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ARTICLE

Second-Order Assessment of Scientific Expert Claims and Sharing Epistemic Burdens in Science Communication

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Abstract

When laypersons are presented with scientific information which seeks to modify their way of life, they are expected to believe, suspend belief, or reject it. Second-order assessment of scientific experts helps laypersons to make an informed decision in such situations. This is an assessment of the trustworthiness of the person making the scientific claim. In this paper I challenge the optimistic view of Anderson (2011), regarding the ease with which laypersons can perform second-order assessment of experts, by pointing out some of the obstacles that may prevent laypersons from arriving at an informed decision through this means. By showing that laypersons cannot easily perform second-order assessment of experts, I make a case for sharing epistemic burdens in science communication by using Lackey's (2006) concept of *dualism* in the epistemology of testimony and Irzik and Kurtulmus' (2019) work on public epistemic trust in science, as a guide. I invite experts to bear a greater share of the epistemic burden when communicating with laypersons because of their privileged epistemic condition vis-à-vis laypersons.

Keywords: Second-order assessments; trustworthiness; sharing epistemic burdens; scientific experts; laypersons; science communication

1. Introduction

Making scientific information available to laypersons is important, but it is often difficult for laypersons to assess the reliability of such information since they are not experts in that field, hence, the role of trust in acquiring knowledge (Hardwig 1985, 1991). In order for laypersons to place informed trust in scientific experts, social epistemologists such as Goldman (2001) and Anderson (2011) suggest that laypersons can perform second-order assessment of expert claims. Goldman (2001) suggests second-order means of assessing expert claims by making a distinction between exoteric and esoteric statements in an expert's discourse.[1] Anderson (2011), similarly, suggests second-order

[1]Exoteric statements are outside the subject matter or domain of expertise. Their truth values may be accessible by a novice either at the time of assertion or later. Esoteric statements, on the other hand, are

means of assessing expert claims, but she is more optimistic than Goldman regarding the ability of laypersons to conduct this assessment (Lane 2014). The second-order means of assessing expert claims shifts the focus of assessment from the scientific claim to the person making the claim, and rightly so, because laypersons lack specialized scientific knowledge. The second-order assessment of experts is an assessment of the trustworthiness of the person making the scientific claim.

This paper challenges the optimistic view of Anderson, regarding the ease with which laypersons can do this, by pointing out some of the obstacles that may prevent laypersons from acquiring reliable information through this means. By showing that laypersons cannot easily perform second-order assessment of experts, I make a case for sharing epistemic burdens in science communication by employing Lackey's (2006) concept of *dualism* in the epistemology of testimony and Irzik and Kurtulmus' (2019) work on public epistemic trust in science, as a guide.

The paper is divided into five sections. The first section deals with the question of the extent to which laypersons can assess scientific expert claims. The second section introduces Anderson's proposal and what I consider as shortcomings of her proposal. In the third section, I consider the influence of motivated ignorance and reasoning in our judgment of expert trustworthiness. I then present a case study of a suspended Ebola vaccine trial in Ghana to show how second-order assessment of experts can be challenging for laypersons. Following from this, I argue in the final section that laypersons will be in a better position to assess expert trustworthiness if experts facilitate laypeople's second-order assessment of their expertise through a process of sharing epistemic burdens in science communication.

2. To what extent can laypersons assess scientific expert claims?

In this paper I shall concern myself with cognitive or intellectual experts whom Goldman (2001: 91) defines as "people who have (or claim to have) a superior quantity or level of knowledge in some domain and an ability to generate new knowledge in answer to questions within the domain." Goldman further asserts that "experts in a given domain (the E-domain) have more beliefs (or high degrees of belief) in true propositions and/or fewer beliefs in false propositions within that domain than most people do (or better: than the vast majority of people do)" (2001: 91). Unlike experts, laypersons do not possess the in-depth knowledge which experts have (Scharrer *et al.* 2017). Laypersons may have a general knowledge, for example, that antibiotics help to fight bacterial infections but may lack the expertise necessary to produce an antibiotic in the laboratory or to determine which antibiotic is effective for which bacterial infection.

In short, experts have technical and in-depth knowledge of a particular field which laypersons lack. Even though laypersons lack first-order understanding of certain specialized scientific disciplines, they can generally acquire knowledge on how to judge the trustworthiness of sources, since this kind of knowledge is not peculiar to science (Bromme and Gierth 2021). When it comes to scientific topics which are usually taught in schools and which form part of scientific literacy, laypersons usually understand these issues because they are topics whose certainty in the scientific community is not in doubt. However, the position of laypersons becomes more complicated in

within the relevant subject matter or domain of expertise and have truth values that are inaccessible to a novice, due to their lack of specialized knowledge (Goldman 2001: 10).

