Scientific Theories and Their Psychological Corollaries: The Ecological Crisis as a Case Study in the Need for Synthesis

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Abstract

That policy makers will ever rationally respond to scientific warnings about the ecological crisis should be treated as a falsifiable hypothesis. After more than five decades of such warnings, there is a strong case for skepticism. Climate and other ecological tipping points constitute the quantitative thresholds beyond which current political systems can definitively be said to have failed. This presents a mandate to generate broad consensus on where tipping points lie, and at what proximity to them new strategies should be pursued. Central to any new strategy should be an understanding of why the old one failed—an understanding of why those in power almost exclusively derive from academic backgrounds other than physical science, and the psychological differences between those who issued or received so many warnings of collapse. To that end, a psychological trait syndrome relevant to political power is proposed, based on correlations between academic specialization, psychometric results, and the behavior of powerful people across a wide range of societies. This proposed syndrome consists of four covarying dimensions of individual difference. These are perceptions of hierarchy vs. egalitarianism, established knowledge vs. open inquiry, physical vs. symbolic action, and schematic vs. particular knowledge.

Introduction

In December of 2017, *BioScience* published an article with 15,364 scientist signatories, from 184 countries—the most to ever cosign and formally support a journal article—stating that "we have unleashed a mass extinction event" and that the "widespread misery and catastrophic biodiversity loss" this entailed would soon be inevitable, absent a massive shift (Ripple et al. 2017). Or rather, they issued the

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successor to a similar warning made twenty five years previous. Exercising a considerable capacity for understatement, the authors of "World Scientists' Warning to Humanity: A Second Notice" said that "in most respects, we have not heeded" the first one, issued by the Union of Concerned Scientists and ~1700 other scientists.

A quarter century is such a significant interval, the global crisis we are in the midst of so profound, and the behavior of political and economic institutions so utterly disconnected from anything that could plausibly be described as a meaningful response, that a wide range of scientific questions emerge about the core assumptions underlying communications such as this. Why continue this strategy? Because if over 1,700 scientific signatories isn't sufficient, 15,364 ought to do the trick? At what point would it be true that such communications have empirically failed? And at what point does this failure indicate a fundamental inability of the extant system to acknowledge our crisis?

If science is to be defined, to a significant extent, by its responsiveness to empirical reality, this point must exist. But we have pushed the global system into a state where outcomes have become very uncertain—far beyond what anyone can plausibly describe as safe (Hansen et al. 2013; Kemp et al. 2022)[1]—and so far, this scientific dialogue has not begun. It is difficult to think of a more concretely useful and theoretically intriguing scientific question than what social structures are compatible with ecological survival, and if we are, by any chance, living in one that isn't. But to begin a scientific assessment of whether the world's political systems are capable of decisive ecological action requires no longer simply assuming that they are.

For instance, the second "World Scientists' Warning to Humanity," says "As most political leaders respond to pressure…dogged opposition can be overcome and political leaders compelled to do the right thing." But how do we know? Such a significant assertion obviously warrants the same scientific scrutiny we would apply to statements like "the horse was domesticated on the Pontic Steppe" or "spadefoot

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[1] The range of opinions among scientists, even in a single discipline, is far vaster than is commonly acknowledged. The most fundamental distinction is between models that are essentially linear and those that posit tipping points. A prominent example of a proposed tipping point is an atmospheric CO_2 of 350ppm before catastrophic processes are triggered, a limit exceeded long ago.

toad cannibalism is mediated by corticotropin releasing hormone." We have no case studies in fundamental socioeconomic transformations of the kind recommended by climate and ecological scientists. A significant curtailment of fossil fuel extraction, deforestation, and animal product consumption—fairly standard items in the policy prescriptions of scientific warnings to policy makers—would constitute one of the major economic reorganizations of human history, roughly akin in scale (but very different in nature) to the industrial revolution or the post-World War Two "great acceleration," as described by (Steffen et al. 2015).[2]

Thus it is an open scientific question whether or not current political systems are capable of affecting the major, unprecedented shifts necessary to avoid catastrophe. This scientific question is probably best framed by physical thresholds of runaway climate change—so-called tipping points. Scientific entities such as the IPCC have made the not-exactly-apolitical decision to simply disregard self-perpetuating climate processes, despite the likely central role such processes played in past mass extinctions (Rogelj et al. 2018). However, we know that the climate system contains feedbacks—such as the release of methane from melting permafrost, the total loss of marine ice, and the conversion of forests to lower biomass ecosystems—which are associated with the earth's past mass extinctions. Political systems can be said to have decisively failed to avert global catastrophe when these processes have been triggered. And strong arguments can be made that it is no longer warranted to place any faith in these systems once there is a significant possibility these processes have been triggered.

