing instruments and methods that have become standard practice. In addition to the factors cited in (g), leadership is indicated by election to leadership positions in the professional societies of the field, election to

honorary scientific societies, such as the National Academy of Science, and receipt of major prizes in the field, such as the Nobel Prize (Anderson, 2011, pp. 146–147).

With respect to the second axis, Anderson thinks that a non-exhaustive list of factors to consider in determining whether a testifier is indeed honest will include conflicts of interest, evidence of scientific dishonesty such as the practice of plagiarism, and so on. Again, she considers that although «some kinds of dishonesty are difficult for laypersons to assess, others, where evidence is easily accessible through the web and verifiable without specialized knowledge, are clearly accessible» to laypersons (Anderson, 2011, p. 147). Regarding the third dimension in which an evaluation of the credibility of a scientist takes place, the author considers it especially important to determine, for example, whether he/she evaded peer review - presenting scientific claims to the non-specialized community before they are refereed -, whether he/she committed «dialogic irrationality», consisting of repeating claims without responding to attempts at refutation, and so on. In the latter case, for example, Anderson thinks that a lay person can evaluate the epistemic responsibility or irresponsibility of a witness by the mere form of her dialogical exchanges; thus, if someone who, in order to question evolutionary theory, denied the existence of «transitional fossils» between one species and another, merely repeated this denial even after a paleontologist offered him a detailed list of the links in the evolution of the whale, we would have a clear case of dialogical irrationality, susceptible of being detected even without going into details about the plausibility of the assertions at stake (Anderson, 2011, p. 148).

Along with the question of the trustworthiness of the alleged experts, laypeople should tackle the question whether there is a *consensus* of experts concerning a certain issue: «When the vast majority of diverse inquirers», Anderson writes, «converge on certain conclusions, as in evolutionary theory, a robust scientific consensus obtains». «Once a consensus of trustworthy experts is consolidated, laypersons are well advised to accept the consensus even in the face of a handful of dissenting scientists, or a few instances of error or dishonesty among a few of the participants in the consensus». However, she adds, before such a situation takes place, «the best course for laypersons is to suspend judgment» (Anderson, 2011, p. 149). It is consequently crucial to determine which of those two situations we find ourselves in—and this, according to the author, is something that laypeople can find out by appealing to «Surveys, reviews, or meta-analyses of the peer-reviewed literature», «Surveys of the trustworthy experts in the field», «Consensus statements and reports of leaders in the field» (Anderson, 2011, p. 149).

Now again, just as judgments of trustworthiness can, according to Anderson, be made by laypeople with no more resources than a high school education and an Internet connection, so can judgments of consensus. In fact, the author is so convinced that «it is not difficult for ordinary citizens to make reliable judgments of trustworthiness and consensus about climate science», that, in face of the evidence that «many are not disposed to do so», the explanation has to appeal, not to the difficulties of the task, but to «three interacting factors: biased and misleading media reports, the segregation of people with different opinions, and ‘cultural cognition’ – the tendency to judge the credibility of factual claims on the basis of their congruence with one’s social or political values» (Anderson, 2011, p. 153).

To sum up: Anderson's proposal focuses on the assessment of

- i. Trustworthiness:
 - a. expertise,
 - b. honesty, and
 - c. epistemic responsibility;
- ii. Consensus.

Let us first consider some general criticisms of this approach, and then the more specific problem we want to tackle.

3. Some general criticisms to Anderson's proposal

A series of concerns has been raised as to whether the criteria proposed by Anderson are even *in principle* so easily applicable as she claims they are (and in such a way that the only explanation for their lack of use by laypeople needs to appeal to the three factors she mentions). To begin with, Neil Levy argues that epistemic credentials of the sort Anderson appeals to are usually «polluted»: «Ordinary people know that universities don't merely certify expertise», but «also aim to attract funding and to manage public perceptions, and that these aims may conflict. Ordinary people know that peer review is conducted by people with their own interests and biases» (Levy, 2021, p. 117). Jeffrey Friedman, in turn, expresses similarly global worries. The kind of «negative heuristics» proposed by Anderson and which demands laypeople to single out fake experts on the basis of their engagement with «crackpot theories» (such as «HIV does not cause AIDS») would, according to Friedman, itself require expert knowledge, so non-experts are simply unable to apply it. Furthermore, the hierarchy of expertise which Anderson offers does not function, according to Friedman, «as a check on false expertise», but as a way of «ceding power to whichever group of putative experts had captured the hierarchy of expertise» (Friedman, 2017, p. 299).

