Commons and Cognition

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Garrett Hardin's Tragedy of the Commons primarily concerns actions rather than thoughts. But he did famously describe the cognitive state of a hypothetical herder on a grassy field. With respect to the field and its other users, Hardin's herder is both ignorant and indifferent; he coolly calculates that his best option is to take the full benefit of grazing his stock while suffering only a fraction of the cost — an action that contributes to the decimation of a common resource. While Hardin viewed the herder's attitude as identical to that of actors in many other collective action situations, the work of other commons theorists suggests several different cognitive stances among such actors, largely depending on the scale of the commons issues they face. Thus participants in the Prisoner's Dilemma (a very small commons) would appear to be dominated by distrust rather than the hypothetical herder's ignorance or indifference. Participants in mid-sized commons — such as Hardin's herders in real life — show some distrust, but also great knowledge and engagement in common pool management. Participants in the largest-scale commons issues are actually those most likely to exhibit the ignorance and indifference that Hardin attributed to the herder. This Article discusses the ways in which these different cognitive stances track the scale of collective action "tragedies" as described by major theorists and concludes with some observations about the cognitive aspects of climate change.

Introduction

In Garrett Hardin's *Tragedy of the Commons*,[1] there is a famous and critical moment of calculation: Hardin describes the herder who is deciding whether

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to let his animals graze on an open common field. The herder calculates the gain that will come to him in the form of additional proceeds from his better-fed stock; he then compares that gain to his loss due to diminished grass in the field — a loss that he shares with all the other herders. That is to say, as Hardin put it, he takes +1 gain, but only a fraction of the -1 loss, with the fraction's denominator equal to the number (N) of other herders. In view of this calculation, our herder adds all the stock he can to the open field. But presumably, all the other N herders make the same calculation, with the result not only that the grass is used up but that it is too depleted to renew itself, so that the field goes to ruin. That is the classic Tragedy of the Commons. The only solutions, according to Hardin, are either private property or coercion.[2]

Let us pause for a moment to consider the Tragedy as an issue of cognition: what does this herder know and how does he appraise what he knows? He knows the potential gains of the fodder, and he knows how much fodder his stock will take from the same field that others are using. He appears to know that there *are* other herders, but he may or may not know how many (the N) or who they are, or how many animals they have. He also appears to know that his decision to graze his stock contributes to the longer-term loss of the field's productivity, insofar as he is thinking of costs that he shares with the N of other herders. His appraisal of what he knows is entirely centered on his own gains and losses, and he does not appear to be thinking about what other herders think or what they will do, except insofar as he may think they are likely to think and act in the same way that he does.

In short, the herder is operating in a fairly limited cognitive and affective universe. Most strikingly, if he knows about the commons situation — and the longer-term costs to himself and others — this knowledge is a matter of indifference to him. His indifference is the concomitant of his rational calculation from the perspective of his own short-term self-interest. But the calculation is, of course, damaging or even disastrous in the end, both to him and other herders: that is the reason, according to Hardin, why the commons ends in tragedy.

But why is the herder indifferent to the consequences of his calculation, when over the longer run those consequences can be ruinous to his own ability to use the grazing resource? Indeed, the same question might be asked of the other examples that Hardin's essay gives, where he treated numerous unrationed resource uses as variants of the Tragedy: traffic jams due to the search for free parking, oceanic overfishing, ranchers' pressure for grazing

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1 Garrett Hardin, *The Tragedy of the Commons*, 162 Sci. 1243 (1968).