We can use the question of whether the world's forests are a net carbon source or sink as an example of establishing a "significant possibility" that these processes have been initiated. If a number of years transpire in which forests lose more carbon to fire and severe weather than they gain in biomass (Baccini et al. 2017; Harris et al.),[3] the possibility that forests are no longer viable in the current climate can be placed in a confidence interval. Obviously, the loss of forests exacerbates the

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[2] The Great Acceleration refers to the exponential explosion of resource extraction after WWII. Taking a more policy-centric approach, many commentators have drawn parallels between the economic mobilization of WWII itself—with its heavy involvement on the part of the federal government in numerous sectors of the economy—and the necessary response to climate change.

[3] These papers provide opposing conclusions on whether this is already happening, but if it is not already true that global forests dying faster than they are regenerating, it is clearly not far off, as a steady stream of papers already measuring net biomass loss testifies.

climate conditions causing forest loss, creating a feedback loop. Overall climate system tipping points can be identified by estimating the triggers for multiple feedbacks of this nature.

The question of exactly where to place such a threshold, and say that beyond it, a political system has failed to avert catastrophe is of course partially a matter of judgement. But for our purposes, the point is that the threshold certainly exists somewhere—it is obviously no longer reasonable to write earnest warnings to policy makers towards the tail end of, say, an end-Permian magnitude extinction—and it is essential that we try to identify it. Otherwise, we have no way to evaluate the question of how to interact with current political systems—and what options exist other than the strategies which have been tried unsuccessfully thus far—in a scientific manner.

What do we learn about science from its perennial debates?

Kemp et al. (2022) explore the strong statistical bias of climate research to ignore the possibility that "abrupt and/or irreversible changes may be triggered at a temperature threshold". If we are rapidly approaching, have arrived at, or are beyond a catastrophic threshold, what does this imply for scientists' strategies for ecological survival? That they should give up on life itself? Or that they should give up on issuing warnings to those in power, and instead attempt to directly intervene in the dynamics of power, to assert new decision making processes wherein scientific comprehension plays a larger role? To rephrase this in more typically political language: when is the science clear that collapse can only be averted by sociopolitical revolution? And if that time has come, or when it does, what will scientific deliberation about how to achieve that revolution look like, and what conclusions will it produce?

Of course, anyone remotely familiar with science as it is actually practiced, here in corporeal reality, is well aware that such a process would be sharply constrained by worldviews. For these deliberations to proceed, it would be necessary for a specific subset of scientists to identify one another. It would be necessary for scientists to *apply to themselves* the very methods they use to study the nature and corollaries of the belief systems of others.

There are numerous indications of an underlying psychological framework involved in various scientific outlooks. For instance, there are statistical predictors of

academic specializations lacking an inherent logical relationship with the field of study. Students with majors such as business, economics, and business administration have higher scores on psychological survey instruments like the Social Dominance Orientation (SDO) and symbolic racism scales than those with majors such as anthropology or sociology (Sidanius et al. 2003). Math and physical science graduates form a distinct cluster in their scores on psychometrics such as Need for Closure and Disgust, while graduates in applied technical fields like engineering form another distinct cluster (Gambetta and Hertog 2016). And academic training itself appears to enhance the psychological tendencies which cause individuals to self-select into a given field—engineering students, for instance, begin their studies with a more hierarchical worldview than physical or social scientists, and that hierarchical outlook intensifies during their training (Haley and Sidanius 2005). Despite intriguing indications of the presence of distinct psychologies in the academy, the corollaries of scientific beliefs have not been given the rigorous, systematic attention the beliefs of non-scientists have received. We do not know what predictors might exist, for instance, of preferences for scientific positions within disciplines.

I believe a more self-referential epistemology, involving concerted inquiry into *the kinds of minds* that favor various scientific paradigms, is necessary for science to progress. The generality of this point is illustrated by perennial debates within various disciplines, as pointlessly repetitive as dire warnings about the ecological crisis. Such debates often feature obsessively stylized reasoning, in service of some unarticulated (but often very apparent) worldview.