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cases of unsettled scientific controversies and conflicts (Bromme and Gierth 2021). The very fact that there exist contradicting claims and uncertain scientific controversies and the need to know which claim is reliable enough to believe justify the need for laypersons to perform second-order assessments of experts.[2]

Since experts possess in-depth knowledge of a target domain which laypersons lack, how are laypersons to go about assessing the reports of scientific experts? Goldman (2001: 90) describes the cognitive state of a novice who must decide between the conflicting claims of two experts, in the following way:

> The novice either has no opinions in the target domain or does not have enough confidence in his opinions in this domain to use them in adjudicating or evaluating the disagreement between the rival experts. He thinks of the domain as properly requiring a certain expertise, and he does not view himself as possessing this expertise.

But not all novices are the same, it is possible to have different levels of understanding of scientific issues even among novices. Nguyen (2020*a*) describes expertise which is close to a novice's understanding of the world as the novice's "cognitive mainland," while expertise which is farther from a novice's cognitive resources, he describes as the novice's "cognitive island." This distinction is important to help laypersons know where they stand in relation to a certain type of expertise and their capacity to judge expert trustworthiness (Watson 2020).

Some novices may think of themselves competent enough or think a scientific issue within their cognitive mainland to warrant an easy enough performance of first-order assessments. As Levy (2019) notes, this confidence stems from the fact that people are epistemic individualists, that is, having confidence in themselves to assess claims without consulting or deferring to an expert. This confidence on the part of laypersons to assess scientific claims for themselves instead of consulting or deferring to qualified experts leads to a disregard of the notion of expertise and often results in wrong judgments on the part of laypersons. Thus, it becomes even more imperative to encourage laypersons to desist from assessing the evidence supporting scientific claims for themselves, since consulting a trusted expert is epistemically prudent. If laypersons are not competent enough to assess scientific claims for themselves, what other avenues are open to them in deciding which scientific claim to believe? In response to this question, Brewer (1998), Goldman (2001), Anderson (2011) and Brennan (2020) have suggested several ways in which laypersons can assess the testimony of experts on a second-order basis. My focus in this paper will be on Anderson's proposal.

3. Anderson's second-order assessment of expert claims

A social epistemologist who provides an optimistic solution to the question of lay assessment of expert testimony is Elizabeth Anderson. Like the work of Goldman, Anderson (2011) provides second-order means of assessing the testimony of experts. Anderson, however, is more optimistic than Goldman when it comes to the ability of laypersons to perform this task (Lane 2014). According to Anderson (2011: 145) laypersons can "mostly judge what to believe by judging whom to believe." She holds the view that using second-order means of assessment, the public in a democracy will be able to

[2]I thank an anonymous reviewer of this journal for pointing this out to me.

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judge which scientific claim to believe and to judge whether other trustworthy scientists agree on the issue in question.

Anderson makes the point that a functioning democracy requires certain epistemic tasks to be performed by citizens. She notes however that in "public policies justified by technical scientific reasoning" the public may find it challenging to do this, although the challenge is surmountable. Anderson (2011) expresses the view that citizens within a democratic society who have an "ordinary education" and who can find their way around the Internet in sourcing ready access to information should be able to assess the trustworthiness of scientific experts. By "ordinary education" Anderson refers to a high school education. Her assessment of the trustworthiness of scientific expert claims depends on four factors. These are an assessment of expertise, an assessment of honesty, an assessment of epistemic responsibility and a consensus of trustworthy and responsible experts.

Assessing expertise requires laypersons "to judge whether testifiers are in a position to know the claims in question – whether they have access to the evidence and the skills to evaluate it" (Anderson 2011: 145). Anderson suggests a way to rank expertise within a particular domain as follows:

(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. This can be determined by considering such factors as citation counts, the impact factors of the journals in which they publish, and record in winning major grants.
(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 … and receipt of major prizes in the field, such as the Nobel prize. (Anderson 2011: 146–7)

Anderson claims that expertise in a particular field increases as one goes down this list from (a) to (h). She asserts that experts who fall within (f), (g) and (h) have more expertise in a particular field which makes their testimony carry more weight. Additionally, Anderson posits that when it comes to highly technical fields such as climate science, those who fall within criteria (b) and (c) are not to be considered experts in the field. She suggests that laypersons can find out this information by searching the Internet.

In moving on from the assessment of expertise to the assessment of honesty, Anderson suggests that there are some signs which discredit the honesty of experts, signs laypersons ought to look out for. These are cases of conflict of interest, where an expert is funded by agents who "have a stake in getting people to believe in a particular claim" (Anderson 2011: 147). Another discrediting criterion laypersons can look

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out for is a track record of previous scientific dishonesty on the part of an expert. Such scientific dishonesty can involve cases of plagiarism, fabrication of research data and "repeatedly citing research that does not support one's claims" (Anderson 2011: 147). Another way laypersons can judge the honesty of an expert is to ascertain whether she has a history of providing misleading statements or "persistently misrepresenting the arguments and claims of scientific opponents or making false accusations of dishonesty against them" (Anderson 2011: 147). Anderson acknowledges that this list is not exhaustive and concedes that in some situations it will be difficult for laypersons to assess cases of dishonesty on the part of experts. However, she is of the opinion that in cases where there is clear information of scientific misconduct on the Internet, laypersons should be able to judge this.

