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Evidence, Testimony, and Trust: How the COVID-19 Pandemic is Exacerbating the Crisis of Trust in Science

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Abstract: In this paper, I consider an example of fast science produced in the early stages of the pandemic and the lasting effects of the study on public safety and trust in science. Due to pressures intrinsic to contemporary science and from the pandemic to produce research on COVID quickly, studies on COVID-19 that did not meet rigorous scientific standards were used to form public health policies and recommendations. I argue that the fast science produced for COVID-19, which caused many public health policies and recommendations to change throughout the pandemic, confuses the publics and erodes their trust in science.

Bio: Clarisse Paron is a PhD student in philosophy at Dalhousie University. Her research interests in feminist bioethics and philosophy of medicine center around autonomy, trust, and decision-making. She comes to philosophy after her Bachelor's Degree in science where she experienced her own disenchantment with science.

Key Words: COVID-19 pandemic, evidence, fast science, testimony, trust in science

Because modern society has not experienced such a catastrophic pandemic, it is understandable that every social sector has scrambled to contain and respond to the spread of the novel coronavirus ("COVID-19"). Not surprisingly, these sectors have looked to science for any knowledge about the virus to inform their actions and policies—a knowledge base that was non-existent until the virus infected the first human community in December 2019. The emergent pressure of the pandemic has encouraged scientists to redirect their research efforts to better understand the immunological properties of the coronavirus, investigate potential treatments, and develop vaccines. This widespread effort of the scientific community to research the coronavirus has been reinforced by increased opportunities to obtain funding for COVID-19 research from governments and other institutions. Many of the social decisions made about pandemic issues have underscored the urgent need for research findings to launch appropriate responses to COVID-19.

However, the time-sensitive pressure to understand the novel coronavirus, so as to inform public health recommendations and social policy, is in significant tension with the funding,

research, and publication processes of rigorous scientific inquiry. I understand the need for scientific research to be produced quickly so that social sectors can make evidence-based decisions in response to the pandemic; however, evidence suggests that the push to publish research quickly on COVID-19 has produced poor quality, easily falsifiable research--a situation where there could be more harms resulting than benefits. Many would contend that scientific practices should exercise social responsibility, where evidence produced from scientific research should inform public health policies and, likewise, challenges within society should guide which scientific questions ought to be pursued in order to improve the health of citizens.[1] However, as I will argue, some of the science conducted on the novel coronavirus was *not* socially responsible; the economic and social drive to rush research and publication processes lead to challenges in forming appropriate public health policies (e.g. Donald Trump's and Andrew Sheer's discreditation of the WHO's response during the pandemic[2,3]), thereby confusing the publics.[4] Most research on the novel coronavirus has social implications since each new publication has the potential to inform public health policies.[5]

In this paper, I attempt to grapple with this tension--can we encourage research to be produced on COVID-19 quickly, so that we can develop evidence-based policies to mitigate crisis, while ensuring that the quality of research is not compromised in the process? I will first describe how the imminent pressures of the pandemic, in addition to pressures for fast science, are compromising the integrity of COVID research and increasing the potential for harm to the publics as a result of poorly conducted research. In the second section, I demonstrate how the harms produced by fast science on the novel coronavirus create a situation where the publics' trust in science could be further eroded. I argue that the lack of robust scientific evidence on COVID-19 challenges for public health decision-making leads to a competition regarding who

should be the 'expert' authority on the pandemic. Conflict among experts and a lack of consensus on scientific evidence risk destroying the publics' trust in science, further exacerbating the "crisis of trust."[6] This conflict confuses the publics to such an extent that citizens turn to the expert who best shares their values. I argue that part of the solution is to consider the role of values in socially responsible science to re-establish the epistemic authority and credibility of science.