There are many examples of this phenomenon, such as the perennially divergent interpretations of the same anthropological data found in discourses such as the Kalahari debate (Solway and Lee 1990), and its more recent counterpart concerning east African foragers (Porter and Marlowe 2007)[4], or perennially divergent interpretations of the same archaeological findings, in cases like the Indus Valley civilization (Green 2020). To examine one example in some detail, reflecting on the "morality play, seemingly bound forever to the wheel of intellectual life," of the *previous century's worth* of nature-nurture debates, Tooby and Cosmides (1995)

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[4] While the surface of the debate concerns whether contemporary foragers offer meaningful insight into past human societies, the underlying, ideologically charged question is whether the egalitarianism many hunter-gatherer ethnographers describe is a plausible form of human organization.

describe the "innumerable incarnations" of this perennial rupture: "rationalism versus empiricism, heredity versus environment, instinct versus learning, nature versus nurture, human universals versus cultural relativism, human nature versus human culture, innate behavior versus acquired behavior, Chomsky versus Piaget, biological determinism versus social determinism, essentialism versus social construction, modularity versus domain-generality" (Tooby and Cosmides 1995). While some echelons of social science have made significant progress toward biologically integrated explanatory frameworks in the thirty years subsequent to this writing, it is hardly the case that these incommensurate modes of reasoning have been truly reconciled. "A rift runs through anthropology" say Camilla, Power, and Callan (2017), in their introduction to a book on human origins, sounding little different in its account of "radically opposed" epistemologies than Tooby and Cosmides in 1995, or for that matter Konrad Lorenz in the 1950s.

Politically predictive psychological traits

My perspective on this particular schism, derived from three decades in ecological politics, illustrates the potential for the kind of inquiry I am proposing. It has long been clear to me that my own and many other social movements are hindered by the nature-nurture thinking which still—after all the exhausting dialogues—animates some social theorists's refusal to reconcile with biology. This is hardly surprising, as political tendencies and social science share a frequent aversion to human nature (Schroder 2023).[5] But what is equally clear to me is that, in movements and the academy alike, there is a distinct underlying psychology involved in this rejection of human nature, which reveals itself through a number of covariates.

The most immediately apparent is that biophobia, as it has been termed, expresses a more general orientation toward the symbolic, at the expense of the physical. This manifests as a more assiduous concern with symbolic harm, e.g. through language, on the part of social constructivists, and a more pronounced inclination toward concrete, physical action on the part of those who favor biologically integrated

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[5] If it seems counterintuitive that "ultimate" explanations of human nature could be concretely consequential in political strategy, which is concerned with affecting more proximate causes of power, consider for instance that social anthropology has long made a habit of overstating differences between people, exoticizing familiar behaviors in an effort to challenge human universals and their biological implications, whereas it is the mandate of political strategies to find common ground between different social groups.

explanations. Chomsky and Foucault's famous 1971 debate is an example, with Chomsky speaking about the biology of language acquisition and advocating for disruptive civil disobedience, while Foucault expresses skepticism about human nature and insists we should engage in critique of institutions, such as the academy, for subtly perpetuating relations of domination (Chomsky and Foucault 1971). Some version of this psychological difference is abundantly clear in any number of movement contexts where strategy is being debated, engendering considerable misery for all involved. But I think we could uncover other psychological corollaries of nature-nurture perceptions if we used the wide range of techniques scientists have used to understand, for instance, left-right political differences.

Political psychologists and others have illuminated a complex, idiosyncratic landscape of traits that correlate with this enduring, fundamental form of political division. A great deal of the results concern fearfulness, with right-wing political perceptions correlating with greater activity of the amygdala during risk-taking activities (Schreiber et al. 2013), stronger tendency to interpret ambiguous facial expressions as threatening (Vigil et al. 2010), greater startle responsiveness with exposure to loud noises (Oxley et al. 2008), heightened general physiological arousal in response to threatening imagery (Dodd et al. 2012), and a greater self-reported fear of death—with this being the strongest correlation of any psychological variable in a large meta-analysis (Jost et al. 2003). Then again, a number of the correlated traits have nothing to do with fear, such as use of body language in conversation (Carney, Jost, and Gosling 2008) and IQ scores (Hodson and Busseri 2012; Kemmelmeir 2008; Stankov 2009).