For Anderson, an assessment of epistemic responsibility of an expert has to do with the assessment of the responsiveness of an expert to objections raised against their claim. An expert who continues to make a claim which has been refuted by other experts in the field, without addressing these objections is engaging in what Anderson (2011: 147) calls "dialogic irrationality." Similarly, an expert who is not open to peer review and who refuses to share their data for no good reason and who refuses to make their methodology open for replication by other scientists, does not meet the criteria of epistemic responsibility. Also, a researcher who does not publish their work in peer-reviewed journals or one who is in the habit of making their research findings known to the press first before making it known to their colleagues does not meet the criteria of epistemic responsibility and is therefore untrustworthy. Other means of evaluation which Anderson provides to assess the epistemic responsibility of an expert is whether the expert is in the habit of:

i. Advancing crackpot theories in domains other than the one under investigation – for example, that HIV does not cause AIDS.
ii. Voluntarily associating with crackpots – e.g., publishing their work, or placing one's own work for publication in their venues. (Anderson 2011: 148)

While Anderson states that it is relatively easy for laypersons to assess whether an expert evades peer review, she believes that laypersons will have a challenging time determining crackpot theories supported by experts, hence she maintains that only theories publicly known by laypersons to be unsupported by evidence should be counted within this criterion. Also, when it comes to detecting dialogic irrationality on the part of an expert, Anderson holds that it will not be necessary for laypersons to possess firsthand knowledge of the subject matter to do this. She suggests that laypersons can read or listen to the arguments of experts to ascertain whether rational arguments are being provided for the point of view being articulated. For instance, laypersons can examine the nature of responses to determine whether they have the semblance of a rational argument or response. An example she provides in her paper, is the following:

> Evolution Denialist: There are no examples of transitional fossils between one species and another.
>
> Paleontologist: Consider the whale. We have a line of fossils starting from the 4-legged ungulate Sinonyx, moving to Pakicetus, Ambulocetus, Rodhocetus, Basilosaurus, and Dorudon, before we get to modern toothed whales. The line is impressive for showing a gradual loss of hind limbs, steady migration of nostrils

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> from the front to the top of the head, forming a blowhole, and continuing development of other characteristics of modern whales, such as their teeth.
>
> Evolution Denialist: There are no examples of transitional fossils between one species and another! (Anderson 2011: 148)

In this exchange, without having firsthand knowledge of the subject matter of evolution, laypersons can nonetheless judge whether the evolution denialist provides any form of rational argument against the objection raised by the paleontologist. The evolution denialist, in their defense, provides no semblance of rational explanation for their claim, except repeating the claim in the face of an objection. Anderson suggests that if the evolution denialist had provided a response such as "Ambulocetus and Rodhocetus cannot be transitional fossils to modern whales, because they are reptiles" (Anderson 2011: 148), a layperson will be able to know that the evolution denialists has provided the form of a rational response, without the layperson's direct knowledge of the truth or otherwise of this response.

The fourth criterion for assessing trustworthiness in Anderson's second-order assessment of scientific testimony is what she refers to as a consensus of trustworthy experts. She makes the following claims about this kind of consensus and its relation to laypersons:

> When the vast majority of diverse inquirers converge on certain conclusions, as in evolutionary theory, a robust scientific consensus obtains. Before a consensus, the best course for laypersons is to suspend judgment. 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. (Anderson 2011: 149)

The crucial question one might ask is how laypersons can determine if a scientific issue has consensus within the scientific community. Anderson answers this question by suggesting that laypersons can do this by assessing surveys, reviews, or meta-analyses of the peer-reviewed literature. In reviewing this body of work, the question that laypersons should be asking is whether there is "a common opinion expressed or presupposed by the bulk of work in the field" (Anderson 2011: 149). Laypersons should also evaluate surveys of the trustworthy experts in the field and while doing this, laypersons should ask the following questions: "Were the questions biased in favor of a particular answer? Were precautions taken to ensure that only trustworthy experts were included in the survey? Did the survey take a representative sample?" (Anderson 2011: 149). Finally, Anderson posits that laypersons should consult "consensus statements and reports of leaders in the field, for example, reports on the matter by the National Academy of Sciences" (2011: 149).

3.1. Shortcomings of Anderson's second-order assessment

Anderson's second-order assessment of scientific expert testimony provides an optimistic outlook to the challenge of lay assessment of experts. It provides a route for laypersons to be justified in their belief in a particular scientific claim by helping laypersons to rationally assess which expert is more credible. This prevents laypersons from blindly

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trusting scientific claims which may turn out to be false. However, one is bound to ask whether Anderson's criteria of assessing scientific expert testimony is without problems. In my view, there are problems within Anderson's framework which will make it difficult for laypersons to undertake the kind of epistemic task required. I believe it takes more than a high school education and a search on the Internet for laypersons to perform an assessment of expertise, an assessment of honesty, an assessment of epistemic responsibility and to determine whether there is a consensus of trustworthy and responsible experts on an issue. I discuss some of these problems presently.