2 *Id*.; *see also* Garrett Hardin, *Political Requirements for Preserving Our Common Heritage*, *in* Wildlife and America (H.P. Brokaw ed., 1978).

permits, overcrowding of freely accessible national parks. Amidst this array, Hardin's main examples were pollution and overpopulation. According to his description, polluters make the same rational calculation that the herder does. Hardin initially was somewhat more circumspect with respect to his main target, overpopulation, describing it as the "root cause" of the other resource problems. In the end, however, Hardin described overpopulation as another core commons problem, saying that "freedom to breed" must be curtailed, through either property or state coercion, but in either case "coercion, mutually agreed upon."[3]

One might think, however, that the participants in these varied collective action examples might know or care about things in different ways from the very stylized example of the herder. Are ocean fishers indifferent to the diminution of the stock, or might their reasoning processes run differently? Do fishers even know that their actions diminish the catch for others? There is certainly a long history of fishers' disbelief in stock scarcity, as exemplified in the adage that there are plenty of fish in the sea. Are polluters indifferent to pollution — and whether or not they are, do polluters even know that they are polluting? After all, to take a different example, until relatively recently, few people knew that carbon dioxide might be linked to change in the composition of the atmosphere. And consider Hardin's "breeders": do people consider their children competitors for global resources, and just breed more because of a rational indifference to any such competition?

This Article focuses on the cognitive aspects of Hardin's analysis of the commons Tragedy. Contemporaries and successors to Hardin have had sharply divergent views on the cognitive states of participants in collective action scenarios. Some have given explanations for the indifference of the herder or others like him. Others have argued that Hardin's description is simply false, and that actors in commons situations are not necessarily indifferent to or ignorant of the elements of their situations.

One dimension along which one might expect cognitive variation is simply the *scale* of the commons in question. Participants in smaller-scale commons situations could well have different kinds of information and interests than do the herders in the middle-sized commons, while participants in very large commons scenarios could vary from both. There are certainly examples of these differences in the literature preceding and succeeding Hardin's classic essay. From the early 1950s onward, mathematicians and others have discussed the game theoretic problem that has come to be known as the Prisoner's Dilemma,[4]

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3 Hardin, *supra* note 1.

4 Perhaps the best known of those is the Canadian-American mathematician Albert W. Tucker. *See Albert W. Tucker*, INFORMS https://www.informs.org/content/view/

a very small-scale version of the Tragedy of the Commons, where the actors are very much concerned about what their counterparts are thinking, and are mistrustful rather than indifferent. Then in 1954, resource economist Scott Gordon described what was effectively the Tragedy in the context of fisheries — a commons considerably larger than the herders' field — where fishers knew some things about their counterparts, but did not know other things about the stock.[5] A few years later, environmental scholars suggested that air polluters — that is, participants in large-scale commons situations — were not so much indifferent as ignorant of their actions, at least until faced with some kind of crisis.[6] As for the middle-sized commons like Hardin's grazing field, numerous anthropological and social science studies of the 1970s, 1980s and 1990s — notably those associated with political scientist Elinor Ostrom and her colleagues — argued that the Tragedy need not occur in the very type of commons that Hardin used as his leading example, the common field or comparable middle-sized commons, because of the participants' knowledge of the actions of others and attentiveness to the community of resource users.[7]

The following Parts of this Article will move from small commons situations, to middle-sized commons, and finally to very large commons. Taken together, they will consider some of the major writings on commons issues in the decades just before Hardin's famous essay and then in subsequent years. Some of these writings are optimistic, suggesting that actors can overcome collective action problems and avoid the Tragedy; others are more comparable to Hardin — that is to say, pessimistic about voluntary or even involuntary solutions. But as readers will see, a notable feature of these writings is that they focus on rather different cognitive elements of collective action, depending in large part on the scale of the collective action topics of interest to the writers.

I will argue that in commons or collective action situations, the participants' major cognitive stances are distrust, ignorance and indifference, but that the significance of those stances varies with the scale of the commons or

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full/271234 (last visited Oct. 2, 2017) (describing the role of Albert Tucker in popularizing and developing the "prisoner's dilemma"); Sylvia Nasar, *Albert W. Tucker, 89, Pioneering Mathematician*, N.Y. Times, (Jan. 27, 1995), http://www.nytimes.com/1995/01/27/obituaries/albert-w-tucker-89-pioneering-mathematician.html (same in obituary).

5 H. Scott Gordon, *The Theory of a Common-Property Resource: The Fishery*, 62 J. Pol. Econ. 124 (1954).

6 *See* text accompanying *infra* note 55.