These criticisms might perhaps be successfully replied to. Levy's preoccupation about the «pollution» of credentials might be taken to imply that such credentials are not always *sufficient* to warrant expertise, but it seems unsure that it can shed doubt on the claim that they are *necessary*—that, at least in relation to the lowest grades of the hierarchy Anderson proposes, it is not necessary to hold a degree in medicine or in climatology to count as an expert in those areas. As to Friedman's remark concerning «crackpot theories», a possible reply might appeal to *degrees* of knowledge of scientific consensus, which provides even non-experts with some general negative heuristics; a person does not need to be a specialist in the mechanisms of AIDS transmission to at least be endowed with a general outline of how the disease is spread. With respect to the risk of a «group of putative experts» «capturing the hierarchy of expertise», this scenario needs to be concretized a little more to support Friedman's worries. It does seem that if the hierarchy of expertise were «captured» *at a global level* by a «group of putative experts», it is not clear who would be in a position to refute them. If, say, Lyssenkoism had spread to the whole community of biologists, maybe no one could, after some years, elaborate a criticism of the theory from within the specialized community. However, if the «capture» of the hierarchy of expertise in a discipline takes

place only at a more local level, criticism of the group of putative experts will still be in principle possible.

Now, we might ask whether an assessment of the existence of consensus in a given area is even feasible on the grounds Anderson takes it to be. It is true that she mentions the Wikipedia entry on global warming, which highlights the controversies on the subject and surveys on the current opinion of the scientific community, but she does not offer reasons for believing that analogous controversies are amenable to analysis with similar tools. It might be the case that there was no easily perceivable consensus on, say, the safety of genetically modified organisms, or vaccines. However, we do not need to enter into details about these questions because, *even conceding* its feasibility, our own concerns with Anderson's proposal lie at a deeper level: the problem whether the strategy of asking people to assess consensus constitutes a legitimate way to tackle controversies in which science deniers do not question the existence of consensus, but its probative value.

Let us begin by analyzing why Anderson's proposal suits particularly well the case of AGW, and then turn to the problem of its legitimacy for dealing with other forms of social controversies which run counter to scientific consensus.

4. Some relevant empirical evidence: perceived consensus as a «gateway belief» and its applicability to the problem of climate change

In fact, it is interesting to note that, although Anderson does not appeal to empirical evidence supporting the effectiveness of her proposal, some studies have shown that highlighting the scientific consensus on certain propositions reinforces the public's belief in them. Anderson's appeal to the assessment of consensus as a «proxy» which would prompt acceptance of scientific knowledge converges with studies that regard «perceived scientific agreement as a 'gateway belief' that either supports or undermines other key beliefs about climate change, which in turn, influence support for public action». In this model, «an experimentally induced change in the level of perceived consensus is causally associated with a subsequent change in the belief that climate change is (a) happening, (b) human-caused, and (c) how much people worry about the issue» (van der Linden et al., 2015, p. 2). Similarly, two studies by Lewandowsky et al. (2013) show that the acceptance of scientific propositions by a series of experimental subjects correlates with the consensus that such subjects believe exists on the propositions in question—an effect that ranges from statements such as «Human CO₂ emissions cause climate change» to «Smoking causes lung cancer». In a similar vein, Ding et al. (2011, p. 462) show that «people who believe that scientists disagree on global warming tend to feel less certain that global warming is occurring, and show less support for climate policy». The fact that, *on the one hand*, an increase in the perception of scientific consensus regarding AGW leads to an increase in acceptance that such phenomenon exists is consistent with the fact that, *on the other hand*, denialist discourses insist once and again that there is no such scientific consensus—as when U.S. Senator Inhofe publicly claimed that «scientists vigorously disagree over whether human activities are responsible for global warming, or whether those activities will precipitate natural disasters» (Inhofe, 2003).