It is arguable whether a layperson with a high school education would be able to follow through with Anderson's assessment model. Whether laypersons with high school degrees would be able to assess experts in the way Anderson suggests will depend largely on the content of their high school education. How robust is a high school education such that it can help graduates to detect plagiarism, fabrication, or falsification of data in a scholarly work, to assess the honesty of experts? Again, it is important to ask how a high school education prepares laypersons to determine whether an expert has not shared data for replication or submitted her research for peer review. It would be laudable if a high school education trains students to be able to perform this epistemic task, but as things stand, I doubt this is the case.

Moreover, some of the assessment criteria suggested by Anderson require more than a cursory search on the Internet. Apart from the fact that there are all kinds of information available on the Internet with no particular way of ranking which source is more credible, there is also the need to go beyond the normal search engines to read policy documents or peer-reviewed journal articles to perform some of the epistemic tasks recommended in Anderson's framework. To illustrate, consider how Anderson suggests laypersons will be able to assess whether there is a consensus of trustworthy experts on an issue. She recommends that to do this, laypersons should assess "surveys, reviews, or meta-analyses of the peer-reviewed literature" to ascertain whether "there is a common opinion expressed or presupposed by the bulk of work in the field" (Anderson 2011: 149). This immediately raises a lot of difficulties for laypersons, especially those with just a high school education.

Firstly, there is no guarantee that a search on Wikipedia, for example (Anderson uses Wikipedia to make her case) will have information on every issue of public interest, especially in the case of novel and emergency public health situations. An analysis of this nature requires that one is trained in how to conduct academic research on the internet. This will also require one to know the peer-reviewed journals specific to the scientific field under scrutiny and the articles to target in such journals. I doubt laypersons with a high school degree are capable of this kind of epistemic endeavor. This kind of epistemic ability is the kind you will expect from students and researchers who have been trained in academic research and writing, usually at the doctoral level. Apart from this, there are other pressing questions which remain when it comes to determining the consensus of trustworthy experts about an issue. One important question is how laypersons can determine how many experts must agree on an issue to form a consensus, or how many peer-reviewed articles to review to arrive at a decision concerning the consensus of trustworthy experts. Laypersons would have a challenging time determining who the trustworthy experts in a field are and what makes them trustworthy.

Anderson's (2011) confidence in the ability of laypersons with an "ordinary education" to use second-order means to assess the scientific testimony of experts appears utopian in the face of these objections and questions. Also, it becomes increasingly inadequate in cases of public health emergencies, such as the safety of new vaccines and clinical trials which have direct impact on the public.

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4. The complex condition of laypersons in deciding whom to trust: the challenge of socially motivated reasoning[3]

Apart from the challenges which laypersons (with at least a high school education) face with the actual process of performing second-order assessments of experts, there are other factors which impede a credible judgment of expertise. According to Anderson (2011: 153), "biased and misleading media reports, the segregation of people with different opinions and cultural cognition[4] make laypersons ill-disposed to carry out second-order assessment of experts." I acknowledge that these are real factors which detract from an unbiased assessment of expert claims, especially when the topic is politically, religiously, or socially charged. However, I differ from Anderson's overly optimistic claim that laypersons can easily perform second-order assessments were it not for these extenuating factors. My pessimism of Anderson's position is also shared by Keren (2018). I consider these three factors Anderson cites as additional factors which complicates further the already existing difficulty which laypersons face when determining whom to trust.

In deciding which expert to trust when there are two conflicting positions, the background of the person confronted with the decision comes into play as well as the political context in which the scientific controversy is taking place. These background conditions can be succinctly captured as the social context of the layperson and the social context of the controversy.[5] Whereas the social context of the individual refers to the identity and values of the individual as a member of a particular community or social circle, the social context of the controversy refers to the media and political environment in which the alleged or actual scientific conflict is embedded. In reference to the social context of the individual, Williams (2021) examines a situation known as 'socially motivated ignorance' in which he argues that in some cases, members of a particular social group prefer to remain ignorant of certain facts (for example anthropogenic climate change) because they want to retain membership of these groups. Such individuals may prefer not to accept certain scientific claims because they do not want other members of their group to know that they believe the scientific claim in question. Kahan (2017) characterizes this phenomenon as 'identity protective cognition' which is a form of cognitive bias in which individuals seek and process information with the goal of protecting their political-coalitional identity rather than arriving at the truth (Williams 2021). This kind of socially motivated ignorance sustains itself through "downgrading epistemic authority of agents who assert identity-inconsistent views, using reasoning to find creative rationalisations for cherished beliefs, and the simple physical avoidance of identity-inconsistent information" (Williams 2021: 7820–1).