7 Elinor Ostrom, Governing the Commons: The Evolution of Institutions for Collective Action (1990); Bonnie J. McCay & James M. Acheson, The Question of the Commons: The Culture and Ecology of Communal Resources (1987); Susan J. B. Cox, *No Tragedy of the Commons*, 7 Envtl. Ethics 49 (1985).

collective action issue at stake. As it turns out, Hardin's description of the herder's mental state of limited knowledge and absence of affect — ignorance and indifference — is radically out of line both at the small and middle-sized commons levels in which real-life herders operate, but applies much better to commons problems of a much larger scale.

I. The Commons Writ Small: The Prisoner's Dilemma

The game-theoretic and iconic Prisoner's Dilemma (PD) grew out of 1950s mathematical research in the Rand Corporation into "games." This particular game is one in which the participants systematically fail to cooperate even though cooperation would serve their collective best interests. Its significance is that it illustrates a set of disturbingly ordinary scenarios in which the actors' best individual choices, taken together, undermine the best social outcomes. The Tragedy of the Commons is sometimes described as an "N-person PD,"[8] although one could just as well say that the PD is a two-person Tragedy of the Commons. The bare-bones rational decision-making process in both is the same: each participant realizes that he or she will be better off not cooperating, no matter what the other does, so that in the end neither cooperates and both arrive at the jointly worst scenario.

While mathematicians Merrill Flood and Melvin Dresher formalized the game, another Rand mathematician, Albert Tucker, turned it into the PD *story*.[9] In this extremely well known narrative, two prisoners in police custody are confronted with a choice between confessing and keeping silent. If both keep silent (i.e., cooperate with each other), both will go free (their best joint outcome), but if one confesses and the other does not, the confessor will receive a reward while the silent one will suffer a heavy sentence; if both confess, both will receive a lighter sentence — not as bad as severe punishment for either one individually, but the worst payoff for the two of them taken collectively. The choices make each better off confessing no matter which choice the other makes. As Tucker put it, with the same cool calculation that Hardin was to use later about the herder, "clearly, for each man the pure strategy *confess* dominates the pure strategy *not confess*." Thus following that rational strategy, both receive moderate sentences — their worst joint solution — and miss their optimal joint solution of going free. Tucker

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8 *See, e.g.*, Thomas Dietz et al., *The Drama of the Commons*, *in* The Drama of the Commons 3, 12 (Elinor Ostrom et al. eds., 2002).

9 Philip D. Straffin, Jr., *Changing the Way We Think About the Social World*, 14 Two-Year C. Mathematics J. 229 (1983).

mentioned that the players would do better if they could form a cooperative coalition, and then — again anticipating Hardin's "mutual coercion" — he went on to suggest that in situations like the PD, the state could require the players to cooperate in order to arrive at their collective best solution, in which case the only remaining question would be how to divide the surplus in a zero-sum game.[10]

Of course, one might expect a mathematician to take a cool approach to the prisoners' decision-making process. After all, Tucker invented the story in order to illustrate a mathematical proposition about the unattractive conclusions of some non-zero-sum games, and as commentator Peter Straffin observed, the contribution that mathematics can make to the social sciences is "to pare away inessentials."[11] Still, the exemplary choice of two criminals not only confuses the story (cooperate or not with whom? each other or the police?), but also suggests an effort to project a certain bad-man model of social decision-making.[12] The PD scenario is one that permeates social life, from economics to politics to ordinary social situations, and certainly other examples could easily have been found. A less confusing and more realistic scenario might have dealt with, say, the example of two persons trying to decide whether to trade their respective goods, or two children trying to decide which of them should get in the swing first and which should push.