Section I: The Harms of Fast Science during COVID

Before I describe some of the ways that research on COVID-19 has harmed the publics during the pandemic, I will first show why these studies are exemplary of fast science. Baylis defines fast science as science which is "driven by personal and commercial interests."[7] As research becomes increasingly privatized, science is no longer about knowledge production, "but about the 'knowledge economy' and the 'delivery of tangible and measurable results' to create a 'prosperous and resilient' economy."[8] This shift prioritizes the quantity, velocity, and economic benefit of science over quality and originality.[9] Due to the shift in priorities for research, Baylis argues that research will not be funded unless it supports the knowledge economy;[10] thus, there is great pressure to produce scientific research and even more pressure to produce original research. Often, fast science is driven by the interests of the pharmaceutical industry which aim to shape and disseminate medical knowledge to promote its interests (profit) over those of patients.[11] Sismondo argues that Big Pharma deliberately affects the quality of research produced, which studies are produced, and the recommendations that emerge from such research--while creating the illusion that the science is unbiased, disinterested, and rigorous. A direct consequence of fast science is that many "factors intrinsic to the current practice of science…encourage outright misconduct and…discourage good scientific behaviour."[12] Because of the competition in science

to produce and obtain funding and recognition, scientists are often guilty of overstating their findings in order to have more exciting conclusions and may even resort to outright unethical or careless research practices to be competitive. While the structure of science theoretically encourages other researchers to eventually disprove 'bad' research by replicating adverse findings, these studies are not being funded nearly as much as original publications.

There have been many examples of fast science produced during the pandemic that have been used to inform public health policies but have since been falsified and retracted.[13] I will focus on one example which had a significant impact on public safety and trust during the pandemic. On March 20th, 2020, Gautret and colleagues published a study recommending that the combination of hydroxychloroquine and azithromycin be used for COVID patients "to cure their infection and to limit the transmission of the virus to other people in order to curb the spread of COVID-19."[14] This study was published nine days after the World Health Organization (WHO) officially recognized COVID-19 as a pandemic. Their project was given ethical approval on March 6th and the results were released when the article was pre-printed on March 16th; however, the researchers claimed that patients were studied over fourteen days. So, either the researchers lied about the timeline of the study or they began the research prior to ethics approval. The study had only 42 participants, 26 of whom were given hydroxychloroquine and only six from this subgroup were also given azithromycin. Four participants of the group given hydroxychloroquine or both withdrew from the study because their condition worsened or they died, thus allowing researchers to exclude them from the final results. Aside from the small sample size of the study, the researchers did not randomize which patients received pharmaceuticals. Lack of randomization is often viewed as bias since researchers can give pharmaceuticals to patients who seem more likely to recover. Researchers failed to control for

confounding factors as there was a high variability of age, gender, and starting health among participants. Additionally, researchers appeared to change which PCR test they used to measure viral load in participants midway through the study. Despite these methodological limitations and unexplained timelines,[15] the researchers asserted that they had found a miracle cure for COVID--even though these conclusions were only based on the results from six participants. Not only was this study rushed through the design and testing, but it was also accelerated through publication. A scientific misconduct expert noticed that the study was peer-reviewed and accepted for publication in 24 hours because one of the researchers was the editor-in-chief of the publishing journal.[16] Clearly, this study is a prime example of fast science, and it illuminates the harms that can result from hastily published preliminary studies.

The day after the study was published, former President Donald Trump tweeted regarding the 'miracle cure',[17] garnering widespread attention about the pharmaceuticals. The publics, media, and even healthcare professionals were so enthralled with the possibility of a potential cure that the expert reports denouncing the study's sensationalized claims were overlooked.[18] This encouraged citizens to obtain chloroquine or hydroxychloroquine and self-medicate because they believed that these pharmaceuticals prevented or cured COVID. Because these drugs are dose-sensitive, there were many hospitalizations and deaths due to self-poisoning.[19, 20] This excitement also led citizens to hoard the medications, causing shortages which prevented lupus and arthritis patients from being able to obtain these medications for their pre-existing conditions.[21] The misinformation about chloroquine and hydroxychloroquine was so pervasive that physicians even hoarded the pharmaceuticals for themselves and their families.[22]

Because of the significant public health risks, many health authorities attempted to mitigate the damage by correcting messaging to the publics. Since the study was published, the