It is beyond our current scope to place these myriad results into a unitary explanatory framework. Hibbing, Smith, and Alford (2014) provide a more comprehensive review of politically correlated traits, and the thematic convergences of numerous studies. I only reference these diverse findings to indicate the ambitious theorizing they could inform (e.g. Schroder 2022),[6] and thus the possibility of applying these wide-ranging techniques—such as brain imaging during experimental game play, psychological self-report, and physiological measures of stress responses, to name a few—to partisans of scientific debates, such as the

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[6] I argue that these individual differences may be a human manifestation of a correlated trait syndrome, seen across many species, which is associated with aggression and hypothesized to involve variation in neural crest cells and their descendant structures during embryogenesis.

interminable nature-nurture dialogue. Does the anterior cingulate cortex activity levels of people who find absolute social constructivist claims convincing—for instance, that Hopi people do not possess a sense of linear time (Brown 1991)[7]—differ from those who find such notions ridiculous?

The above example is an instance of left-right psychological difference; ACC volume (Kanai et al. 2012) and activity (Amodio et al. 2007) is greater among left-leaning study participants. Such findings are, of course, guided by hypotheses, and I'm not certain there's any particular reason to speculate that the ACC—which is involved in everything from modulating aggression to disengaging from habitual behavioral responses—varies with one's perspective on nature-nurture dialogues. However, I would like to advance a tentative hypothesis of temperamental divisions within what we broadly describe as science, guided by existing findings.

A psychological trait syndrome apparent in the exercise of political power

This hypothesis emerges from what has always struck me as an unfortunate gap in the empirical foundations of science: there is no discipline which requires direct experience with attempting to achieve political outcomes in order to claim expertise. Scientific proclamations about the social leveling mechanisms of hunter-gatherers or the intergroup aggression of chimpanzees require somebody to actually go spend time around hunter-gatherers or chimpanzees, but statements about the amenability of political systems to vaguely specified forms of "pressure", such as the one found in the scientists' second warning to humanity, do not require any such fieldwork. I do not think I would've formulated the hypothesis I am presenting here absent direct experience with political processes.

This hypothesis was formulated by observing the personalities involved in political conflicts. I was attempting to understand why people with certain temperaments and worldviews consistently seemed to inhabit certain specialized social roles. It consists of a schema of four covarying dimensions of perceptual difference. These four perceptual oppositions are hierarchical vs. egalitarian, established vs. innovative, corporeal vs. symbolic, and definitive/schematic vs. ambiguous/particular.

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[7] Admittedly a claim—made by Benjamin Whorf, of Sapir-Whorf fame—with a distinctly 20th century quality.

The first is perhaps hardly surprising, as this is the most fundamental and enduring form of political division across human contexts. Left and right have no particular established meaning, even among—perhaps particularly among—specialists (Jost et al. 2003; *What Is Politics* 2020) but the most recurrent definition is that leftism is a politics of egalitarianism and rightism a politics of hierarchy (Jost et al. 2003; Tuschman 2013).

Politically, the established vs. innovative opposition is frequently expressed as tradition vs. progress. The terms conservative and progressive are used interchangeably, for better or worse, with right and left. Robinson et al. (2015) show significant differences in references to the past and future based on political outlook.

The third perceptual binary I hypothesized was in *mode of instantiation* of a given worldview, a corporeal vs. symbolic axis. As numerous studies reviewed by Haley and Sidanius (2005) describe, police and military employment strongly predicts a hierarchical worldview. The metrics of worldview used in these studies, such as the Social Dominance Orientation Scale and the Right Wing Authoritarianism Scale, also negatively predict an environmental worldview (Altemeyer 1998). Likewise, professional specializations concerned with the administration of economic activity, involving the direct manipulation of the physical world tend to have more hierarchical and extractive/utilitarian worldviews (Gambetta and Hertog 2016).

Correspondingly, those who specialize in the production of knowledge and culture tend to have more egalitarian and ecological worldviews. My experience of conflict around environmental issues was thus of one side contending in the symbolic world while the other contended in the physical world. Those advocating for ecological protection might write books, give speeches, hold protests, and issue dire warnings. Those seeking maximum resource extraction, on the other hands, tended to be the ones in a position to arrest protestors or to actually occupy the industries (and their regulatory agencies) which environmentalists wrote to or protested. Naturally, this correlation between worldview and social role had a great deal to do with the final outcomes of these conflicts.

