



Research Repository

Meaning maintenance drives science rejection

Accepted for publication in Current Opinion in Psychology.

Research Repository link: <https://repository.essex.ac.uk/41629/>

Please note:

Changes made as a result of publishing processes such as copy-editing, formatting and page numbers may not be reflected in this version. For the definitive version of this publication, please refer to the published source. You are advised to consult the published version if you wish to cite this paper.

<https://doi.org/10.1016/j.copsyc.2025.102184>

Meaning maintenance drives science rejection

*Natalia Zarzeczna¹ & Travis Proulx²

¹University of Essex,

²Cardiff University

This article is in press at *Current Opinion in Psychology*

Please cite this article as: Zarzeczna N, Proulx T, Meaning maintenance drives science rejection, *Current Opinion in Psychology*, <https://doi.org/10.1016/j.copsyc.2025.102184>.

Author Note

*Correspondence should be addressed to Natalia Zarzeczna, University of Essex, Department of Psychology, Wivenhoe Park, Colchester CO4 3SQ, UK; email: n.j.zarzeczna@essex.ac.uk

Abstract

Currently, ideologically-motivated discourses are actively undermining perceived value of science, with evidence-based policy-making being increasingly replaced with antiscience agendas shaped by political, spiritual, or conspiratorial ideologies. We propose that motivated science rejection is driven by compensatory mechanisms serving to maintain a coherent understanding of reality when this understanding conflicts with science. Drawing on the meaning maintenance model and the assumption of fluid compensation—any belief framework can be replaced with another to restore meaning—we argue that when science violates meaning, it is rejected in favour of an alternative framework of ideological beliefs, regardless of their epistemic validity. Interventions that align science with meaning-maintenance needs to minimise compensatory responses may prove promising in reducing science rejection.

Keywords: Meaning, science attitudes, science rejection, threat-compensation, motivated cognition

Meaning maintenance drives science rejection

Science is a cultural pursuit of knowing that accumulates understanding of the natural world, using rigorous and systematic empirical methods. As such, science also serves psychological functions for controlling and predicting the environment, with the capacity to satisfy a fundamental human need for coherent meaning [1]. Crucially, to be accepted as reliable and functional by the scientific community, scientific knowledge needs to be objectively and critically evaluated. Indeed, organised scepticism is one of the guiding norms of science [2]. However, lay evaluations of scientific findings often deviate from the principle of organised scepticism rooted in objective scrutiny, and instead take a form of scepticism grounded in psychological motivations [3]. We propose that when scientific findings conflict with these motivations, science is rejected in favour of reducing the feeling of conflict and regaining a coherent understanding of reality [4,5].

Science rejection—the unwarranted scepticism towards science, its epistemology, sound empirical outputs, or advice—has often devastating consequences for wellbeing, the environment, and societal progress [6]. In extreme cases, refusal to engage in evidence-based health advice in order to preserve one’s subjective understanding of reality results in loss of lives [7]. While unwarranted science scepticism has a long history [8], today, antiscience sentiment driven by political agendas, spiritual concerns, or conspiracy beliefs is gaining prominence across public and political discourses and requires urgent attention [9–11]. Yet, motivated science rejection is resistant to change and represents a key challenge in improving science acceptance [12].

The Need for Meaning

In the present paper, we propose that motivated science rejection is difficult to reduce because it is largely driven by a fundamental human need for meaning [13]. Although, in

principle, science should represent an objective epistemology, in practice, science functions as a subjective belief framework, perceived as a way to provide meaning or explain the world at large [14]. Indeed, as proposed by Kuhn [15], scientific paradigms, like any other non-epistemic systems, are laden with values and fulfil social functions. Drawing on the meaning maintenance model and its key assumption of fluid compensation—any committed belief frameworks of expected associations can be substituted for one another to reduce anxiety felt in response to meaning violations—we propose that when science violates meaning, it is rejected in favour of another alternative committed framework. This represents a palliative meaning maintenance process [13,16]. Importantly, all violations of committed expectations result in equivalent experiences of aversive arousal evoked by perceived inconsistency that motivate compensatory behaviours to restore meaning [16,17].