But the Prisoner story was wildly successful. This author has seen fictional versions of the actual story repeated several times in television cop shows, and perhaps most notably, a variation in *Orange is the New Black*, in which the protagonist stays mum while her supposed ally confesses. The story is vastly more widespread figuratively, however, and within a few years it gave rise to hundreds of social science experiments and papers on a great variety of human experiences.[13] By now, the follow-on writings have reached the thousands.[14]

Some of the experimental writings deal with the problem of what it would take to get the "prisoners" or other participants in PD situations to form coalitions; in turn, these investigations touch on some aspects of the PD actors' cognitive frameworks. If we return to Tucker's original PD story, we infer that one premise is that the police keep the prisoners apart. This is an interesting feature in itself, because it suggests an artificial effort to keep the

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10 Albert W. Tucker, *The Mathematics of Tucker: A Sampler*, 14 Two-Year C. Mathematics J. 228 (1983) (reproduction of Tucker's original note).

11 Straffin, *supra* note 9, at 229.

12 *See* Carol Rose, *Game Stories*, 22 Yale J.L. & Human. 369 (2010).

13 Straffin, *supra* note 9, at 229.

14 Barry Nalebuff, *Prisoners' Dilemma*, *in* New Palgrave Dictionary of Economics and the Law 88, 89 (1998).

actors ignorant, and even to mislead each prisoner about the other's actions and statements. The artificiality of these factors suggests several cognitive elements in the prisoners' makeup. First, these prisoners might be able to reach agreement if they were not kept apart. Indeed, they might be able to agree even if they did not know each other in advance. Second, the prisoners also know something about the punishment they are likely to face if found guilty of the crime of which they are accused, although in the PD story the police may exaggerate that factor. But third, the prisoners are certainly not indifferent to punishment, and finally, fourth, they know that the key to avoiding or suffering punishment rests with their own actions — that is to say, whether or not one or both confesses.

And yet, even with all this knowledge, they may both confess. Why? Obviously, ignorance and indifference are not the cognitive culprits. The cognitive culprit is distrust, and it stems from the structure of the PD itself, in which each player is better off not cooperating no matter what the other player does.

Thus, in the PD, there is a cognitive step beyond the simple rational calculation of the player's own best choice; there is also distrust of the other player. To be sure, if their enforced separation were relaxed, the prisoners might be able to come up with a collusive plan. But then again, they might not. Why not? Because the PD structure also lends itself to a kind of destructive common knowledge. Each player realizes that his own best prospects entail cheating or betrayal. At best, betrayal gains a reward while "suckering" the other party; at worst, betrayal at least avoids being a sucker oneself. But since this is simply a matter of logic, if one party thinks about the matter at all, he realizes that the other party will arrive at the same rational conclusion. Both know this, and both know that both know it; the drive to betray is common knowledge between the two of them. This is the case if they cannot communicate, but what is worse, it is the case even if they *can and do* communicate. Tucker's bland reference to coming to an agreement turns out to be not so easy after all. In the world of rational calculation, mutual betrayal is not only possible, but probable.

Moreover, Tucker's suggestion of cooperation enforced by the state (or some other third party) is not so easy either. This is a point that James Krier made some years later in the course of reviewing a book on Free Market Environmentalism, in which the authors optimistically presumed that property regimes would emerge *sua sponte* to contain resource-related commons problems.[15] But Krier pointed out that a property regime or any other kind

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15 James E. Krier, *The Tragedy of the Commons, Part Two*, 15 Harv. J.L. & Pub. Pol'y 325 (1992).

of organized management of a commons — including Hardin's or Tucker's third-party coercion — can only function if someone has solved another set of commons problems: organizing the governance rules and making them work. Hopes for solutions at an organizational level, like hopes for "community" solutions, beg the question how individuals trying to organize or to form communities can overcome the distrust that affects the prisoners in the original PD. Might the stakes be lower in trying to organize rules? Perhaps. Might the range of tradeoffs be greater? Again, perhaps. But the PD's rational calculations invade these scenarios too — that is, each potential participant rationally suspects that other participants will try to evade the burdens of organizing or community maintenance while free riding on others. As Krier observed, if people cannot solve their commons issue at the resource level, there is no reason to think they can solve it at the organizational level either. The collective action problem continues, but now at the secondary level of governance. Krier thought that this logical lapse was forgivable for someone like Hardin, whose special expertise was in biology, but that the economists whose work he was reviewing should have known better.[16] He might have said the same of a mathematician like Tucker.