More concretely put, what makes the case of AGW (and, conversely, of climate change *denialism*) a topic which suits Anderson's proposal particularly well is that, in this area, denialists

- 1) acknowledge the existence of *experts*, the value of whose opinion is superior to the value of laypersons' opinions.

But they

- 2) deny, however, the very existence of a consensus

–by which they implicitly

- 3) acknowledge that *if* there existed a consensus, *it would have a probative value*;

Finally, they

- 4) appeal, in order to deny the existence of such a consensus, to a fraudulent «dissent»–either to fake experts (i.e., scientists with no credentials in the specific area which is climatology, as seen in the Oregon petition), or to experts with conflicts of interests (as in the case of physicians paid by tobacco companies).

In Table 1, we show how the cases of tobacco and of climate change fare with respect to these aspects.

Table 1. Analysis of two uses of the «tobacco strategy» in comparison to discourses aligned with scientific consensus

	Tobacco and cancer	Climate change denialism	Defense of scientific consensus in these areas
Area(s) of science to which it is opposed	Medicine	Atmospheric sciences	-
1) Recognition of the value of expert authorities	Yes	Yes	Yes
2) Recognition of the existence of a consensus	No	No	Yes
3) Valuation of scientific consensus as probative	Yes	Yes	Yes
4) Appeal to fraudulent «dissent»	Yes (conflict of interest)	Yes (fake experts)	No

As can be seen, the points in which these two denialist discourses diverge from the defense of scientific consensus are (2) and (4). These discourses are not committed to a form of epistemological individualism—and therefore accept, regarding (1), the value of expert authorities. And they also accept that *if* there were a consensus among these expert authorities, that consensus *would* be probatory—which is why they need to deny (regarding (3)) its current existence. But this means that such denialist discourses sufficiently overlap with actual scientific discourse to make Anderson's response applicable. This would not be the case if we

were dealing with a form of science denialism which –regarding (1)– appealed to forms of epistemological individualism in relation to which it would be question-begging to insist on the value of adequate experts, or which –against (3)– *denied* that scientific consensus is really probative, on the basis of an alleged conspiracy among specialists. And the reply would also have to be different if –in opposition to (4)– we faced a denialist discourse able to find support among actual experts, without conflicts of interests. Now, at least *prima facie*, it seems that the strategies deployed by forms of scientific denialism other than AGW denial are different in these respects—and that the way to vindicate good science needs to be different as well. Let us see, first, whether it is reasonable to claim that Anderson's proposal *should* be applicable to those other forms and, then, whether the proposal succeeds in that task.

5. Should this proposal be applicable to other denialist discourses?

As we partially anticipated, although Anderson presents as a «case study» the question whether lay assessment of the theory of AGW is possible (Anderson, 2011, p. 149), such a theory might represent for her proposal much more than a case among others—it seems to be *the* kind of denialist discourse which can be successfully tackled by means of assessments of trustworthiness and consensus, whereas such assessments fail at showing the illegitimacy of other equally denialist theories. However, we should first ask ourselves *why* those other theories should fall under Anderson's scope.

According to the author, in the United States «there is enormous political controversy over the scientific theory of global warming or anthropogenic climate change» that, she goes on, «engages not only the question of what ought to be done about climate change, but about whether the theory enjoys scientific support. *This is the type of case for which our criteria are designed*» (Anderson, 2011, pp. 149–150). Therefore, although Anderson's article has repeatedly been cited precisely in relation to the problem of AGW (Cook, 2019; Lewandowsky et al., 2018; Longino, 2019) if it is just *one* case within a *more general* «type», we may want to elucidate a little more about this type, in order to check whether such criteria should be applicable to other controversies.

Given that her proposal is motivated by the *problem* of determining what expert discourses laypeople should accept, and hinges on a *solution* that appeals to epistemic «proxies» such as expertise and consensus, the criterion to identify other controversies as relevant for the application of this solution should not involve as a necessary condition that they be *political* controversies. What really seems to matter here is (i) that there exists a controversy and (ii) that it involves highly specialized claims which laypeople are unable to assess directly—a situation that produces the need for «proxies» such as those Anderson introduces. It would sound ad hoc, then, to claim that Anderson's solution can be tested against the problem of controversies regarding climate change but not against controversies such as those generated by anti-vaxxers or flat-Earthers, which are similar forms of science denialism, in the sense that they emerge in society as a whole, but not within the scientific community. If laypeople can be taught, when it comes to accepting AGW, how to identify real experts, what the consensus among the experts is, and that such a consensus has a probative value, one should expect such a strategy to be also feasible when other scientific claims are at issue.