Our final opposition is between the definitive and schematic vs. the ambiguous and particular. I cannot overstate the extent to which a certain epistemic paralysis, born of incessant reference to reality's inherent ambiguities and local vicissitudes, is

profoundly disruptive of political organizing efforts. Bizarre as it may sound, contemporary political groups fail most often through self-reflection of a decidedly academic nature. Do we really know if we should try to stop this coal export facility from being built? Or is our conception of climate change really just a reductionist way of seeing the world that fails to account for equally valid indigenous cosmologies which transcend western notions of causality? Should we really try to implement a local network of food distribution production and distribution? Or is what we think of as food an inherently colonial construct rooted in soil fertility metaphors designed to justify male domination? Of course, asking questions of this broad nature can be productive, but refusing to act because one can never fully answer them guarantees passivity. Think of Foucault repudiating Chomsky's organizing, citing our inability to ever really disentangle our perceptions from their unconscious frames of reference and socially conditioned schematics. If real estate developers and police departments experience a similar paralysis, I am unaware of it.

An inherent relationship between the third and fourth of these opposing perceptual modes should be noted. I believe a tendency to physically manipulate reality correlates with abstract, schematic *perceptions* of reality, because "Legibility is a condition of manipulation" (Scott 1998). Some level of reductionism is required for any instrumental action, and excessive reductionism likewise seems to correlate with the kind of excessive, catastrophic manipulations of the physical world undertaken by those in power.

Temperament, worldview, academic specialization, and power

Gambetta and Hertog (2016) document correlations between academic specialization and affiliation with different types of terrorist organizations, over a number of decades and a range of political contexts, involving hundreds of participants in groups ranging from the Red Army Faction to Islamic Jihad. The correlation is particularly striking among engineers, who are vastly overrepresented in right-wing terrorist groups of the islamic and western varieties. Engineers are *seventeen times more likely* to be found in their sample of islamic terrorists than would be expected if they were found in proportion to their presence in the adult male population.

Gambetta and Hertog utilize data from the European Social Survey (ESS) on 11,183

male graduates, from 17 western European countries, with results that indicate the existence of three statistically robust, temperamentally distinct populations in the academy. In addition to presence in terrorist groups, they report correlations between academic specialization and ESS data on three traits strongly associated with political perception: disgust, need for closure (NFC), and in-group/out-group distinction. Higher measures of any of these three traits is predictive of right-wing political perception.

The first of these populations practices engineering, medicine, law, and business, economics, and administration. These disciplines are overrepresented in right-wing terrorist groups and, as we would expect, their practitioners have higher than average scores on the three traits. The next of the three populations practice math and physical science: this population is not significantly present in terrorist groups and has societally average scores on these three traits. Finally, we find particularly low scores on these traits—predicting left-wing political perception—among practitioners of social and psychological sciences and the humanities, as we would expect from their disproportionate representation in left-wing terrorist groups.

These findings militate for a program of concerted inquiry into the kinds of minds found in various academic departments. I relate them to my hypothesized perceptual differences to indicate potential paths of inquiry.

The egalitarianism vs. hierarchy component of my psychological schema is explicitly present in the left-right aspect of Gambetta and Hertog's findings. However, a motivation for my hypothesis was to account for recurrent uniformities between political systems with divergent ideologies. Something to note about the disciplines with a right-wing bias is that they are heavily overrepresented in institutions of power in modern societies, regardless of official ideology. Business and law are the most common degrees among US policy makers, while Stalin complained that all the socialists had been replaced by engineers (Curtis 1992). Scott (1998) calls the worldview of those who orchestrated "the most tragic episodes" of late 19th and 20th century state power Authoritarian High Modernism, noting this worldview unites Lenin, Robert McNamara, and the Shah of Iran. "As a faith, it was shared by many across a wide spectrum of political ideologies. Its main carriers and exponents were the avant-garde among engineers, planners, technocrats, high-level administrators, architects, scientists, and visionaries."