WHO has denied the efficacy of these pharmaceuticals for COVID treatment.[23, 24] Despite these efforts, sometimes once a study is misreported, the damage of spreading misinformation is already done. We can look to numerous historical instances where poorly conducted studies have caused prevalent misunderstanding among the publics and unsuccessful attempts by public health authorities to correct the misinformation. One of the most disastrous examples in recent history was Wakefield's 1998 publication in *The Lancet* claiming a causal relation between the measles-mumps-rubella (MMR) vaccine and autism. After the findings were reported, parents grew wary of vaccines, leading them to refuse or hesitate to vaccinate their children, thus reducing the population's herd immunity and allowing previously eradicated infectious diseases to reemerge in the population.[25] While the study was problematic from the beginning (e.g., results based on a sample of 12 participants), further investigations also revealed that Wakefield falsified the results, leading to the loss of his medical license. Even after years of long-term, meta-studies disproving the original conclusions, vaccine hesitancy and misinformation about vaccine safety persist.[26]

The excitement around the use of hydroxychloroquine and azithromycin have also lead to some physicians in certain jurisdictions (e.g., Montefiore Medical Center in New York) mass prescribing hydroxy/chloroquine[27] in the absence of evidence that mass-prescribing these pharmaceuticals would not harm COVID-19 patients in the short or long term. As desperate as we are to find a 'cure' for the coronavirus, there are serious risks in conducting research that does not meet rigorous standards and then using these findings to mass prescribe pharmaceutical treatment. A good example was the push to bring Thalidomide to market in the late 1950's and early 1960's to help with morning sickness in pregnant women, resulting in thousands of congenital deformations worldwide. Substantial caution should be taken if we are basing

healthcare, public health, and policy decisions on fast science. It was later discovered that hydroxychloroquine and azithromycin actually increased morbidity and mortality in COVID-19 patients (by increasing risk for cardiac arrest).[28] Clearly, scientists should exercise caution when describing their findings and publishing fast science. When there is such a close relationship between the research and its impact on society, fast science can be harmful, even if motivated by good intentions.

In sum, while fast science might be able to offer some insights on the novel coronavirus for crisis mitigation, the findings should not be taken as established facts on COVID-19 as these studies were rushed through the design, data collection, and publishing processes. The economic and political influences that encourage misconduct in the production of scientific research are exacerbated by the competitive pressure to discover a therapeutically efficacious treatment for coronavirus. For example, it was revealed that Donald Trump had connections to the pharmaceutical industry and stood to benefit economically and politically if the drugs were mass-prescribed and, by chance, helped to control the outbreak.[29] Such a conflict of interest reveals the influence of Big Pharma funding research on potential COVID-19 treatments and underscores the lack of due diligence in evaluating research on these treatments before recommending or mass prescribing them. While healthcare professionals, public health experts, and policy makers need some scientific evidence on which to base their decisions, historic examples of bad science should be a precautionary for the way in which preliminary research is conducted, interpreted, translated to the publics, and used to inform pandemic decision-making.

Section II: Whose Testimony is Expert? Public Trust in the Wake of COVID-19

During the pandemic, where social actors are looking for evidence upon which to base decisions, a lack of scientifically rigorous evidence about COVID-19, coupled with the publics' mistrust in science, allow other social actors to compete for expert testimony in pandemic decision-making. In this section, I argue that this competition for expert authority in the pandemic highlights the way in which the clash of values between science and society is used to fuel the crisis of trust in science.

Many academics have recently critiqued what seems to be a war on expertise--identifying a new social pattern where people seem to believe whatever they want, instead of trusting the expertise of specialists to inform their beliefs. One area affected is the "war on science," or the "conflict between science and society, [and]…the worry that science may not win."[30] However, Goldenberg argues that the "war on science" does not adequately capture this anti-science/anti-science expert sentiment. She argues that the "war on science" is a misnomer because it implies that only the evidence and expertise of scientists is disputed, while framing the problem as a battle between "us" versus "them" and "minimizes the need to understand the perspective of the other, or to find compromise."[31] Although it feels like science and scientific expertise are under attack, it is really the values that appear to guide science and policymaking that are under attack —a point that I will discuss later. Thus, we ought to reframe the problem as a "crisis of trust" in science where we can better understand the public or political rejection of science or science-based policies as "a sign of poor public trust of medico-scientific institutions."[32] In considering the pandemic and other well-known anti-science campaigns, I adopt Goldenberg's framing and argue that the fast science on COVID-19 and informed policies is fuelling the crisis of trust in science.