The mini-commons of the PD, then, adds significant cognitive resources to Hardin's indifferent rational calculation. The PD actors know and care about the resource destruction that will follow from noncooperation. In the classic PD story itself, each actor knows that he has only one counterpart with whom he must reach a collusive agreement, and he very likely knows who that counterpart is. He is intensely interested in what that counterpart is thinking, but he knows the counterpart's dominant strategy, and hence he knows that the counterpart cannot be trusted. Indeed, both know what their counterparts are likely to be thinking, and that knowledge leads to distrust, no matter how hard each beats his breast and swears to fealty. If indifference is the most striking aspect of Hardin's herder story, distrust is the most striking — and seemingly inevitable — cognitive feature of the PD story.

The oddity, of course, is that distrust and noncooperation appear to be so inevitable in the ubiquitous PD scenario, whereas in real life cooperation and trusting relationships are everywhere to be found, and generally applauded too, with shock and disapprobation reserved for the cheaters. Friendships, business relationships, buying a café latte — all have some element of the PD scenario, and yet they manage to work out.

How could this be? There are several possible routes out of the dilemma, but some effectively change the game. A number of these involve a change in the payoffs; a crude example would be the matter just discussed, namely the

16 *Id*. at 337-39.

addition of third-party punishment for noncooperation, akin to the suggestions for state coercion made by Tucker and Hardin. The problem with this game-changer, of course, comes with Krier's caveat: orchestrating coercion creates a secondary PD or collective action problem. An apparent alternative escape route, and one that has been very widely discussed, is *repeat play*. The great attention to repeat play came thanks to the 1984 publication of Robert Axelrod's book, *The Evolution of Cooperation*, in which repeat play has a starring role.[17] Repeat play itself builds on a variation of changing the payoffs of the PD game, because the players who engage in a series of cooperative moves — for example, ongoing business relationships — can improve their individual lots far more than they would in a one-off cheating scenario. But Axelrod's contribution was to show everyone how to get to this happy state, and he did it with computers.

Axelrod initiated a competition among game theorists to devise strategies for sequences of cooperative or non-cooperative moves; the strategies then competed against one another in a pairwise round robin of PD situations. The winner was the quite simple TIT FOR TAT strategy devised by University of Toronto psychology professor Anatol Rappaport. In TIT FOR TAT (TFT), a player begins with a cooperative move and thereafter makes the same move that the opposite party makes. A cooperates when B does, but reacts in kind when B defects. When run through iterated computer models, TFT defeated much fancier strategies, whether more forgiving and cooperative (e.g., TIT FOR TWO TATS) or less so (an occasional cheating move), and when two TFT players found each other, they succeeded in an indefinite series of cooperative moves.

Axelrod's PD studies quickly drew critiques, with some arguing that with modest alterations in the setup, other games did better than TFT,[18] and others pointing out that TFT is too vulnerable to misperceptions, particularly under real-world conditions of uncertainty.[19] Moreover, TFT assumes that the players' moves will continue indefinitely, whereas any horizon on the game introduces a cognitive factor that Barry Nalebuff has called a "logical time bomb": rational players will realize that they are better off cheating on the last move, but they know that their counterparts will think of this too, so they

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17 Robert Axelrod, The Evolution of Cooperation (1984). The book quickly generated a very large follow-on literature; *see* Robert Axelrod & Douglas Dion, Annotated Bibliography on the Evolution of Cooperation (1988).

18 Jack Hirschleifer & Juan Carlos Martinez, *What Strategies Can Support the Evolutionary Emergency of Cooperation?*, 32 J. Conflict Resol. 367 (1988).

19 Nalebuff, *supra* note 14, at 91, 93.

then reason backward to the second-to-last move, and finally roll the cheating strategy all the way back to the first move: don't cooperate.[20]

There is another important cognitive aspect to TFT as well, even a TFT game that goes on indefinitely and is not subject to time-bomb calculation. The critical move in this strategy is the first one — the first cooperative gesture that, when emulated, sets off a fruitful cascade of further cooperative moves. TFT appears to rest on the premise that one can indeed overcome the cognitive factor of distrust embedded in the PD game: one overcomes *distrust* by, well, by *trusting*. This is not to say that the premise is false; numerous psychological experiments show that many players do start with a cooperative move.[21] It is just not rational to do so, in the austere sense of rationality that the PD game supposes.