I believe Scott is describing one extreme of my hypothesized psychological trait syndrome—a correlated preference for hierarchy, established knowledge, and corporeal action based on schematic abstraction—in positions of power in technological mass societies, while Gambetta and Hertog are identifying this same trait syndrome in the academy. Asking what kinds of people exercise what kinds of power allows us to transcend the chaos inherent in taking overtly stated ideologies at face value. The same people, for instance, comprised the security services of both the USSR and Russia in its current hyper-capitalist phase. Surely attributing some significance to this fact makes more sense than describing their system of mass coercion as a fundamentally left-wing phenomenon until 1991, and right-wing thereafter. It would make a great deal of sense if, for instance, personnel of the FSB scored higher on the Right-Wing Authoritarianism scale than the average Russian, even when it was called the KGB. This prediction emerges from the fact that high RWA predicts, for instance, hyper-violent partisanship of both Israeli and Palestinian nationalism (Tuschman 2013). In other words, it predicts a fundamental temperament that consistently manifests in the killing and caging of others, while contextually varying in the rationale for doing so.

Our three populations exhibit continuous variation with respect to the established vs. innovative component of the hypothesized trait syndrome. The four disciplines associated with institutional power (engineering, medicine, law, and business, economics, and administration) concern the application of existing knowledge, and so fall on the established end of the continuum, as expected. Likewise, in Gambetta and Hertog's sample, this population scores high on a subcomponent of the Need for Closure scale called Traditionalism, which measures preferences for social arrangements based on traditional family and religious authority. Math and science are concerned with innovations and undiscovered terrain, but they build on previous work, meaning knowledge can, in fact, become established. A recurrent frustration with many permutations of social science is a lack of truly definitive conclusions, and thus of progress of any kind (e.g. Tooby and Cosmides 1995).

The corporeal vs. symbolic axis is clearly present along our proposed disciplinary-perceptual continuum, again displaying continuous variation. The institutional power-associated disciplines are fundamentally concerned with the manipulation of corporeal reality. Science and mathematics is a dynamic integration of the accumulation of pure knowledge and its physical application. The only

physical manifestation of many varieties of social science and humanities is the publication of books.

Likewise, the presence of the definitive/schematic vs. ambiguous/particular axis in academic specializations is conspicuous. As we have already noted, certain elements of social science and humanities are characterized by a sort of general epistemic fatalism, while physical science and mathematics comprise a dynamic synthesis, attempts at reductionism and systematic knowledge conducted with a measure of epistemic humility. Engineering and other technocratic disciplines are notorious for the cheerful certainty of their predictions, sometimes in the presence of screamingly apparent contradictory evidence.

Scott calls Authoritarian High Modernism "a faith that borrowed, as it were, the legitimacy of science and technology," characterized by "unscientifically optimistic" assessments of its own technical mastery. Anyone familiar with the rosy forecasts found in Environmental Impact Statements for new fossil fuel infrastructure, or US military strategies for increased troop commitments, knows the distinctly schismatic quality this "synoptic view of a selective reality" possesses. Towering infernos and enraged violence are disregarded in favor of confidence intervals and first derivatives—a model is asserted to possess greater validity than reality itself. Gambetta and Hertog note that "engineers strongly believe that science can solve environmental problems" to a much greater degree than scientists themselves, and echo Scott's description of their worldview, noting that "engineering students, like followers of text-based religions, rely … on answers that have already been given." Likewise, Scott notes Lenin's belief in the "objective and logically inevitable" judgements of the Bolsheviks, while Gambetta and Hertog describe a jihadist engineering student's YouTube videos, where he explains how the curves produced by two simple formulas represent the fight between al-Qaeda and its enemies, offering unequivocal mathematical proof that al-Qaida will prevail.

These correlated psychological tendencies indicate that the broad construct of science encompasses distinct epistemologies and patterns of conduct. Understanding these distinctions is central to understanding the nature of power in the societies in which science is conducted, and thus its ability to solve problems.

Conclusions

Two concrete scientific initiatives have been proposed in the course of this discussion, the first of which informs the second. The first is the identification of climate and ecological tipping points, and their articulation as thresholds for the failure of the current scientific and political approach. The literature on tipping points is currently quite diffuse; an integrated assessment of the many potential runaway processes which have been identified, and an effort to establish a broad consensus on how to determine when they have been triggered, would be a major development. This would require political will on the part of scientists: as Kemp (2022) and others have noted, the IPCC simply refrains from modeling feedbacks, and this has significantly influenced scientists' perceptions of what constitutes "mainstream" climate analysis.