Trust between science and the publics is critical in preventing (normatively inappropriate[33]) dissent against science.[34] The pressures for fast science, as well as the resulting harms of such research, can make science and scientists appear untrustworthy to the publics. Melo-Martín and Intemann argue that the lack of trust in science and scientists can fuel dissent against science: "failing to confront [the] problematic aspects of the research enterprise will lead to further erosion of public trust in scientific communities and hinder the ability of science to meet its practical aims."[35] They draw on the examples of climate change and vaccine hesitancy to illustrate mistrust and dissent against science. Despite the strong scientific consensus on these issues, there is resistance from the publics against the evidence that supports these examples, which prevents compliance with science-based social policies. In these cases, dissent clearly has negative epistemic and social impacts—for example, vaccine hesitancy has allowed previously eradicated diseases to re-emerge in the population. I believe that the COVID-19 pandemic similarly demonstrates the negative social and epistemic consequences of dissent against science.

Anti-science dissent is apparent in the examples of lockdown and anti-mask protests, as well as vaccine hesitancy/refusal. In considering lockdown protests, health authorities and political leaders took immediate action to curb the spread of the virus in the first wave of the pandemic. Based on early knowledge, public health authorities recommended that policy leaders should implement strategies to "flatten the curve." By calling for jurisdictional lockdowns, public health officials attempted to minimize contact among citizens to slow the spread of the virus. The strategy aimed to prevent a complete collapse of the healthcare system[36] and delay the outbreak long enough to either build herd immunity or buy time to develop a vaccine. Despite its success in curbing the spread of the outbreak,[37, 38, 39] social distancing policies caused significant economic recessions by leaving many citizens without work and businesses struggling to survive

the lockdown(s). Consequently, there has been dissent against social distancing policies in some jurisdiction; for example, in Michigan, protesters blocked traffic and congregated at state capitol buildings demanding return-to-work orders,[40] and in Alberta, some citizens organized large events (e.g., a rodeo) in protest of the lockdown restrictions.[41]

While there is no simple explanation for why some reject the science-based policies in place to keep them safe, explaining this dissent is more complicated than people simply disagreeing with scientific expertise.[42] Many cases of dissent against science are not rejections of scientific evidence and expertise *per se*, but actually rejections of the values that these scientifically based policies appear to support.[43, 44, 45] Without a strong evidence base of research, ever-changing information being released, and social policies changing, COVID science appears untrustworthy and, arguably, the fast science produced on COVID warrants this mistrust. As observed with the Gautret *et al.* and Wakefield examples, the social, personal, and political values that guide scientists resulted in the production of conclusions that were epistemically unsound. Knowing that researchers conducted studies unethically can threaten the publics' trust in science. Or, if we consider the mass prescription of hydroxychloroquine/chloroquine in New York Hospitals, the healthcare providers and administrators who decided to mass prescribe pharmaceuticals that lacked rigorous RCTs for COVID patients made poor judgements about the social consequences of their decisions. "Lack of warranted trust on the side of the public[s] regarding scientific testimony can thus be an obstacle to fully realizing science's goal of benefitting society"[46]--without trust in science or scientists, the publics will believe that science is guided by values that are against the interests of society, thus preventing science from informing policies related to social concerns or public uptake of science-based policies.

If the publics mistrust scientists and feel like science is not socially responsible, they may reject them and look for policies which appear to align with their values. Melo-Martín and Intemann notice that anti-science dissent "seems to strongly correlate with certain ideological and political value systems."[47] Politicians can strategically use dissent against science to fuel bipartisan conflicts and promote their own political and economic interests. For instance, some conservative politicians in Canada have fueled dissent during the pandemic by downplaying the severity of the virus and critiquing/creating policies based on Canadian working-class values, such as freedom, independence, and economic stability. By blaming the stay-at-home orders for restricting their freedom and causing the economic recession, Canadians who protested the stay-at-home orders do not seem to reject science or the expertise of scientists outright, but the un-Canadian values on which they think these science-based policies are founded.[48] Many citizens are rejecting scientific research and science-based policies that are necessary for their safety and health because politicians can often make these policies seem like they contradict the values of society--ironically, deflecting the blame from their inability to support citizens through the crisis. Politicians can create the illusion of an "us-versus-them" rhetoric by highlighting certain values in individual decisions and policies. It is not that citizens hold drastically different values, however, but rather that they prioritize and trade off some values over others. For example, citizens who support lockdown and mask orders also value freedom and independence; nevertheless, they are more willing to accept limits to their right to freedom in order to keep themselves and others safe by accepting measures to curb the spread of the virus. Likewise, many who protested lockdown and mask policies acknowledge that personal and public health is important, but the severity of the virus does not warrant such limits to freedom and risk of economic instability. Yet, these common values were rarely discussed publicly or politically,

