

The relationship between free speech and science is increasingly framed as a conflict. Scientific institutions face growing pressure from misinformation, conspiracy theories, political polarization, and declining public trust.¹ During public crises, unsupported claims often spread more rapidly than scientific corrections, leading many to argue that unrestricted speech threatens scientific progress. The question of whether free speech is the enemy of science is therefore frequently treated as a choice between protecting open expression and protecting scientific truth. This framing is misleading. The fundamental meaning of science, defined as a systematic process of gathering knowledge through observation and experimentation, is underlined and supplemented by the need for free speech, where unconstrained truths can emerge. Scientific knowledge materializes through criticism, disagreement, replication, and the possibility that prevailing consensus is wrong.² However, the same openness that allows science to correct its errors also permits the circulation of falsehoods that can weaken confidence. This essay argues that free speech is neither the enemy nor the ally of science in any simple sense. Rather, science exists because of a structural tension between scholarly criticism and accepted authority that is constantly balanced.³ The question is not whether science should permit dissent, but how much dissent science can tolerate before the mechanisms that generate knowledge begin to erode.

John Stuart Mill's classical defense of expressive liberty in *On Liberty* posits that the suppression of any opinion, even one completely devoid of empirical validity, is a form of epistemic theft from humanity.⁴ For Mill, the danger of silencing an erroneous belief lies in the inevitable stagnation of the accepted truth; when valid ideas are insulated from adversarial confrontation, they cease to be understood as rational convictions and instead degrade into what Mill labels "dead dogmas." Thus, the authority of a scientific consensus derives more from survival through exhaustive and unconstrained cross-examination. However, while democratic free speech assumes a flat epistemic landscape with every citizen possessing an equal right to contribute to public discourse, the scientific enterprise is fundamentally hierarchical, relying on rigorous gatekeeping,

credentialing, and specialized methodologies that are explicitly non-democratic. Therefore, unstructured free speech must be constrained by institutions and methodologies to prevent factual degradation.

Science emerged through opposition to intellectual authority. Many of the most significant scientific advances began as challenges to accepted consensus. The value of a scientific theory lies in its continued vulnerability. A consensus protected from scrutiny ceases to function as science and increasingly resembles dogma. Scientific inquiry therefore depends upon the freedom to question prevailing assumptions, challenge established theories, and expose methodological weaknesses. Free speech supplies the conditions under which scientific self-correction becomes possible.

This self-correcting dynamic clarifies what the scientific process itself demands. John Locke's epistemological framework in *An Essay Concerning Human Understanding* famously positions the seeker of knowledge as an "under-labourer" whose duty is to clear the ground of scholastic rubbish, vague nomenclature, and unverified assumptions.⁵ For Locke, human understanding relies entirely on a *tabula rasa* that accumulates valid ideas strictly through observation, experience, and inductive reflection. Science, by extension, cannot function when permanently insulated from adversarial interrogation. Karl Popper, through his doctrine of falsification, later asserted that only theories inherently vulnerable to empirical refutation truly retain scientific status.⁶ Therefore, when prevailing scientific consensus is shielded from dissent, it loses its empirical character and reverts to the dogmatic scholasticism that Locke opposed.

In *Conjectures and Refutations*, Karl Popper rejects the classical verificationist model of science, which posits that knowledge accumulates through the passive collection of confirming observations. Instead, he argues that because no finite number of empirical confirmations can ever definitively prove a universal theory, scientific progress occurs exclusively through the elimination of error.⁷ A theory earns scientific status through the

ability to specify the exact empirical conditions showing errors. Consequently, Popper demands an environment of institutionalized dissent. If the expressive environment of the scientific community is restricted, whether by state censorship or professional ostracization, the vital mechanism of refutation is dismantled.⁸ Hence, free speech serves the role of upholding scientific paradigms by allowing the process of refutation to occur.⁹

However, this argument risks overstating the relationship between criticism from free speech and knowledge, as science also requires standards for evaluating competing claims. Scientific conclusions are not automatically validated because they are freely expressed, but because they survive observation, experimentation, and replication. The modern scientific enterprise depends upon highly specialized knowledge that few citizens can independently verify.¹⁰ Science therefore depends also on authority. Accordingly, science encourages doubt while simultaneously requiring public confidence in its conclusions. Excessive deference risks transforming science into a rigid institution resistant to criticism. Excessive skepticism risks dissolving the trust necessary for scientific knowledge to function.¹¹ Science therefore requires a balance between both criticism and authority, despite the fact that they pull in opposite directions.

