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Supplementary Information for
Why are people antiscience, and what can we do about it?

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Unresolved Questions for Future Research

Beyond explaining, predicting, and addressing antiscience views, our framework raises unresolved questions for future research. First, the construct of "being antiscience" is a broad one. As an umbrella term, at least the way we have used it in this article, it subsumes a variety of psychological responses, such as ignoring, trivializing, denying, rejecting, and hating scientific information. These responses, however, are not identical; they are conceptually distinguishable from each other. Empirically, when and why do people simply ignore scientific information versus actually process and then reject it? What variables predict whether people actively demonize scientists versus apathetically trivialize them? Varying shades of being antiscience have yet to be systematically teased apart.

Second, the impact of social identity (basis 2), particularly political identity, on antiscience attitudes raises the possibility that expressive responding is a methodological issue worth examining in antiscience research. Expressive responding refers to the notion that survey respondents can respond to politically relevant survey measures in ways that express partisan cheerleading rather than based on genuinely held beliefs (1). Research on expressive responding has focused on how survey respondents express their attitudes towards *political* information (e.g., political events, political figures). Less is known about the extent to which expressive responding shapes how survey respondents express their attitudes towards *scientific* information (e.g., scientific findings, scientific innovations). Even within the political domain, there has been mixed evidence for expressive responding. Some studies found clear evidence (1) whereas others did not (2). The conditions under which, and the issues for which, expressive responding is likely to occur, in both political and scientific contexts, remain to be fully explored.

Third, we have described research that illustrates the role of some dimensions of epistemic style (basis 4) in antiscience attitudes. What other dimensions of epistemic style are relevant? For instance, valence weighting bias [i.e., the tendency to interpret novel, ambiguous information as consistent with either known negative or positive information (3)] could be another dimension that shapes rejection versus acceptance of new scientific information. Because scientific information often comes with warnings and recommendations, those who tend to assimilate new information with known negatives might be particularly prone to heeding those warnings. When and for whom is scientific information about the positive consequences of an innovation (e.g., new capabilities) more effectively accepted than scientific information about its negative consequences (e.g., environmental harm)? When and for whom is it the other way around? Little is known about what predicts these situational and individual differences in the context of science communication.

Fourth, we hope to see further research that develops additional strategies for counteracting antiscience attitudes, tests their effectiveness, and examines their heterogeneity (4–6) in real-world settings (e.g., field experiments). For example, one strategy that remains to be tested in the context of science communication but that has proven effective in other important naturalistic contexts is an intervention called paradoxical thinking (7), which prompts the recipient to doubt their existing attitude and feel less confident or less strongly about it. A paradoxical thinking induction involves presenting the recipient with attitude-consistent but poorly reasoned, exaggerated, or even absurd arguments; the attitude-consistent aspect circumvents rejection, and the poorly-reasoned aspect prompts reflection. It has been shown effective for changing high-stakes attitudes in the field (on Israeli-Palestinian relations) from pro-conflict to conciliatory, impacting voting behavior and with sustainable attitudinal effects a year later. It has also been shown effective for changing other sociopolitical attitudes (e.g., attitudes towards refugees, gender-based discrimination). The logic of paradoxical thinking taps into basis 3 of our framework and is highly applicable to science communication and persuasion; we recommend testing it.

Finally, what are the relations among the four bases? When do they have additive effects? Or interactive effects (e.g., synergistic or antagonistic)? Statistical modelling and situational sampling will be required to capture how much each basis is responsible for

antiscience attitudes under different circumstances. Understanding which basis is most influential, for whom, and on what scientific topics is necessary for researchers and policymakers to make informed decisions about when to leverage which basis (selectively or collectively) to combat public rejection of specific scientific issues (e.g., politicized ones vs. non-politicized ones). Developing and testing interventions is a costly endeavor, so fundamental knowledge about the relative and interactive efficacies of different bases will optimize the use of limited resources and maximize the likelihood of attaining success.

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