The establishment of quantitative physical thresholds would provide a metric for evaluating the strategies thus far employed in fields like climate science and conservation biology for averting catastrophe. The core premise of these strategies—that policymakers embedded in the current systems of power will someday rationally respond to the warnings and recommendations of scientists—would then gain the status of a falsifiable hypothesis. Ideally—although this obviously involves some level of discretion—the threshold for declaring the current paradigm a failure would exist when tripping points are imminent, but somewhere before their actual triggering.

There are certainly examples of the scientific acknowledgement of the intransigence of extant political systems. For instance, Gardner and Bullock (2021) state that, because of the climate crisis, the traditional goals of conservation science are no longer physically attainable. Noting that the field relies on "false assumptions of how to catalyze transformative change," the authors suggest their scientific discipline transform into one they call survival ecology.

Like Gardner and Bullock, here I am advocating that the question of how to avert global catastrophe be treated as an open-ended scientific one. A meaningful scientific inquiry into why the system has thus far been unresponsive scientists' warnings would, of course, be a vast and multifaceted one. We could note any number of conceivable starting points for this journey, such as the long history of

those in power exhibiting non-responsiveness to other existential crises (Tuchman 1984), and the tendency toward collapse of hierarchical mass societies throughout the archaeological record (Tainter 1988; Scott 2009; 2017).

However, the second concrete scientific initiative presented here concerns a particularly central aspect of this inquiry: the underlying cause of the landscape of variable perceptions climate and ecological scientists find themselves in. In particular, it proposes to search for answers to two very fundamental questions. One, why is it that when physical scientists are communicating their results to policymakers, they are always communicating with people from different disciplinary backgrounds? Two, why do people from different disciplinary backgrounds—even if those backgrounds involve a great deal of technical reasoning—vary in the ways they do in their perceptions of environmental issues?

The proposal is that the methods of political psychology, which have produced a body of robust results on populations outside the academy—with findings from brain imaging, psychological questionnaire, physiological, and behavioral studies corroborating one another—be applied within it. A number of studies could be directly replicated with academics as their subjects. In addition to the dimensions of individual variation found within the existing political psychology literature, I have proposed a syndrome of four correlated psychological traits, extending current findings, which I believe warrants study.

It seems likely that some people will have a broad aversion to the study of any psychological differences in the academy. This is perhaps why there aren't a large number of such studies, despite that each one I am aware of has, in fact, found interesting and meaningful differences. The existence of a psychological corollary to, for instance, a particular divide within a discipline, or an entire discipline, might be perceived as diminishing the credibility of that discipline or partisans of that divide. But of course, the fact that certain kinds of minds are attuned to certain aspects of reality, or certain kinds of explanation, doesn't invalidate them. Certain personalities are more or less attuned to threat—obviously this does not invalidate the objective reality of both threatening and benevolent circumstances. I believe that scientific knowledge would be significantly advanced by a better understanding of the different kinds of minds that produce it.

According to West (2017), the pace at which complex systems generate new crises

is commensurate with their scale. As global human society generates new crises ever faster, it appears to be outpacing the ability of science to adapt and respond (e.g. Kirchner 2022). The need to adapt to—and meaningfully influence—these changes has engendered numerous meta-scientific proposals, to which these two are added. One, that we treat dominant assumptions about how to address the ecological crisis as falsifiable hypotheses. Two, that science applies its methods for understanding belief systems, and their underlying temperaments, to itself.

Gardener Comments

Josh Randall:

This paper presents two central ideas, that certain disciplines of academia either produce or attract people with specific psychological traits along four axes and that this idea should belong to a line of inquiry that focuses on learning about the politics of the world using empirical data of immense social change. I think this first idea could benefit from an explicit comparison to other social tests' categories in addition to their results as described in the manuscript. The second idea is given almost no additional information and is possibly a more important question, especially as it critiques several currently existing disciplines without fully explaining where this empirical study of collapse could come from.

Ted Wade:

The article first says that we need a scientific basis for deciding when current strategies to mobilize against ecological collapse have failed and we must try some other, unspecified course of action. It brings up tipping points, but maybe we have already passed one or more. At any rate, changing strategy after a tipping point seems futile. The author then hypothesizes 4 psychological trait dimensions, and offers a combination of existing research and speculation in applying these to 3 populations: entrenched authorities, violent extremists, and scientists. Along the way, the writing is erudite and interesting, with some very quotable lines, but I found it hard to track where it was going. The Conclusion section mostly does not follow from the body, but does offer that the "trait syndrome" discussed might help with finding a path to survival. That's all the cash value that I see. What I would like to see would be a reason to pursue this research instead of the many other explanations of our societal paralysis, because we don't have much bandwidth or

time remaining to get this figured out. The three populations mentioned all have a role in what might happen, but if we did the research and nailed down their positions on the trait dimensions, what would we do with that? We would still need to learn how those groups can be made to agree on actions with huge and uncertain costs and benefits. I realize that is an impossible ask for a single call-to-action paper.