Others interested in the PD game have also suggested various relaxations of the players' rationality, most very tiny but still potent, amounting to changes in the characteristics of the players rather than the game. Long before the PD was formalized, Adam Smith argued that "mutual sympathy" might keep two players from causing pain to each other.[22] Given such sentiments, a player might assume that the counterpart can be trusted to meet a "nice" move with a reciprocal nice move instead of the rational but game-ending defection.[23] Another relaxation of severe rationality might be for a player to care what others think about him or her, and particularly to care about reputation and esteem.[24] But such players are not thinking in the way that Albert Tucker described.

Thus, from the voluminous literature on the PD game, one might conclude that this miniature version of the Tragedy of the Commons can be solved by changing the payoffs, as mentioned above — that is to say, changing the game itself. But it also might be solved by changing the *players* and the way they think, most notably by making them act in a trustworthy way and take the risk that others may be trustworthy too — not entirely rational in the minimalist sense, but certainly a matter of common observation.

To sum up the cognitive comparison between Hardin's depiction of the herder and the PD player: unlike Hardin's herder, the PD player understands

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20 *Id*. at 91.

21 David Sally, *Conversation and Cooperation in Social Dilemmas: A Meta-Analysis of Experiments from 1958 to 1992*, 7 Rationality & Soc'y 58 (1995).

22 Adam Smith, Theory of Moral Sentiments, pt. 1, ch. 1-2 (1759).

23 Nalebuff, *supra* note 14, at 92-93.

24 Hugh Pettit, *Virtus Normativa: Rational Choice Perspectives*, 100 Ethics 725 (1990); Richard McAdams, *The Origin, Development, and Regulation of Norms*, 96 Mich. L. Rev. 338 (1997).

that a common resource may be squandered and cares about that fact; he or she knows a good deal about others who have access to the resource and cares about what they are thinking. For the player in this mini-commons, the critical cognitive factor is not knowledge as opposed to ignorance or affect as opposed to indifference. Instead, it is trust as opposed to distrust.

II. The Middle-Sized Commons: Fields, Reef Fish, Forests, and Other Community-Based Commons-es

In the decades before and after Hardin published the *Tragedy*, the study of the small-scale PD burgeoned in mathematics and soon attracted the attention of scholars in other relatively abstract fields like philosophy and economics, as some expanded beyond the two-player PD game. Just a year before Hardin published the *Tragedy of the Commons*, economist Harold Demsetz wrote a short and later much-cited article arguing that property regimes evolve when common pool problems become sufficiently serious. He used as an example the development of a property system in a middle-sized common pool resource somewhat like Hardin's grazing field: the family hunting preserves in Canadian tribal areas, which supposedly emerged after the European fur trade set off a period of indiscriminate hunting and near collapse of the hunted animal populations. Demsetz's optimism about the emergence of property contradicted Hardin's gloomy story, effectively arguing that if there were a "tragedy," it would only be temporary, acting as an impetus to the evolution of an effective management regime.[25]

Demsetz's article ignored the second-order organizational commons problem that Krier identified, but in the follow-up to the article, the sharpest criticisms of Hardin's analysis came from a different direction: from scholars and researchers in social sciences other than economics. Like Demsetz, the commons that they put front and center was the very type of commons that Hardin used as his chief example: the middle-sized commons, represented by a community grazing field. An article by Susan Buck Cox was the most explicit, with the argumentative title, "No Tragedy of the Commons."[26] Cox asserted that whatever Hardin had implied about the medieval English common fields,

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25 Harold Demsetz, *Toward a Theory of Property Rights*, 57 Am. Econ. Rev. 347 (1967); but see Michael Morin, *The Absence of Indigenous Peoples and Political Economists from the "Tragedy of the Commons,"* 19 Theoretical Inquiries L. 559 (2018) (arguing that indigenous family hunting areas preceded the fur trade).