6. The problem of the applicability to other denialist discourses

Bearing this possibility in mind, we decided to analyze the most popular discourses that reject expert consensus and survey their main characteristics to see if it was feasible to apply Anderson's criteria. An element which suggests that her proposal might be successful when applied to denialist discourses other than climate change denialism is that several studies indicate that «attitudes toward a wide range of issues are related to how much consensus people think there is among experts» (Czarnek & Kossowska, 2023, p. 3) and this is not limited to climate change. In particular, Czarnek & Kossowska (2023) found a strong correlation between the perception of scientific consensus and support for COVID-19 vaccination and Kerr & van der Linden (2021) revealed that «experimentally induced increases in perceived scientific consensus regarding the threat posed by COVID-19 predicted increases in personal agreement with the same claim, and this in turn predicted increases in support for policies that aim to restrict the spread of the virus» (p. 10). These results are in line with those obtained for perceived consensus in climate change and, in this sense, one might think that antivaxxers, like AGW deniers, are so because they are not familiar with the existence of a well-established scientific consensus. However, as we will see below, this is not exactly the case because antivaxxers *do* acknowledge the existence of a consensus, they just do not consider it probative.

Table 1 summarizes and compares the main characteristics of popular science denialism discourses: antivaxxerism, flat-Eartherism and climate change denialism.

Table 2. Comparison of the main characteristics of other popular science denialism discourses

	Tobacco and cancer	Climate change denialism	Defense of scientific consensus in these areas	Anti-vaxxerism	Flat-Eartherism
Area(s) of science to which it is opposed	Medicine	Atmospheric sciences	-	Medicine	Geology Astronomy
1) Recognition of the value of expert authorities	Yes	Yes	Yes	Yes	No
2) Recognition of the existence of a consensus	No	No	Yes	Yes	Yes
3) Valuation of scientific consensus as probative	Yes	Yes	Yes	No	No
4) Appeal to fraudulent «dissent»	Yes (conflict of interest)	Yes (fake experts)	No	No	No

As we can see, although antivaxxers –like climate change deniers– resort to experts in the field, this is not the case with Flat-earthers, who show (regarding (1)) a high degree of epistemological individualism. On the other hand (regarding (2)), both the antivaccine and Flat-Earth discourses, unlike that of climate change deniers, recognize the *existence* of a consensus. The problem does not lie in this acknowledgement, but (regarding (3)) in the fact that they value it negatively: they do not consider the scientific consensus to be probative, either because they regard it as dishonest or as a part of an alleged conspiracy. As for the kind of «dissent» antivaxxers turn to (regarding (4)), we will see below that they do not appeal to false experts as the ones in the «Oregon petition».

Therefore, some forms of science denialism, such as flat-Eartherism and anti-vaccination, are not as vulnerable as AGW denialism to criticism on the basis of the application of Anderson's criteria. We will now delve deeper into each of these discourses in order to better show why Anderson's proposal is not adequate.

6.1. The case of flat-Earthers: if I don't see it, I don't believe it

The Flat Earth Movement is not new –its origins can be traced back to the mid-nineteenth century (Olshansky et al., 2020)– but it has gained a new and significant number of acolytes in the last decade thanks to the massive success of YouTube and the videos shown there. Although the literature is scarce, Olshansky et al. (2018; 2020) have shown that those who embrace Modern Flat Earth ideology, although their motivations for holding their beliefs have different origins, are what we would call epistemological individualists. Mantras such as «Trust your eyes,» or «Do your own experiments» often emerge as justifications for their non-belief in experts and official institutions.