We argue that such compensatory behaviours account for science rejection. First, science can violate meaning by clashing with another committed belief framework. As a result, science is rejected through the process of compensatory assimilation. That is, to retain a sense of familiar understanding, one can assimilate perceived conflict by disregarding science as valuable [4]. Second, science may also violate meaning by failing to explain the world. This will result in fluid compensation, whereby people affirm commitment to alternative frameworks [5]. While alternative frameworks, often related to telos (e.g., fate, God, nature), do not serve the same objective epistemic function as science, these frameworks will be more valuable insofar as they alleviate the anxiety caused by perceived inconsistency and restore a sense of meaning [5]. In other words, the mechanisms supporting meaning maintenance when evaluating science reflect motivations to feel like one understands reality, and violation-compensating cognitions that sustain this understanding. We first review evidence illustrating how compensatory processes involving assimilation and

affirmation underlie science rejection, and second, we highlight how meaning can be employed in designing interventions against motivated science rejection.

Conflict Assimilation

Psychological motivations are well-established antecedents of science rejection across several science domains [3]. According to the attitude roots model, science is rejected due to perceived incompatibility between science and underlying motivations (i.e., attitude roots: ideologies, but also vested interests, anxieties/phobias, identity, conspiracy mindset) [4]. To illustrate, political conservatism predicts climate change denial [18], spirituality contributes to vaccination rejection [19–21], while both religion and spirituality involve disbelief in the value of scientific epistemology [22]. All these ideologies conflict with certain aspects of science-derived policies, scientific method, or knowledge (climate change mitigation conflicts with conservative free market ideology; spiritual inner knowing and religious faith conflict with scientific reason) [3,4,19,21].

We suggest that assimilation of perceived conflict largely drives motivated science rejection. Specifically, people reframe incongruent scientific claims as non-scientific or illegitimate, rather than rejecting science as a whole [3]. This compensatory process is motivated by aversive arousal evoked by perceived inconsistency between science and an aspect of committed ideology [16]. However, it is possible that when perceived inconsistency evokes less arousal and is therefore less threatening, scientific claims might be accepted as compatible with a relevant ideology. One way this can be achieved is through tailored science communication. Hornsey and Fielding [see Jiu jitsu persuasion, 4] suggested that tailored and domain-specific communication techniques can be used to address incompatibility between science and motivations. As such, presenting specific scientific findings as aligning with an identified underlying motivation reduces science rejection [e.g., addressing conservative climate change scepticism by highlighting how protecting the environment maintains

patriotic values; 4]. Tailored science communication aims to address the process of motivated cognition, whereby a desire to arrive at conclusions aligning with prior attitudes overshadows rational processing of scientific information, leading to biased reasoning [23]. But tailoring may also buffer individuals from experiencing aversive arousal, as the perceived inconsistency between science and ideological concerns is removed. So far, presenting tailored messages shows promising but mixed results, with some successful outcomes in the domain of climate change [24, 25, but see 26], though no effects for general trust in scientists [27]. Potentially, to the extent that tailoring effectively buffers against physiological arousal, serving the meaning-maintenance function, this technique should be effective in reducing science rejection. Future research should examine this mechanism directly.

Affirmation of Alternative Beliefs

Beyond incompatibility with ideologies, science may also fail to address explanatory needs, both in terms of epistemic and existential understanding of reality. As a result, science can be rejected through fluid compensation and affirmation of alternative beliefs.