Anonymous1:

The article is vague, and it can be summarized into a complaint: our ecological concerns do not translate into political action. It transpires some resentment against the technical professions, and in fact is a clear example of why people in government and the corporate world, even if sympathetic to the concerns of the author, do not act on their advice: the advice itself is not produced in actionable form! Shall we apply a carbon tax? To which countries? How do we avoid the free rider problem? These are the problems to be addressed. And they shall be addressed with both scientific AND strategic soundness. No hint of understanding of particular interests and adversarial relations or real world politics is found in the entire article. No references to serious political science literature, institutional mechanisms, or any other relevant social science is offered. Even the most important issue (the tragedy of commons in a world with multiple and adversarial countries) is not discussed.

Mark:

Overall, I think this is well situated and thoughtful. With absolutely no pressure to cite this work, the author might be interested in Almaatouq et al. 2022 and many of the papers it discusses which have a strong thematic overlap to this work.

Dr. Payal B. Joshi:

The article is well-presented and the topic is relevant and timely. I recommend publishing the article as it is.

Joe R:

1. Does the article contain novel ideas that have the potential to advance science?

Asking what kinds of biases inform our thinking is an important part of advancing human knowledge. Noticing said biases in oneself is a rare skill, and often crucial to

avoiding mistakes in science. Studying those biases scientifically isn't exactly a novel idea, but there's definitely room for a lot more growth in that arena. Philosopher, know thyself; scientist, study thyself. "We must apply our methods for understanding belief systems, and their underlying temperaments, to ourselves" (p. 11) is, out of context, an excellent piece of advice for anyone, especially those dedicated to the systematic, evidence-based study of the ground truths of reality.

Unfortunately, the author had to go and add context.

2. Does the article include adequate justification for its ideas and how they could advance science?

It's hard to find an actual fully-stated hypothesis in any of the sections except maybe the one starting on page 6. But based on past replication failures, when someone says "Aha! I have found the four fundamental axes on which political opinions vary!" they tend to be overhyping at best and tragically mistaken at worst. And that's for n=10,000 giant personality test studies, compared to this paper's n=0 personal experience. It is especially suspicious when the author might have an incentive to label the side of the axis they're on as the Good and Righteous side. Consequently, I am highly skeptical of these claims.

3. Does the article contain high-quality writing?

It is hard to extract a unified or coherent claim from this paper. I scoured the document for a core claim or concrete proposal, but failed to find one I could clearly restate. It reads more like a passive-aggressive manifesto than a scientific paper, and I am getting a hard-to-describe suspicion that the author is trying to say "academics are biased and can't agree, THEREFORE, my intellectual opponents disagree with me because of their evil angry fearful monkey brains" in scientific-sounding language, hoping we won't notice the shift from a claim with decent evidence to a claim with basically none. And I have absolutely no idea where they're going with the claims about "powerful" disciplines sharing psychological traits. Are they looking to overthrow the math majors?

The best I can manage to extract from this paper is their original point about climate studies, which seems to go "nobody in power listened to us, it is time for

REVOLUTION!" I see precisely zero actionable or realistic proposals for such, let alone any assurance that trying won't result in a giant flaming disaster. I expect that if this article were to be published and, against all odds, taken seriously by mainstream science, it would only precipitate a massive flamewar in which academics accuse one another of hierarchical/established/corporeal/definitive/schematic bias or their counterparts, declare one another shills for the powerful, and somehow manage to blame it all on the engineers and business majors. (Okay, so not that different from present dialogues).

There might be some kernels of truth buried in this paper - and it cites some extant studies that sorta point in the same direction - but accusing entire disciplines as being inhabited by hidebound loons is the sort of thing that ought to be handled carefully. I'm seeing a lot more heat than light, and I can't recommend a paper this bloated and incendiary as kindling for a bright new paradigm.

Enrique Muñoz:
The article is well structured and easy to follow for non-specialists. I merit the self-reflection of the author which, undoubtedly, we all should do more often.

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