As Lee McIntyre recollected in interviews with flat-earthers, they refuse to accept evidence «on authority» and insist on the need to obtain it firsthand (McIntyre, 2021, p. 8). They are systematically dismissive of the value of allegedly expert knowledge. In terms of one particular flat-Earther, «This guy was trying to tell me I'm wrong, and he was like, 'I have a master's degree in science.' And I said, 'I guarantee you that you're smart, brother. But you're a parrot. All you're doing is repeating back what they told you'» (Ingold, 2018). This is connected with the flat-Earthers' belief that «the elite among world governments, scientific institutions, and international space agencies are conspiring to deceive the public and hide the true shape of the Earth» (Olshansky et. al, 2020, p. 47). Conspiratorial thinking has been repeatedly identified as a core trait of flat-Eartherism (Olshansky, 2018, pp. 46–48, 51).

Let us note, then, two main (and closely related) characteristics of flat-Earthers: they are (concerning (1)) epistemological individualists and believe in a huge conspiracy, which is why (concerning (3)) do not value scientific consensus.

Therefore, if a layperson were under the influence of this specific kind of discourse (for example through YouTube videos) it would be question-begging to insist that the «consensus of the trustworthy» in areas such as geology and astronomy goes against them. Flat-Earthers do not even need to deny (regarding (2)) the existence of that consensus and (regarding (4)) to fabricate fraudulent dissent as AGW denialists did by means of the Oregon petition. Even if flat-Earthers can sometimes appeal to «conventional» experts –as is, alas, the case of a

geophysicist who happens to be one of the most notorious representatives of this ideology in Brazil («To 11 Million Brazilians, the Earth Is Flat,» 2020)—, the real point simply does not lie there: for a supporter of a belief system such as flat-Eartherism, which claims that laypeople can and should do their «own research» (Sargent, 2015), the remark that scientific authorities do not share their beliefs is anything but disturbing. As we will also see in the case of anti-vaxxers, here Anderson's proposal scratches where it doesn't itch.

6.2. The case of anti-vaxxers—with lessons from history and an exhaustive review

Let us turn to our second counterexample: anti-vaxxers.

The first anti-vaccine movements can be traced back to the 19th century when, faced with the incipient vaccination against smallpox, resistance was based on alleged safety problems, personal liberties and connivence between doctors and the government (Wolfe & Sharp, 2002).

Anti-vaccine groups have, in fact, gained prominence in recent years, as a consequence of the advent of the COVID pandemic. With a strong presence in social media, they sow doubts and mistrust, and they have become amplifiers of misleading information, thus posing a serious threat to public health since they hinder the achievement of herd immunity (de Oliveira et al., 2022; Dubé et al., 2015; Evrony & Caplan, 2017). We conducted an exhaustive survey of over 600 Twitter posts of Doctors for the Truth (DFT), a German group that emerged strongly in Spain and Latin America during the pandemic and which includes physicians and health researchers among its members (Gardel, 2020; Maldita.es, 2021; Micheletto, 2021). We specifically analyzed all posts made during 2020-2022 by the DFT branches from Argentina, Peru and Chile (Edelsztein & Cormick, 2023).

Along with many other issues, we focused on the specialists to whom these groups appealed to disseminate misinformation. And the results are in fact rather disquieting.

As to the judgment of *expertise*, even if these specialists are not «leaders» in their areas, they still make it at least to level (e) in Anderson's hierarchy. They are certainly not «leaders» in their field, but they are nevertheless rather specialized. The situation in the anti-vaccine groups was by no means similar to that of the «Oregon petition». Even using a rather strict characterization of who to call «experts» (i.e., only considering experts those with academic credentials specifically in areas related to vaccine production such as biochemistry, chemistry, medicine, immunology and microbiology), we found that there were several limitations in characterizing the discourse of DFT as analogous to the Oregon petition. Although in a few cases the groups appealed to testimonies of non-specialists (tennis players, journalists, forensic doctors, general pediatricians), in the overwhelming majority of cases, they resorted to medical specialists: immunologists, experts in molecular biology and genetic engineering. And this occurred in all the branches analyzed: out of the total number of posts that resort to experts for each country, the groups from Argentina and Peru rely on accredited specialists in 76.1% and 81.6% of the cases, respectively and the Chilean group turned to real experts 64.4% of the cases.