Epistemic Understanding

Beliefs serve the subjective feeling of making sense and people explicitly justify holding different beliefs in terms of epistemic or explanatory needs [14]. In turn, their perceived truth increases when beliefs have strong explanatory power, account for multiple observations in the environment, and hence, do not evoke conflict arousal [28]. However, perceived truth is not the only source of feeling that one understands reality. Explanatory power also affects the extent to which beliefs are psychologically valuable in terms of personal meaning, relevance, and importance - all markers of the subjective feeling of understanding [29]. Supporting Camus' notion of nostalgia for unity—people's desire for a unified explanation of the world as a whole—a scientific theory presented as accounting for multiple, as opposed to a few observations, is evaluated as more valuable and meaningful

[30,29]. Explanatory value in turn has implications for science evaluations. When scientific theories on the origins of the universe were presented as having strong in contrast to weak explanatory power, science was implicitly evaluated more positively [5, see also 31]. Crucially, this also resulted in automatic negative evaluations of God. The same evaluations criteria applied to religious explanations - seeing God as having strong explanatory power led to automatic positive evaluations of God and negative evaluations of science. Although people have an intuitive understanding that scientific beliefs should be objective and less personally relevant [14,32], science is still evaluated based on its subjective meaning-maintenance value similarly to religious belief. These findings illustrate fluid compensation and functional equivalence of science and religion – when one framework fails to satisfy understanding of reality, it is rejected in favour of the other one that reaffirms meaning with a stronger explanation. Hence, to the extent that science provides subjectively satisfying explanations about epistemic phenomena (even though unrelated to the self), it will be positively evaluated, rather than rejected and replaced with another framework.

Overall, perceived meaning-maintenance value of science is crucial in determining science evaluations. As a result, modifying what science means to people should have positive consequences for science acceptance, whereby science should be evaluated as coherent with one's existing understanding of reality and assimilated, rather than rejected in favour of another framework. Indeed, reducing psychological distance to science, that is, increasing the extent to which science is seen as tangible and personally relevant in the here and now, predicts greater science acceptance across multiple contentious science domains [33]. This is likely because psychological proximity increases the strength of commitment to science [13]. Overall, such interventions have promising outcomes for increasing science acceptance [34].

Existential Understanding

Beyond epistemic understanding, there is also evidence suggesting that science can maintain existential understanding for some individuals. For example, affirming belief in science as a best way of knowing, endorsed by secular individuals highly committed to science, resembles the function of religious belief in alleviating stress and fear of death [35, but see 36]. Also, some secular individuals report experiencing spirituality—inner feelings of transcendence and a deep sense of connection—in response to thoughts about scientific theories [37,38]. Such feelings correspond to Camus’ notion of satisfied nostalgia for unity and Freudian sensations of eternity [39,40]. Indeed, those who experience spirituality of science show greater meaning in life, as well as positive science attitudes [38].

While commitment to scientific belief frameworks can provide existential understanding, affirming beliefs in science does not serve the meaning-maintenance function across all contexts. Belief in science as a best epistemology correlates negatively with meaning in life in religious contexts even among scientists, whilst spirituality of science does not alleviate concerns about death across secular and religious contexts [41,42]. Also, reminders of scientific materialism lead to decreased perceptions of existential mattering in non-believers [43]. Future research should determine whether such effects also translate into negative evaluations of science for non-believers. Overall, beliefs in science can offer a sense of epistemic understanding and at times, this sense provides existential comfort to highly committed secular individuals in academic contexts [44]. Yet, for the general population, beliefs in science seem to have poor explanatory power in addressing questions about deeply subjective matters of life and death. When such decreased explanatory value becomes salient, science may be rejected through fluid compensation in favour of reaffirming meaning in frameworks that better preserve a sense of existential meaning.

Implications for Interventions

In the present paper, we argued for the importance of compensatory mechanisms serving meaning-maintenance needs—assimilation and affirmation—in science rejection. When science fails to maintain meaning because scientific claims directly violate committed alternative frameworks, science is disregarded through the process of assimilation. Further, when science has weak explanatory power—it does not account for observations in the environment or address questions about meaning in life—people replace science and affirm meaning in another alternative framework through the process of fluid compensation.

We suggested that communication techniques that tailor science to ideological frameworks may reduce assimilation efforts through alleviating aversive arousal to perceived inconsistencies. Yet, frameworks that have strong subjective explanatory power may be always prioritised over scientific claims that fail to address the feeling that one understands epistemic as well as existential concerns. For this reason, tailoring should be combined with science communication techniques highlighting what each science domain does best: It accounts for multiple observations in the natural environment [8]. This can be further reinforced by highlighting personal importance of science in the here and now through decreasing psychological distance to science. Therefore, modifying what science means to people and how it aligns with important ideologies should minimise compensatory responses and be especially beneficial in fostering greater science acceptance.