This structural friction governs the formal mechanisms through which scientific knowledge is disseminated and debated. Unlike a flat democratic system where every citizen possesses an equal procedural right to contribute to discourse, the scientific enterprise is an explicit meritocracy relying on rigorous gatekeeping. Robert Merton's sociology of science identifies "organized skepticism" as a core cultural norm.¹² Peer review subjects any individual work to the objective and methodical scrutiny of qualified experts before being able to enter the canon of accepted literature. Peer review is thus an inherently discriminatory filter that separates rigorous empirical data from unverified speculation. The vulnerability emerges when it transforms from an evaluation of competence into an enforcement of ideological or paradigm conformity.¹³ Thomas Kuhn observed in *The Structure of Scientific Revolutions* that during long periods of "normal

science,” the governing community frequently works to suppress anomalies or heterodox hypotheses that threaten the foundational paradigm.¹⁴ Peer review can consequently be co-opted to serve as an instrument of institutional preservation, penalizing valid dissenting data.¹⁵

Additionally, Kuhn argues that the history of science is characterized less by continuous open-minded criticism than by prolonged periods of “normal science” punctuated by rare and violent paradigm shifts. During periods of normal science, the scientific community does not actively encourage challenges to core assumptions; rather, it operates within a paradigm dictating questions worth asking and methods worth pursuing. Kuhn demonstrates that a high degree of institutional dogmatism is actually indispensable for scientific productivity, as without an enforced commitment to a common paradigm, researchers would spend their lives perpetually renegotiating premises rather than solving puzzles. Institutional authority and peer-enforced conformity are the mechanisms that allow resources to be concentrated and inquiries to achieve depth. If every eccentric hypothesis or unverified claim were granted equal standing under absolute free speech, the consensus-building capacity of science would be greatly impaired. Science is thus forced to execute balance, enforcing a rigorous orthodoxy to ensure efficiency while remaining sufficiently permeable to prevent orthodoxy from stagnating scientific advancement.

Advocates of unrestricted speech frequently assume that truth naturally prevails within open discussion.¹⁶ This assumption is questionable, because human beings do not evaluate information as detached rational actors. Political identity, social incentives, and emotional commitment frequently shape belief formation, overpowering evidence.¹⁷ Falsehoods are often more emotionally compelling than scientific conclusions, particularly during periods of societal uncertainty. Open discourse cannot guarantee that the most accurate claims will become widely accepted.

At the contemporary intersection of politics and science, where empirical inquiry frequently collides with deeply entrenched social, moral, and economic frameworks, conservative factions or traditionalist institutions oppose specific avenues of scientific research, such as embryonic stem cell studies, climate forecasting models, or public health interventions.¹⁸ Framed as a defense of moral boundaries, religious tenets, or national economic stability, society often imposes boundaries on empirical studies. This corrodes the objective nature of scientific discovery. In the historical precedent of Lysenkoism in the Soviet Union, the state mandated Trofim Lysenko's ideologically agreeable agricultural theories and silenced dissenting geneticists, resulting in a collapse of domestic biology and widespread agricultural ruin.¹⁹ When a form of scientific inquiry is banned or a certain nature of conclusions are suppressed to preserve political harmony, society is left defenseless against the unyielding realities of the natural world.

By requiring that scientific claims withstand peer review before gaining institutional dissemination, science prevents the public from being overwhelmed by emotionally compelling yet empirically false statements. However, the integrity of this process hinges on peer review operating fairly based on valuation rather than ideological enforcement. If reviewers use their gatekeeping power to suppress valid empirical findings simply because they challenge prevailing political narratives or threaten institutional funding, peer review becomes a form of bureaucratic cartelization. The dissemination of knowledge must therefore remain structured.