Druckman and McGrath (2019) argue that the empirical evidence is not so clear when it comes to how directional motivated reasoning makes people disbelieve the scientific consensus since a desire to acquire accurate beliefs also involves a kind of motivated reasoning. According to Druckman and McGrath, individuals vary in what they consider credible evidence, and this may explain preference formation when it comes to contested scientific topics. If this is anything to go by, the literature on motivated

[3]This section was developed because of the useful comments by an anonymous reviewer of this journal.

[4]This is a phrase introduced by Kahan and Braman (2006) to refer to the tendency to judge the credibility of factual claims based on their congruence with one's social or political values.

[5]This description and phrasing of the condition of laypersons was suggested by a reviewer of this journal. I like it and hence use it here.

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reasoning, motivated ignorance and cultural cognition shows that the condition of non-experts when it comes to whom to trust is a complex one.

In response to the challenge of socially motivated cognition, De Cruz (2020) suggests a three-pronged solution: (1) improving the message by using mechanistic explanations, in the case of climate change; (2) improving the messenger by having testifiers who appear benevolent and who are part of the audience's in-group, for instance, a political conservative who accepts anthropogenic climate change; and (3) improving the epistemic environment in which the message is conveyed through an institutional regulation of misinformation on traditional and social media. A similar institutional solution to the phenomenon of fake news on social media is presented by Rini (2017). Brennan (2020) also suggests that laypersons should perform second-order assessments of their own trustworthiness in deciding whom to trust through a process of meta-cognition. I share the views of De Cruz and Brennan and agree that although these suggestions are not a panacea to the problem of socially motivated reasoning and cognitive biases, they can minimize it.[6] In the long run, I believe that psychological training in identifying and responding to cognitive bias, as well as inculcating an ethics of appealing to experts[7] in the school curriculum at an early stage will help to mitigate the threat of socially motivated reasoning. Moreover, research on the social groups that people want to be aligned with, and the reasons why they want to identify with particular social groups, will shed light on this phenomenon and may provide ways of responding to it.

In the next section I provide a case study to illustrate the complexity of performing second-order assessments of scientific expert claims within a social context.

5. The suspended Ebola vaccine trials in Ghana: a case study

In 2014 West African countries such as Guinea, Liberia and Sierra-Leone were struck with a deadly Ebola virus outbreak. International efforts to combat the ravaging effects of the virus led to the commencement of several vaccine trials intended to develop a vaccine against the virus. Some of the vaccine trials were intended to take place in Ghana, however, this never happened because of several factors ranging from misinformation by the media, political reasons, and disagreement between the Ghana Food and Drugs Authority (FDA) and the Ghana Association of Arts and Sciences (GAAS). Although Ghana had not recorded a case of Ebola, there were two vaccine trials scheduled to take place in the country. The Janssen Ebola vaccine was to undergo phase 1 trials while the GlaxoSmithKline vaccine was to undergo phase 2 trials.

The FDA is the regulatory body set up by an Act of Parliament to approve clinical and vaccine trials in Ghana. The FDA had granted approval for the vaccine trials to be conducted in Hohoe, a town in the Volta Region of Ghana. The FDA in various statements provided reasons why it had approved the vaccine trials and vouched for its

[6]For additional work that has been done in this area see Nguyen (2020*b*), also see work by Kahan *et al.* (2010).

[7]Hardwig's 'Toward an Ethics of Expertise' acknowledges the ethical responsibility of those who appeal to experts. One relevant maxim he provides for those appealing to experts is the following: "Try to find the best-qualified expert and recognize that agreement with your values, desires, policies, plans, or hunches is not a qualification for an expert. Selecting an expert whom you think will likely support your position is an epistemic vice, a form of rationalization. Selecting an expert because you know she will support your position is a form of deliberate deception (or of self-deception) and hence an ethical vice. Appealing to experts who will support the views we already hold is a common failing, but it defeats the rational purpose of appealing to experts" (Hardwig 1994: 11).

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safety. The approval given by the FDA for the GlaxoSmithKline vaccine trial was challenged by the Ghana Academy of Arts and Sciences, a group of renowned professors in the humanities and sciences, stating that the GSK vaccine trial was not safe. According to the GAAS' own assessment, Ghana was not ready for the vaccine trial, and they were concerned about the inclusion of children in the trial. Overall, the GAAS was unconvinced that the trials met strict international standards of vaccine trials (Aggrey and Shrum 2020). The conflict surrounding the Ebola vaccine trials was introduced into the public domain through newspaper publications and media activities. Two sets of statements from a local Ghanaian newspaper read as follows:

> Scientists of the Ghana Food and Drugs Authority (FDA) blithely authorised Ghanaian scientists, working for a foreign pharmaceutical company to carry out trials of an Ebola vaccine, without so much as a word to the Ghanaian public, to prepare their minds for the trials. (Ghanaian Times Newspaper, 30.06.2015)