Conclusion

At present, public antiscience discourses rooted in ideological beliefs challenge perceived value of science, with potentially catastrophic consequences for wellbeing and tackling global emergencies. We proposed that when science violates meaning needs, people are motivated to reject it through compensatory mechanisms. While all efforts to reduce science rejection are extremely important (see this special issue), we argue that science communication techniques that align science to existing ideological motivations combined

with boosting explanatory value of science may prove successful in reducing antiscience sentiment. These techniques will be successful insofar as they serve the underlying process of meaning maintenance and minimise compensatory responses to meaning loss.

References and recommended reading

Papers of particular interest, published within the period of review, have been highlighted as:

* of special interest

** of outstanding interest

- [1] **Zarzeczna N, Haimila R. Science and religion: Meaning-making tools competing to explain the world. *Handbook of the Science of Existential Psychology*, 2025.

This publication outlines why the relationship between science and religion is complicated and attracts much controversy. By reviewing research on beliefs, mortality, and morality, it concludes that the two are used as tools to meaning-making and serve as competing explanations for reality. Conflict or compatibility perceptions are determined by socio-cultural context, which guides how one chooses to use each system as a tool for meaning.

- [2] Merton R. The normative structure of science. In: Storer N, editor. *The sociology of science: Theoretical and empirical investigations.*, Chicago: The University of Chicago Press; 1942, p. 267–78.
- [3] Rutjens BT, Sutton RM, van der Lee R. Not all skepticism is equal: Exploring the ideological antecedents of science acceptance and rejection. *Pers Soc Psychol Bull* 2018;44:384–405. <https://doi.org/10.1177/0146167217741314>.
- [4] Hornsey MJ, Fielding KS. Attitude roots and Jiu Jitsu persuasion: Understanding and overcoming the motivated rejection of science. *American Psychologist* 2017;72:459–73. <https://doi.org/10.1037/a0040437>.
- [5] Preston JL, Epley N. Science and God: An automatic opposition between ultimate explanations. *Journal of Experimental Social Psychology* 2009;45:238–41. <https://doi.org/10.1016/j.jesp.2008.07.013>.
- [6] Singh K. Medical groups call on US Health Secretary Kennedy to step down. *Reuters* 2025.
- [7] BBC News. Measles outbreak in west Texas worsens due to vaccine scepticism. *BBC News* 2025. <https://www.bbc.com/news/articles/cwy7eyde3xeo> (accessed July 16, 2025).
- [8] Rutjens BT, Preston JL. Science and religion: A rocky relationship shaped by shared psychological functions. *The Science of Religion, Spirituality, and Existentialism*, Elsevier; 2020, p. 373–85. <https://doi.org/10.1016/B978-0-12-817204-9.00027-5>.
- [9] Hotez PJ. The antiscience movement is escalating, going global and killing thousands. *Scientific American* 2021. <https://www.scientificamerican.com/article/the-antiscience-movement-is-escalating-going-global-and-killing-thousands/> (accessed June 30, 2025).
- [10] Nature Editorial. Trump 2.0: an assault on science anywhere is an assault on science everywhere. *Nature* 2025;639:7–8. <https://doi.org/10.1038/d41586-025-00562-w>.
- [11] van der Gaag. Knowledge for the Netherlands is falling behind due to budget cuts in higher education and research | NWO 2025. <https://www.nwo.nl/en/news/knowledge-for-the-netherlands-is-falling-behind-due-to-budget-cuts-in-higher-education-and-research> (accessed July 16, 2025).
- [12] **Rutjens BT, Hornsey MJ. The psychology of science rejection. *Advances in Experimental Social Psychology*, vol. 71, Elsevier; 2025, p. 243–80. <https://doi.org/10.1016/bs.aesp.2024.10.002>.