Conversely, attempts to protect science through restrictions on speech introduce a different danger. Scientific institutions derive legitimacy partly from their openness to criticism. While political philosophers like Paul Feyerabend argue in *Against Method* that science must be separated from the state to prevent it from becoming an instrument of democratic oppression, a more balanced perspective suggests that while society may legitimately regulate the ethical conduct of experiments, such as ensuring human subject protections or biosafety standards, it cannot restrict the freedom to articulate conclusions

without undermining the foundation of science.²⁰ If authorities acquire the power to determine which criticisms are permissible, the distinction between scientific expertise and institutional authority begins to narrow. History demonstrates that governments, universities, and research institutions are affected by political pressures or intellectual error. Science may gradually shift towards protecting authority from scrutiny.

The debate ultimately asks the wrong question. Free speech and science are not opposing forces. Science depends upon free speech because criticism is the mechanism exposing error. Yet science also depends upon institutions and authority. The enemy to science is therefore neither free speech nor disagreement, but the collapse of confidence in the institutions responsible for evaluating competing claims. A scientific community insulated from criticism loses capacity for self-correction, while a scientific community incapable of maintaining authority loses capacity to generate trust. Science survives by constantly finding a balance between this tension.

Endnotes

1. Gordon Gauchat, "Politicization of Science in the Public Sphere: A Study of Public Trust in the United States, 1974 to 2010," *American Sociological Review* 77, no. 2 (April 2012): 167–187, <https://doi.org/10.1177/0003122412438743>.
2. John P. A. Ioannidis, "Why Most Published Research Findings Are False," *PLOS Medicine* 2, no. 8 (August 2005): e124, <https://doi.org/10.1371/journal.pmed.0020124>.
3. For comprehensive social epistemic frameworks detailing how scientific consensus and objectivity survive through structured communal criticism and institutional mechanisms, see Helen E. Longino, *Science as Social Knowledge: Values and Objectivity in Scientific Inquiry* (Princeton: Princeton University Press, 1990), <https://press.princeton.edu/books/paperback/9780691020587/science-as-social-knowledge>; Miriam Solomon, *Social Empiricism* (Cambridge, MA: MIT Press, 2001), <https://mitpress.mit.edu/9780262692908/social-empiricism/>; and John M. Ziman, *Real Science: What it Is, and What it Means* (Cambridge: Cambridge University Press, 2000), <https://doi.org/10.1017/CBO9780511541391>.
4. John Stuart Mill, *On Liberty* (London: John W. Parker and Son, 1859), <https://www.gutenberg.org/ebooks/1404>.
5. John Locke, *An Essay Concerning Human Understanding*, ed. Peter H. Nidditch (Oxford: Clarendon Press, 1975; first published 1689), <https://global.oup.com/academic/product/an-essay-concerning-human-understanding-9780198243861>.
6. Karl R. Popper, *The Logic of Scientific Discovery* (London: Hutchinson, 1959; first published 1934), <https://www.routledge.com/The-Logic-of-Scientific-Discovery/Popper/p/book/9780415278447>.
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8. Karl R. Popper, *Conjectures and Refutations: The Growth of Scientific Knowledge* (London: Routledge and Kegan Paul, 1963), <https://www.routledge.com/Conjectures-and-Refutations-The-Growth-of-Scientific-Knowledge/Popper/p/book/9780415278447>.