26 Cox, *supra* note 7. Interestingly, Scott Gordon's 1954 article on the fishery had pointed out that the medieval common fields were in fact managed and not an open access resource. Gordon, *supra* note 5, at 135.

and whatever self-serving mythology had followed about their wastefulness, these community-based resources had never been open to all, and they had always been subject to rules to maintain productivity — and far from sliding into rapid decay, these commons had lasted for many centuries.

Cox's article was one of a growing number of social science and historical studies of community-based common resources in the 1970s and 1980s, studies that continued into later decades. These are the commons I am describing as "middle-sized" — those whose participants number more than two or a handful, but that still stay within the size in which the players can know one another and notice one another's actions. Studies of this kind of commons covered a wide variety of topics — irrigation systems, inshore fisheries, pasturage, and community forestry, among others.[27] The picture of the "commoner" emerging from these studies is very different from Hardin's herder. This user of a common resource is exceedingly knowledgeable about the resource and the other resource users; he or she follows specific methods for using the resource cooperatively and sharing its bounty; and generally he or she is not at all indifferent to the resource's continued productivity. This commoner does have something in common with the PD player, however: distrust of the other players. But this commoner's distrust is only provisional and not crippling, and it can be allayed by monitoring and accounting, as well as by participatory rulemaking and dispute resolution.

By the end of the 1980s, the late Elinor Ostrom definitively claimed leadership in studies of this type with her widely-read book, *Governing the Commons* (1990), which summarized and systematized this growing field, and with her leadership of the Workshop in Political Theory and Policy Analysis at the University of Indiana. Ostrom took Hardin to task in *Governing the Commons*, as did her students in many later writings. Her particular ire was aimed at Hardin's view that commons tragedies could only be prevented by instituting private property or through direct rule by government — "Leviathan," as Hardin was to put it in a brief essay a decade after the original "Tragedy."[28] Ostrom argued that people who use a resource in common are capable of self-organization that rests neither on individual private property nor on state

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27 *See, e.g.*, Arthur Maas & Raymond L. Anderson, ...and the Desert Shall Rejoice: Conflict, Growth and Justice in Arid Environments (1978); Donald N. McCloskey, *English Open Fields as Behavior Toward Risk*, 1 Res. Econ. Hist. 124 (1977); Robert McC. Netting, *What Alpine Peasants Have in Common: Observations on Communal Tenure in a Swiss Village*, 4 Human Ecol. 135 (1976); and the essays in McCay & Acheson, *supra* note 7. *See also* Dietz, *supra* note 8, at 11-14 (a brief overview of the increasing number of these studies in the 1970s and 1980s).

28 Hardin, *supra* note 2, at 314; Ostrom, *supra* note 7, at 8-9.

directives, but rather on community-based institutions and decision-making. In *Governing the Commons*, Ostrom alluded briefly to the second-order problem — that is, that organizing community institutions implicates secondary PD problems — but she appeared to view repeat play in the community context as a game-changing solution to at least some of these problems.[29] Moreover, her own field research illustrated the prevalence of self-organized community regimes in the numerous small-scale irrigation systems of Nepal — systems that she argued were superior to the state-sponsored, top-down systems instituted by bureaucrats who did not even notice the community systems.[30]

Ostrom's analysis began with what she called "common pool resources": in such resources, individual use subtracts something, but exclusion of any particular use is difficult. She came up with a number of "design principles" that characterize successful management of such resources. Some are more or less physical; for example, exclusion might be difficult, but it cannot be impossible, because one of her design principles requires that the users as well as the boundaries of the common pool resource be "clearly defined."[31] Other design principles are institutional, for example, that there must be arrangements to make rules, settle disputes, and deal with infractions.[32]

One of Ostrom's design principles directly engages the knowledge and attitudes of the participants: the principle that the participants be able to monitor one another's behavior, either personally or through trusted proxies.[33] The case studies in *Governing the Commons* give a number of examples, as in a Spanish community-based irrigation system in which each participant can see the water pulse approaching through the ditch, and can see how much his neighbor is using before his own turn begins.[34] Just to be sure that the neighbor and others are not taking too much, irrigators also hire and pay ditch-riders who ensure that water allocation follows the rules.[35] Other examples of close monitoring abound: in the Alpine community of Toerbel, stock owners may graze on the common pasture only as many animals as they can feed over the winter, a rule that Ostrom describes as "easy to monitor

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29 Ostrom, *supra* note 7, at 140-41.