This paper synthesises the most recent insights on the psychology of science rejection. It outlines three theoretical approaches that explain science rejection, including: information deficit, attitude roots, and psychological distance to science. Each theory offers unique techniques for reducing science rejection under appropriate circumstances. Integrating these approaches might be promising in fostering greater science acceptance.

- [13] Heine SJ, Proulx T, Vohs KD. The Meaning Maintenance Model: On the coherence of social motivations. *Pers Soc Psychol Rev* 2006;10:88–110. https://doi.org/10.1207/s15327957pspr1002_1.
- [14] Metz SE, Liquin EG, Lombrozo T. Distinct profiles for beliefs about religion versus science. *Cognitive Science* 2023;47:e13370. <https://doi.org/10.1111/cogs.13370>.
- [15] Kuhn TS. The structure of scientific revolutions. Fourth edition. Chicago ; London: The University of Chicago Press; 2012.
- [16] Proulx T, Inzlicht M, Harmon-Jones E. Understanding all inconsistency compensation as a palliative response to violated expectations. *Trends in Cognitive Sciences* 2012;16:285–91. <https://doi.org/10.1016/j.tics.2012.04.002>.
- [17] Proulx T, Inzlicht M. The five “A”s of meaning maintenance: Finding meaning in the theories of sense-making. *Psychological Inquiry* 2012;23:317–35. <https://doi.org/10.1080/1047840X.2012.702372>.
- [18] Hornsey MJ, Harris EA, Bain PG, Fielding KS. Meta-analyses of the determinants and outcomes of belief in climate change. *Nature Clim Change* 2016;6:622–6. <https://doi.org/10.1038/nclimate2943>.
- [19] *Zarzeczna N, Bertlich T, Večkalov B, Rutjens BT. Spirituality is associated with Covid-19 vaccination scepticism. *Vaccine* 2023;S0264410X22014633. <https://doi.org/10.1016/j.vaccine.2022.11.050>.

This publication illustrates that science is rejected when it comes into epistemological conflict with an important ideological belief framework. Spiritual beliefs, focused on an experiential inner knowing, predict stronger Covid-19 vaccination scepticism and low vaccine uptake, and this is explained through low belief in science as a good epistemology. These findings demonstrate that vaccination violates important epistemological aspects of spiritual beliefs, leading to stronger rejection of vaccination.

- [20] Rutjens BT, Zarzeczna N, van der Lee R. Science rejection in Greece: Spirituality predicts vaccine scepticism and low faith in science in a Greek sample. *Public Underst Sci* 2021;096366252110615. <https://doi.org/10.1177/09636625211061520>.
- [21] Zarzeczna N, Večkalov B, Rutjens BT. Spirituality and intentions to engage in Covid-19 protective behaviours. *Soc Personal Psychol Compass* 2023;17:e12765. <https://doi.org/10.1111/spc3.12765>.
- [22] Zarzeczna N, Preston JL, Samekin A, Reinhardt CS, Bolatov A, Mussinova Z, et al. The feeling is not mutual: Religious belief predicts compatibility between science and religion, but scientific belief predicts conflict. *Psychology of Religion and Spirituality* 2024. <https://doi.org/10.1037/rel0000537>.
- [23] Kunda Z. The case for motivated reasoning. *Psychological Bulletin* 1990;108:480–98. <https://doi.org/10.1037/0033-2909.108.3.480>.
- [24] Baldwin M, Lammers J. Past-focused environmental comparisons promote proenvironmental outcomes for conservatives. *Proc Natl Acad Sci USA* 2016;113:14953–7. <https://doi.org/10.1073/pnas.1610834113>.