- c-Knowledge/Popper/p/book/9780415285940. See also Imre Lakatos, “Falsification and the Methodology of Scientific Research Programmes,” in *Criticism and the Growth of Knowledge*, ed. Imre Lakatos and Alan Musgrave (Cambridge: Cambridge University Press, 1970), 91–196, <https://doi.org/10.1017/CBO9781139171434.009>.
9. On the necessity of unrestricted discourse for error correction, compare with John Stuart Mill’s classical epistemic defense against the silencing of minority opinions in *On Liberty* (London: John W. Parker and Son, 1859), <https://www.gutenberg.org/ebooks/1404>.
 10. On the problem of institutional epistemic dependence and the structural criteria for placing trust in specialized scientific consensus, see John Hardwig, “Epistemic Dependence,” *The Journal of Philosophy* 82, no. 7 (July 1985): 335–349, <https://doi.org/10.2307/2026523>; and Alvin I. Goldman, “Experts: Which Ones Should You Trust?,” *Philosophy and Phenomenological Research* 63, no. 1 (July 2001): 85–110.
 11. Naomi Oreskes, *Why Trust Science?* (Princeton, NJ: Princeton University Press, 2019), <https://press.princeton.edu/books/hardcover/9780691179001/why-trust-science>.
 12. Robert Merton, “The Normative Structure of Science,” in *The Sociology of Science: Theoretical and Empirical Investigations*, ed. Norman W. Storer (Chicago: University of Chicago Press, 1973), 267–278. For an analytical counterpoint exploring how actual institutional scientific practices frequently operate on divergent internal scripts, see Ian I. Mitroff, “Norms and Counter-Norms in a Select Group of the Apollo Moon Scientists: A Case Study of the Ambivalence of Scientists,” *American Sociological Review* 39, no. 4 (August 1974): 579–595, <https://doi.org/10.2307/2094423>.
 13. See Stephen Cole, Jonathan R. Cole, and Gary A. Simon, “Chance and Consensus in Peer Review,” *Science* 214, no. 4523 (November 1981): 881–886, <https://doi.org/10.1126/science.214.4523.881>; and Michael J. Mahoney, “Publication Prejudices: An Experimental Study of Confirmatory Bias in the Peer Review System,” *Cognitive Therapy and Research* 1, no. 2 (June 1977): 161–175, <https://doi.org/10.1007/BF01173636>.
 14. Thomas S. Kuhn, *The Structure of Scientific Revolutions* (Chicago: University of Chicago Press, 1962), <https://press.uchicago.edu/ucp/books/book/chicago/S/bo13179781.html>.
 15. For empirical studies on institutional and reviewer bias toward conserving pre-existing theoretical consensus, see Michael J. Mahoney, “Publication

- Prejudices: An Experimental Study of Confirmatory Bias in the Peer Review System,” *Cognitive Therapy and Research* 1, no. 2 (June 1977): 161–175, <https://doi.org/10.1007/BF01173636>; and Stephen Cole, Jonathan R. Cole, and Gary A. Simon, “Chance and Consensus in Peer Review,” *Science* 214, no. 4523 (November 1981): 881–886, <https://doi.org/10.1126/science.214.4523.881>.
16. This classical formulation of the unrestricted marketplace of ideas traces back to John Milton, *Areopagitica; A Speech of Mr. John Milton for the Liberty of Unlicenc’d Printing, to the Parliament of England* (London, 1644), <https://www.gutenberg.org/ebooks/608>.
 17. Dan M. Kahan, “Ideology, Motivated Reasoning, and Cognitive Reflection,” *Judgment and Decision Making* 8, no. 4 (July 2013): 407–424, <http://journal.sjdm.org/13/13313/jdm13313.pdf>; and Stephan Lewandowsky, Gilles E. Gignac, and Klaus Oberauer, “The Role of Conspiracist Ideation and Worldviews in Predicting Rejection of Science,” *PLOS ONE* 8, no. 10 (October 2013): e75637, <https://doi.org/10.1371/journal.pone.0075637>.
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 19. For comprehensive historical accounts of state capture, ideological enforcement, and the suppression of genetics under Soviet Lysenkoism, see David Joravsky, *The Lysenko Affair* (Chicago: University of Chicago Press, 1970), <https://press.uchicago.edu/ucp/books/book/chicago/L/bo5908906.html>; Nikolai Krementsov, *Stalinist Science* (Princeton, NJ: Princeton University Press, 1997), <https://press.princeton.edu/books/paperback/9780691028774/stalinist-science>; Loren R. Graham, *Science in Russia and the Soviet Union: A Short History* (New York: Cambridge University Press, 1993), <https://doi.org/10.1017/CBO9780511622359>; and Nils Roll-Hansen, “The Lysenko Effect: Undermining the Autonomy of Science,” *Endeavour* 29, no. 4 (December 2005): 143–147, <https://doi.org/10.1016/j.endeavour.2005.10.003>.

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