Regarding the judgment of *honesty*, physicians such as María José Martínez Albarraacín or Luis Marcelo Martínez, on the contrary, do not have obvious conflicts of interest which

may taint their public judgments. And, as we argued (Edelsztein & Cormick, 2023), highlighting some of the adverse effects of vaccines, which is something desirable among the scientific community, *is not* cherry picking (unlike making moves such as citing a study which was later retracted or contradicted by better evidence).

As to the judgment of *epistemic responsibility*, this is perhaps the one in which the DFT fare worst, as long as specialists such as Martínez Albarracín or Martínez fail to, for example, submit their claims to peer review before making them available to the wider public. But, again, the key difficulty for using Anderson's tests in order to show the weaknesses of this kind of discourse lies in the fact that *even if* the DFT catastrophically failed these three trustworthiness tests (which is not precisely the case), a layperson under the influence of this discourse may still believe that *the main point* of their discourse is being neglected. Which brings us, again, to the question of consensus: if current scientific consensus is actually the result of a conspiracy, why should we even pay attention to it, and consider the question of the reliability of individual researchers more important than the tainted character of mainstream science?

In other words: from the point of view of a person under the influence of the discourse of anti-vaxxers, among the two main axes of Anderson's interest (trustworthiness and consensus), the second is clearly more important than the first. The real problem is the nature of existing scientific consensus. And this can be further illustrated by reflecting on a case in which assessment of trustworthiness *does* seem to yield clearly catastrophic results: the case of Andrew Wakefield.

In 1998, the anti-vaccination movement was reinvigorated when physician Andrew Wakefield presented preliminary research, published in the prestigious scientific journal *The Lancet*, showing that 12 children had developed autistic behavior and severe intestinal inflammation upon vaccination against measles, mumps and rubella (MMR vaccine). Wakefield suggested, then, that a causal link existed between those events. Although this connection was debunked time and again, Wakefield was shown to have conflicts of interest and to have committed fraud, and the article was retracted from the journal, the connection between autism and vaccines became a central focus of claims by anti-vaccine groups and instigated social concern that led to a decline in vaccination rates (Omer, 2020; Rao & Andrade, 2011).

Let us look in detail at this case, one of the most resonant in history, and try to apply Anderson's criteria. Recall that, to assess *trustworthiness*, Anderson considers three different axes: *expertise*, *honesty*, and *epistemic responsibility*. According to Goldenberg, it is easy to quickly see that «Wakefield scores low on Anderson's hierarchy of expertise, having fallen from the top rank of recognized leader in the relevant field of research to the lower status of 'PhD scientists trained in the field'. His financial conflicts of interest discredit», concerning the second axis, «the honesty of his claims», and, as to the third, «he has evaded accountability for his pronouncements on numerous occasions» (Goldenberg, 2021, p. 162). Up to this point, then, Anderson's criteria *seem* sufficient to discard Wakefield as not «trustworthy». The problem is that, according to Goldenberg, it seems that the very fact that Wakefield was ostracized by the scientific community, more particularly that he was *because of challenging scientific consensus*, is what makes him look as a hero who dared dissent from the scientific establishment, who is a victim of a «witch hunt». «Wakefield's persisting maverick status reveals a reversal of the hierarchy of expertise offered by Anderson (2011) (...)

The perceived trustworthiness of the maverick lies in his distance from organized science; this contradicts Anderson's hierarchy, in which near proximity to the establishment's core ensures credibility» (Goldenberg, 2021, pp. 162–163. Emphasis ours). We may rephrase Goldenberg's remarks in the following way: Wakefield can indeed be said to fail Anderson's three «trustworthiness» tests, but, perhaps paradoxically, the fact that his positions *also* fail to represent the scientific consensus in the area *are precisely what renders them attractive for his followers*. Anti-vaxxers do not respect Wakefield due to their hypothetical *ignorance* of the existence of an expert consensus, but because they believe the consensus in question is the result of a corrupt establishment. Arguing against this specific kind of denialism cannot consist of making the same moves that would be appropriate against the «tobacco strategy». What seems necessary in this case is, instead, to show that there are no good grounds to support the kind of conspiratorial thinking required to side with Wakefield.