- [25] Campbell TH, Kay AC. Solution aversion: On the relation between ideology and motivated disbelief. *Journal of Personality and Social Psychology* 2014;107:809–24. <https://doi.org/10.1037/a0037963>.
- [26] Kim I, Hammond MD, Milfont TL. Do past-focused environmental messages promote pro-environmentalism to conservatives? A pre-registered replication. *Journal of Environmental Psychology* 2021;73:101547. <https://doi.org/10.1016/j.jenvp.2020.101547>.
- [27] Gligorić V, Van Kleef GA, Rutjens BT. Political ideology and trust in scientists in the USA. *Nat Hum Behav* 2025;9:1501–12. <https://doi.org/10.1038/s41562-025-02147-z>.
- [28] Thagard P. Explanatory coherence. *Behav Brain Sci* 1989;12:435–67. <https://doi.org/10.1017/S0140525X00057046>.
- [29] Preston JL, Epley N. Explanations versus applications: The explanatory power of valuable beliefs. *Psychol Sci* 2005;16:826–32. <https://doi.org/10.1111/j.1467-9280.2005.01621.x>.
- [30] Camus A. *The myth of Sisyphus*. London: Penguin Books; 1955.
- [31] Preston JL, Ritter RS, Hepler J. Neuroscience and the soul: Competing explanations for the human experience. *Cognition* 2013;127:31–7. <https://doi.org/10.1016/j.cognition.2012.12.003>.
- [32] Davoodi T, Lombrozo T. Explaining the existential: Scientific and religious explanations play different functional roles. *Journal of Experimental Psychology: General* 2022;151:1199–218. <https://doi.org/10.1037/xge0001129>.
- [33] Većkalov B, Zarzeczna N, McPhetres J, Van Harreveld F, Rutjens BT. Psychological distance to science as a predictor of science skepticism across domains. *Pers Soc Psychol Bull* 2024;50:18–37. <https://doi.org/10.1177/01461672221118184>.
- [34] Većkalov B, Zarzeczna N, Van Harreveld F, Rutjens BT. Psychological distance to science affects science evaluations. *Journal of Social Issues* 2025;81:e12663. <https://doi.org/10.1111/josi.12663>.
- [35] Farias M, Newheiser A-K, Kahane G, de Toledo Z. Scientific faith: Belief in science increases in the face of stress and existential anxiety. *Journal of Experimental Social Psychology* 2013;49:1210–3. <https://doi.org/10.1016/j.jesp.2013.05.008>.
- [36] Farias M, Newheiser A-K. The effects of belief in God and science on acute stress. *Psychology of Consciousness: Theory, Research, and Practice* 2019;6:214–23. <https://doi.org/10.1037/cns0000185>.
- [37] Preston JL, Shin F. Spiritual experiences evoke awe through the small self in both religious and non-religious individuals. *Journal of Experimental Social Psychology* 2017;70:212–21. <https://doi.org/10.1016/j.jesp.2016.11.006>.
- [38] *Preston JL, Coleman TJ, Shin F. Spirituality of Science: Implications for meaning, well-being, and learning. *Pers Soc Psychol Bull* 2023;01461672231191356. <https://doi.org/10.1177/01461672231191356>.

This paper demonstrates that secular individuals can use science to experience spirituality, that is, transcendent feelings of connection, meaning, and awe evoked through thoughts about science. This form of science attitude promotes engagement and interest in science, and greater meaning in life. That is, when science is incorporated into a coherent belief framework, it can satisfy both explanatory as well as existential needs.

- [39] Camus A. *An absurd reasoning*. New York: Vintage; 1955.
- [40] Freud S. *Civilization and Its Discontents*. New York: Broadview Press; 2015.

- [41] Folk D, Rutjens BT, Van Elk M, Heine SJ. Dare to know! The existential costs of a faith in science. *The Journal of Positive Psychology* 2024;1–12. <https://doi.org/10.1080/17439760.2024.2314294>.
- [42] Zarzeczna N, Preston JL. Meaning in science as a response to existential threat. *Psychology of Religion and Spirituality* 2025. <https://doi.org/10.1037/rel0000552>.
- [43] Tracy JL, Hohm I, Makridakis A. Does science erode meaning? *Curr Dir Psychol Sci* 2024;33:254–60. <https://doi.org/10.1177/09637214241262709>.
- [44] Haimila R. Does a science-oriented worldview entail unbelief? Meaning, morality, and continuity from scientific research in self-reports of Finnish unbelievers and believers. *Secular Studies* 2020;2:83–116. <https://doi.org/10.1163/25892525-bja10006>.