> If you … try, even if metaphorically, to "smuggle" the project into the country, you will ensure that the first that is heard of it is through the news broadcast by a local radio station, then you are asking for trouble. (Ghanaian Times Newspaper, 30.06.2015)

These media statements agitated the public who then pressurized their political representatives in parliament to do something about the approved vaccine trials. The Minister of Health, who is the head of the Ghana Health Service, was invited for questioning by parliament; on his part, he stated that the vaccines had gone through the required processes for approval by the FDA but added that the stakeholder consultation which needed to be had was not thorough enough. The parliament of Ghana suspended the approved vaccine trials and directed the minister of health to reverse the approval given by the FDA. In reaction to the suspension of the clinical trials, a leading professor of pharmacology bemoaned the suspension and considered it a sad day for Ghana, since in his view, Ghana had missed an important opportunity to contribute to the advancement of science (Kummervold *et al.* 2017).

Five months after the parliamentary suspension of the vaccine trials, the trials received parliamentary approval, but the momentum was already lost, and the trials never took place. In this controversy a principal factor behind the public outcry, the newspaper publications, and the eventual suspension of the trials by parliament was the fear associated with the Ebola outbreak. The Ebola virus is a deadly virus which kills patients within a brief period, due to this, most laypeople in Ghana who opposed the trials did so out of fear. There was an ongoing rumor that the vaccine trials were designed to spread the Ebola virus within the country. Some people also did not understand why the trials were to be conducted in Ghana when the country had not recorded cases. Again, some other people considered the vaccine trials unsafe due to the history of research misconduct in Africa.

It is within this context that the Ebola vaccine trials were suspended in Ghana. Moreover, the conflicting reports by the FDA and the GAAS left the public in a state of indecision, not knowing whom to trust. In this context of contradictory expert claims, uncertainty and fear surrounding the vaccine trials, how could the public have known whom to trust and which report to believe? Could the second-order assessment tools provided by Anderson (2011) have helped the Ghanaian public decide the reliability of the vaccine trials and thereby take appropriate actions to volunteer in the trials?

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5.1. Second-order assessment of the Ebola vaccine trials in Ghana

The suspended Ebola vaccine trials in Ghana present a situation where two professional groups disagree on a scientific issue. The Ghanaian Food and Drugs Authority (FDA) approved the trials while the Ghana Academy of Arts and Sciences objected. The mission of both institutions is the following:

> FDA – The FDA exists to protect public health by assuring the safety, efficacy and security of human and veterinary drugs, food, biological products, cosmetics, medical devices, household chemical substances, tobacco and the conduct of clinical trials in the country. (http://www.fdaghana.gov.gh/)
>
> GAAS – The mission of the Ghana Academy of Arts and Sciences is to encourage the creation, acquisition, dissemination and utilization of knowledge for national development through the promotion of learning. (https://gaas-gh.org/)

From both missions, the institution which has direct expertise in clinical trials is the FDA, hence their approval should have been considered more trustworthy than the counter claims by the GAAS. However, given that the GAAS is made up of renowned scientists and professors, who have expertise in clinical trials, it becomes difficult for the public to know whom to trust. Anderson's assessment of expertise becomes cumbersome in this scenario where there are equally competent experts. Anderson's recommended grades of expertise in a particular field may be useful in determining who has more expertise in the field, either the FDA or the GAAS. But this is no easy task for laypersons. One reason for this is that, when institutions or professional organizations are involved, as in this case, it becomes difficult to identify which scientist among the FDA or the GAAS is making the claim. In such a case, the expertise of individual scientists is subsumed under the professional organization and this makes it difficult to assess expertise according to Anderson's criteria.

Also, in such situations, scientific statements are owned by the institutions as a whole and not individual scientists. A way to get around this may be to assess the mission of the FDA and GAAS – when this is done, it is clearly seen that the FDA has a direct mission to ensure the safety and regulation of vaccine trials, but this information is not enough to vouch for the trustworthiness of the FDA in the Ebola vaccine trials. It is one thing having a mission and another, carrying out that mission well. Moreover, the information needed to assess the expertise, honesty, epistemic responsibility, and the consensus of trustworthy experts in this case was not readily available on the Internet. The information about the vaccine trials was conveyed to the public through newspapers, radio, and television and usually by journalists who sensationalized the issue, resulting in aggravated fear.

It is also important to mention that context matters. In Ghana, the Internet is not the first means of acquiring information for most laypersons; the local radio or TV station is. For many rural areas where these clinical trials often take place, most of the people have less than a high school education, with many depending on rumors, hearsay and their traditional leaders for information. In such a context, Furman (2020) argues that it is sometimes reasonable for laypersons to trust the rumors of their neighbors, more than expert claims, since their neighbors are more likely to make value judgments which align with their own. Given this context, coupled with the blinding influence of

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fear which makes people ignore the facts, it will require more than a second-order assessment on the part of laypersons to determine which scientific claim to believe.