which encourages polarization among members of the publics based on the values and beliefs that motivate their position on these issues. By exposing the lack of scientific evidence on COVID and encouraging dissent against science and science-based policies, politicians and other social actors can dislodge science from its authoritative position in society. The expert testimony of science is at odds with social authorities who have a more visible influence with the publics and know how to articulate values and actions.

In this pandemic, the competition of expert testimonies for social authority has fuelled the crisis of trust in science and endangered the lives of innocent citizens at the expense of economic and political gain. Science must rebuild its perception of trustworthiness by resisting the pressures for fast science and being more transparent with the way in which values inform and produce science.[49] Science and scientists ought to explicitly acknowledge the importance of social values in their research and recognize the limits of research on policymaking, an effort which is discouraged when science is funded for political or industry interests. In response to the fast science trend, Stengers argues that slow science is the best way to achieve a socially responsible science--in slowing down how research is approved, conducted, and published, we can help to ensure that scientifically rigorous science of high quality is produced. For science to improve its trust with the publics, values need to be clarified and translated if they are used to inform social policies; it takes time to identify social values and concerns, formulate how to study them appropriately, and then inform policymaking.[50] As attractive as the slow science model is, however, I doubt that it is feasible during a pandemic. Such a model seems to be in an unresolvable paradox with the need for healthcare providers, public health authorities, and policy makers to make crisis management decisions with whatever evidence they have to guide pandemic decisions and is at odds with the pressures to produce fast science.

A possible way to encourage slow science is by motivating and protecting academic whistleblowers. After the publication by Gautret *et al*., Dr. Bik, an expert in identifying scientific misconduct and error, criticized the authors' methodology, analysis, and conclusions that hydroxychloroquine and azithromycin effectively treated COVID.[51] Despite her criticisms, the journal refused to retract the paper and the researchers threatened to sue Bik for harassment and defamation.[52] In an interesting development, academic and citizen supporters of Bik have called for protection of whistleblowers to ensure scientific integrity and rigor.[53, 54] This solution prevents placing an unrealistic onus on the average person to be sufficiently scientifically literate to identify instances of fast science for themselves, while allowing scientists (who are in the best position for catching mistakes and misconduct) to hold each other accountable. Encouraging scientists to assess the research of their peers will encourage discussion about which epistemic and non-epistemic values may be acceptably compromised, thus striking a balance between the benefits and costs of slow and fast science in pandemic research and policymaking.

In this paper, I have argued that fast science on COVID-19 has not been socially responsible science. By failing to acknowledge the role of values in the scientific process and policymaking, scientists are failing to earn the trust of the people who they are trying to help. The pandemic is not the last instance where the publics will dissent against science--it is a pivotal moment for scientists and science supporters to rebuild trust with the publics and demonstrate how socially responsible science is consistent with the values of the people it is trying to help.