The distrust of scientific consensus is not limited to the response Wakefield's claims received. Hobson-West found in a qualitative analysis of «Vaccine Critical groups» that these groups construct trust in others as passive, portraying parents *who become experts themselves* as an alternative to *trusting experts* (Hobson-West, 2007, p. 212). Gross (2009) quotes the words of Lisa Kaufman, a medical anthropologist, who claims that the persistence of the vaccine-autism link theory is partly due to the belief *that blindly following experts negates personal responsibility* (Gross, 2009, p. 6). Kata has also reported and analyzed the distrust of medical expertise among anti-vaxxers, with common assertions found online, including the belief that vaccines cause illness, are ineffective, are part of a medical/pharmaceutical/government conspiracy, and mainstream medicine is incorrect or corrupt (Kata, 2012, p. 3779). In all these cases, what the empirical evidence seems to suggest, again, is that anti-vaxxers question the probative value of consensus—not its existence.

Moving closer to the present day and the COVID-19 pandemic, we find similar suspicions about the evidentiary value of scientific consensus in the face of the alleged conspiracy. In the UK, protesters opposing COVID-19 vaccination gathered to hear a professor claim that «vaccines make people sick, you should not trust the Government, the doctors, and the media, they are lying about the Covid-19 vaccine» (Roach & Clifton, 2020). These distrustful attitudes are also noted in a review by the Royal Society and the British Academy (2020) regarding the pandemic.

AGW denialists, then, did not question the general criterion according to which, as Anderson defends, «laypersons are well advised to accept the consensus»—they only questioned the claim that such a consensus exists in climate science. But things are quite different when *conspiratorial thinking* enters the picture—and this is why discussing this form of denialism in the same way as against AGW denialists *would be question-begging*. Anti-vaxxers such as those in DFT gladly accept that *of course* there is a consensus regarding the safety and effectiveness of vaccines against SARS-COV-19—a consensus which includes the positions of the World Health Organization, the FDA, and other agencies. But, in the absence of further arguments, the mere existence of such an agreement cannot carry, for these dissenters (and for a layperson under their influence), any probative value: this virtual unanimity is in fact the product, not of independent converging investigations, but of spurious interests and a conspiracy. In a strategy *very* dissimilar from that which we find displayed in the case of AGW, these DFT are far from denying that their views are those of a tiny minority. They

claim, instead, that the minority in question is constituted by «the brave» who courageously oppose a tyrannic «thought police». Against such claims, then, reminding the reader of the existence of a widespread consensus about the safety and effectiveness of vaccines scratches (once again) where it doesn't itch.

7. Summing up

Let us recapitulate. We saw that, apart from more general criticisms to her proposal, Anderson's suggestion that laypeople can successfully assess the acceptability of the testimony of (alleged) scientific experts, in terms of their trustworthiness and their relation to scientific consensus, suits particularly well the case of AGW denialism, but fails to offer a similarly satisfactory reply to two other main currents of denialism: flat-Eartherism and opposition to vaccination. *Even if* consensus in these areas were simply to detect, this would not amount to a solution to controversies in which the existence of that consensus is not denied.

More concretely:

1. The kind of assessment of epistemic credentials of experts, and of the existence of a consensus which Anderson champions seems of little use against the discourse of *flat-Earthers*, who both deny that expertise in areas such as geology or astronomy is crucial for the question of the shape of the Earth *and* claim that the scientific consensus in the area, whose existence they do not deny, is simply the result of a conspiracy.
2. In the case of *anti-vaxxers*, though they acknowledge the value of expertise (and therefore do not share the epistemological individualism of flat-Earthers), they again do not deny the existence of a scientific consensus on the safety and effectiveness of vaccines—but, instead, explain such a consensus conspiratorially. This aspect, which has been pointed out regarding the well-known minority position held by Wakefield, can also be found in the denounce of scientific consensus voiced by several anti-vaccination groups.


In other words: it would be a mistake to assume that scientific denialism, *in general*, is committed to the «tobacco strategy»—consisting of the appeal to fake experts to cast doubt on the existence of a scientific consensus in a certain area. Different forms of science denialism deploy equally different strategies, and the attempts to tackle them should remain sensitive to these particularities.

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