6. Sharing epistemic burdens in science communication

Considering the limitations of second-order assessment of the claims of scientific experts, I propose that there must be an uneven sharing of epistemic burdens[8] in scientific communication between scientists and laypersons. An epistemic burden as I use it here refers to the cognitive work involved in knowing what one does not know. Scientists have an epistemic burden of understanding a phenomenon through a rigorous epistemic process and to communicate their findings to non-experts. Non-experts, on the other hand, have an epistemic burden of deciding which scientist to trust concerning scientific issues of interest.

In my proposal, I assert that experts should bear the greater epistemic burden when communicating their findings to laypersons, due to their privileged epistemic position in relation to laypersons and the challenges laypersons face when performing second-order assessment of scientific expert claims. My proposal draws from the work done by Lackey (2006) in the epistemology of testimony. In her proposal, she assigns epistemic responsibilities to the person conveying information as well as to the person receiving the information. She refers to her proposal as *dualism*, understood in this way:

> For every speaker A and hearer B, B justifiedly believes that p on the basis of A's testimony that p only if: (1) B believes that p on the basis of the content of A's testimony that p, (2) A's testimony that p is reliable or otherwise truth conducive, and (3) B has appropriate positive reasons for accepting A's testimony that p. (Lackey 2006: 170)

In Lackey's dualism, for an information to be justifiably believed by a hearer it requires collaborative epistemic effort on the part of the speaker and the hearer. The speaker's epistemic task is to provide a reliable or otherwise truth-conducive testimony about an issue (p), while the hearer's epistemic task is to base her belief that (p) on the content of the speaker's testimony and have appropriate positive reasons for doing so. The second-order assessment criteria offered by Anderson contributes towards the positive reasons the hearer, in our case laypersons, may have for accepting a scientific claim. A similar proposal which shares the epistemic burden between a speaker and a hearer is the work of Irzik and Kurtulmus (2019). Their work relates to scientific testimony and epistemic trust more specifically. According to their proposal,

> M has warranted epistemic trust in S as a provider of P only if (1) S believes that P and honestly (i.e. truthfully, accurately and wholly) communicates it to M either directly or indirectly, (2) M takes the fact that S believes and has communicated that P to be a (strong but defeasible) reason to believe that P, (3) P is the output of reliable scientific research carried out by S, and (4) M relies on S because she has good reasons to believe that P is the output of such research and that S has communicated P honestly. (Irzik and Kurtulmus 2019: 1150)

[8]The concept of epistemic burden has been used by Scheall (2019) and in co-authored papers by Scheall and Crutchfield (2021).

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Here, M is a member of the public, S is a scientist and P is the information or claim being conveyed. Irzik and Kurtulmus note that conditions (1) and (3) relate to the scientist's trustworthiness, while conditions (2) and (4) provide the grounds of trust for the layperson. My proposal is an addition to condition (4) in Irzik and Kurtulmus' proposal and condition (B) in Lackey's proposal. While Lackey refers to this condition as "appropriate positive reasons for accepting A's testimony that p," Irzik and Kurtulmus refer to it as "good reasons to believe that p." I believe that second-order assessment of experts form part of the "appropriate positive reasons" and "good reasons" that laypersons must have before accepting a scientific claim. My evaluation of second-order assessments show that laypersons are often not equal to the task. I therefore suggest that experts facilitate laypersons' second-order assessment of their claims by assisting laypersons to perform this epistemic task with little or no obstacles in their way.

This proposal stems from challenges laypersons face in assessing expertise, honesty, epistemic responsibility, and the consensus of trustworthy and responsible experts as proposed by Anderson. It is epistemically charitable that experts consider their epistemic privilege when it comes to technical issues and the limitation of laypersons in this regard and assume a greater share of the epistemic burden in public acquisition of reliable information. Apart from communicating honestly and carrying out their research in the most competent and rigorous manner, experts must readily supply information about their level of expertise, their track record, whether there is a scientific consensus on the issue and make such information available through engagements and interactions with the public to help laypersons to easily assess the expert's trustworthiness.

An addition to Irzik and Kurtulmus' (2019) proposal to include the epistemic burden of experts to assist laypersons to conduct second-order assessment of their expertise will look like this: L (layperson) can acquire reliable scientific information from S (scientist) only if (1) S believes the scientific claim and honestly (i.e. truthfully, accurately and wholly) communicates it to L either directly or indirectly, (2) S communicates in such a way that L understands what S communicates, (3) S provides additional information about their level of expertise, track record and whether or not there is a consensus of trustworthy scientists about what is communicated, (4) L is able to perform second-order assessment of expertise, honesty, epistemic responsibility and consensus based on the information openly supplied by S, and (5) What S communicates is the output of reliable scientific research carried out by S.