Endnotes

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[3] John Paul Tasker, "Andrew Scheer says he has 'serious concerns' about WHO, Trudeau vows to stick with global health agency," *CBC News*, April 15, 2020, https://www.cbc.ca/news/politics/scheer-serious-concerns-who-china-1.5533325.
[4] In this paper, I will discuss the "publics" (as opposed to "public" singular) because I want to recognize that there are many diverse groups within the public. While I generalize among these groups for present purposes, I by no means want to dismiss the important differences among these groups nor assume my argument applies to all groups equally.
[5] Examples of such are whether countries should remain in lockdown or attempt to re-open, whether masks should be mandatory, etc.
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[8] Françoise Baylis, "The Hazards of Fast Science," *The Hastings Center*, published on March 20, 2012. https://www.thehastingscenter.org/the-hazards-of-fast-science.
[9] It is important to note that these are not necessary nor sufficient conditions for identifying "fast science." Fast science is a rough and ready concept that describes how the conduct of scientific research has changed since leaving the academy and attempts to capture issues with scientific conduct that have arisen from this trend.
[10] Baylis, "The Hazards of Fast Science."
[11] Sergio Sismondo, *Ghost-Managed Medicine: Big Pharma's Invisible Hands* (Manchester: Mattering Press, 2018).
[12] Inmaculada de Melo-Martín and Kristen Intemann, *The Fight Against Doubt: How to Bridge the Gap Between Scientists and the Public* (New York: Oxford University Press, 2018), 112.
[13] Examples include 1) using an unrealistically high viral load to study how long COVID-19 lasts on surfaces, which led to excessive use of disinfectants and aerosols; 2) preliminary research on the ineffectiveness of mask-wearing to slow the transmission of COVID-19 which was quickly debunked and replaced by mandatory mask wearing policies, and 3) questioning of the vaccine safety of the Astra Zeneca and Johnson & Johnson vaccines after they were administered to the publics and were banned in some jurisdictions for causing rare blood clots. See Emanual Goldman, "Exaggerated Risk of Transmission of COVID-19 by Fomites," *The Lancet Infectious Diseases* 20, no. 8 (2020):892-893*;* Jacqueline Howard, "WHO stands by recommendation to not wear masks if you are not sick or not caring for someone who is sick," *CNN World*, March 31, 2020, https://www.cnn.com/2020/03/30/world/coronavirus-who-masks-recommendation-trnd/index.html; Noah Weiland, Sharon LaFraniere, and Carl Zimmer, "Johnson & Johnson Vaccinations Paused After Rare Clotting Cases Emerge," New York Times, updated June 18, 2021, https://www.nytimes.com/2021/04/13/us/politics/johnson-johnson-vaccine-blood-clots-fda-cdc.html.
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[17] Donald J. Trump (@realDonaldTrump), "HYDROXYCHLOROQUINE & AZITHROMYCIN, taken together, have a real chance to be one of the biggest game changers in the history of medicine…," Twitter, March 21, 2020, https://twitter.com/realdonaldtrump/status/1241367239900778 50.
[18] Other examples of poor-quality research conducted in the pandemic include 1) using an unrealistically high viral load to study how long COVID lasts on surfaces and 2) preliminary research on the ineffectiveness of mask-wearing to slow the transmission of COVID-19. See Emanual Goldman, "Exaggerated Risk of Transmission of COVID-19 by Fomites," *The Lancet Infectious Diseases* 20, no. 8 (2020):892-893 and Jacqueline Howard, "WHO stands by recommendation to not wear masks if you are not sick or not caring for someone who is sick," *CNN World*, March 31, 2020, https://www.cnn.com/2020/03/30/world/coronavirus-who-masks-recommendation-trnd/index.html.
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[30] Goldenberg, *Vaccine Hesitancy*, 12.
[31] *Ibid.*, 17.
[32] *Ibid.*, 14.
[33] Some level of dissent is critical in the process of science to improve the quality of research and what should establish given facts about our world. Melo-Martín and Intemann clarify that the dissent with which they engage in discussion is normatively inappropriate because it "fails to yield any of the epistemic benefits that make even false dissent valuable… [and] *fails to promote or…hinder scientific progress*" (*italics in original*, p. 6).
[34] Melo-Martín and Intemann, *The Fight Against Doubt*, 8.
[35] Melo-Martín and Intemann, *The Fight Against Doubt*, 114.
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[44] Stengers, *Another Science.*
[45] Goldenberg, *Vaccine Hesitancy*.
[46] Melo-Martín and Intemann, *The Fight Against Doubt*, 89.
[47] *Ibid*., 139.
[48] I believe a similar analysis can be applied to the anti-mask movement and vaccine hesitancy.
[49] Melo-Martín and Intemann, *The Fight Against Doubt.*
[50] Stengers, *Another Science*, 104.
[51] Davey, "World expert faces legal action for challenging study."

[52] Else, "Sleuth faces legal action."
[53] Lonni Besançon, et al., "Open Letter: Scientists Stand up to Protect Academic Whistleblowers and Post-publication Peer Review," *OSF Preprints*, Updated on May 18, 2021, doi:10.31219/osf.io/2awsv.
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