The epistemic burden of experts to facilitate laypersons' second-order assessment as suggested here connects to work by some philosophers which call on experts to avoid expert trespassing (Gerken 2018; Ballantyne 2019). It is connected as well to works by other scholars in the science of science communication literature who focus on communicating scientific consensus about a scientific topic to laypersons (Boykoff & Boykoff 2004; van der Linden *et al.* 2015). Additionally, my proposal connects to science education literature about teaching the nature of science as part of the school curriculum (Lampert 2020).[9]

A problem which I foresee arising for my proposal is that laypersons would be left vulnerable to manipulation and deception if their second-order assessment is to be facilitated by those who purport to make scientific knowledge claims. For instance,

[9]My appreciation goes to a reviewer of this journal who made the point that there have been similar proposals for experts to facilitate second-order assessments of their claims in the science of science communication and science education literature.

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how do laypersons know if an expert is being truthful about their qualifications, conflict of interest, whether they have published their research in peer-reviewed journals or whether there is a consensus on the scientific claim being made? Given this problem, I see a role for science communicators, especially science journalists who serve as intermediaries between scientists and the public. I assume that in most societies there are trusted and accountable media organizations who have the responsibility of transmitting relevant information to the public. I propose that due to their training as science journalists, they will be more efficient than laypersons in performing background checks on those who make scientific claims. Thus, to prevent laypersons from being deceived or manipulated, science journalists must not just relay scientific information to the public in an understandable way but must also provide information on the track record, expertise, potential conflict of interest of experts and whether there is a scientific consensus on the claims being made.

A similar proposal has been made by Elliott (2019), who argues that science journalists have a role to play in unearthing the underpinning value commitments of scientists to help laypersons to make informed judgments. Others who have emphasized a role for science journalists in science communication have questioned the notion of balanced science reporting, which they argue has been a cause for the spread of misinformation in the public domain (Anderson 2011; Gerken 2020). In an ideal world, we would expect journalists and experts to be objective and honest, but that is not the real world in which we live. Therefore, to be epistemically vigilant, laypersons must cross-check the second-order information that experts and science journalists provide by verifying them. The kind of second-order information that experts and science journalists would be expected to provide to laypersons would look like this: the scientist or expert provides laypersons with a website where laypersons can verify their qualifications. Laypersons can go a step further to consult the institution or organization where the potential expert reports to have obtained their degree to ascertain its truth. When it comes to a test of epistemic responsibility, the scientist or science journalist should provide information about the peer-reviewed journals where the claims in question have been published. Laypersons should then verify this information by searching the purported journals to be informed about the credibility of the journal and the expert's publication within the journal.

Also, experts and science journalists should let laypersons know whether there is a consensus in the scientific community about the claim being made. To do this, experts can let laypersons know where to find this consensus document which laypersons can verify if truly there is a consensus in the scientific community about a scientific claim. The difference, therefore, between Anderson's second-order assessment and the expert-facilitated second-order assessment which I propose is that in Anderson's proposal, laypersons begin from a position of disadvantage because they have a bulk of information on the Internet to search to assess an expert's trustworthiness, often not knowing where to begin the search. In my proposal, however, laypersons begin their assessment from a position of advantage because they have been furnished with essential information from experts and science journalists which serves as a foundation to ascertain expert trustworthiness.

7. Conclusion

I return to the Ebola vaccine trial example. Given my proposal, laypersons in Ghana, including the political representatives of the people, would have been in a better

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position to assess the contradictory claims of the FDA and the GAAS if the various competing experts within these groups identified themselves and provided information which would have made it easier for the public to perform second-order assessment of their claims. Moreover, the science journalists involved in the controversy were not helpful in this regard. Instead of reporting the intended vaccine trials in a sensationalist way, they could have aided the public's second-order assessment of the experts in question. They could have done this by providing valuable background information about the qualifications, track records, conflict of interest and epistemic responsibility of the experts or organizations in question. This information should help the public to assess expertise, honesty, epistemic responsibility, and the consensus of trustworthy and responsible scientists on the issue.

However, due to the history of epistemic trust injustices[10] which people within vulnerable and marginalized groups face, the Ghanaian context demands that the scientists who were spearheading the Ebola vaccine trials build trust among the people by holding a public forum in which various sections of the public can ask questions and seek clarification, to understand the nature of the vaccine trials, its risks and benefits and for the public to assess their sincerity and benevolence. This might help to address the rumors surrounding the Ebola vaccine trials and help the public to make an informed judgment.

In supplying additional information to assist laypersons to make an informed decision, experts take on an additional epistemic burden which hitherto would be the sole burden of laypersons. A sharing of epistemic burdens, which places more epistemic responsibility on experts and science journalists, recognizes the epistemic advantage of experts vis-à-vis laypersons and foresees the obstacles laypersons are bound to face when they perform an unaided second-order assessment of experts. In effect, recognizing and responding to the epistemic limitation of laypersons when assessing scientific expert claims is an ethical approach to communicating scientific information to laypersons.[11]

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[10]This is a term coined by Grasswick (2018) to describe the breach of trust between experts and marginalized groups due to a history of abuse of trust (e.g. the Tuskegee Syphilis study), which prevents members of these groups from placing responsible trust in experts, making them lose out on the benefits of reliable scientific research.

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