30 Elinor Ostrom et al., *Revisiting the Commons: Local Lessons, Global Challenges*, 284 Sci. 278, 280 (1999).

31 Ostrom, *supra* note 7, at 90.

32 *Id*.

33 *Id*. at 59, 90.

34 *Id*. at 73-74.

35 *Id*. at 74.

and enforce."[36] A Canadian fishing community allocated rights on the basis of fishing technology, "an easily observable factor."[37]

Ostrom argues that the participants in communities that manage common pool resources generally follow rules, indeed to a surprising extent, but that they do not trust that all other members will do so; otherwise, as she comments, they would not invest so heavily in monitoring. Ostrom's picture of the participant in the middle sized commons, then, shows one who suspects his counterparts, but at the second order, he or she has some confidence that their propensities to cheat can be thwarted, at least with sufficient opportunities for observation and availability of institutional remediation.

Ostrom's other design principles for successful community management suggest other facets of the thought processes she noted among middle-stage commoners. Their institutions for rulemaking and dispute resolution suggest that the participants are willing to defer to group decisions, so long as they can have a say as individuals; that is to say, they may distrust other individuals, but they have more trust in the collectivity. For example, Ostrom notes repeatedly that punishment for infractions is generally light, a matter of some interest to others who have studied community-based management regimes. Legal scholar Robert Ellickson's *Order Without Law*, published almost simultaneously with Ostrom's *Governing the Commons*, famously discussed the role of gossip as a form of social control in a Northern California ranching community.[38] Social scientists and other commentators have described the terrible efficacy of shunning, a punishment used by some religious communities, among others the Amish.[39] These measures might seem light by comparison to fines or imprisonment, but they are effective because they are in fact not so light to the participants in these tight-knit communities; the members have closely intertwined lives, and most importantly, they are heavily dependent on one another to maintain the resource on which their livelihoods all rest.

Somewhat along the same lines, another of Ostrom's design principles suggests a strong distinction between insiders and outsiders in successful community resource management: the participants draw close boundaries around the common pool resource and around those with rights of access. Monitoring extends to insiders, but perhaps even more firmly to outsiders. Thus Japanese villagers through the nineteenth century promoted promising

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36 *Id*. at 62

37 *Id*. at 174.

38 Robert C. Ellickson, Order Without Law: How Neighbors Settle Disputes 57-58 (1991).

39 Donald B. Kraybill, Karen M. Johnson-Weiner, & Steven M. Nolt, The Amish 165-68 (2013).

youths to be the horse-riding detectives who kept interlopers out of common forests;[40] thus Maine's Monhegan Island lobstermen have devised a variety of methods, ranging from colorful to destructive, to keep strangers off the island's fishing grounds;[41] thus Swiss villagers refuse entry to the common pastures to mere landowners unless and until they receive permission from the entitled commoners.[42] All this boundary guarding suggests something about the mentality of the participants in the middle-sized commons, or at least the successful ones: most importantly, they understand that they share a limited common resource, they value that resource, and they do not want to let it go. They particularly do not want to let it go to persons who are not already associated with the existing community, although they guard against overweening insiders as well.

As presented by Ostrom and other community scholars of the 1980s and 1990s, then, the participant in the middle-sized commons does not think and care in the way that Hardin suggested with his rather misplaced example of the herder, who calculates his own interest with complete indifference to other users or to maintaining the resource. Nor does this commoner think in the way that the PD player does; she instead understands the stakes without being frozen by mistrust of the counterpart player. She also manages to work with others to get to a jointly maximizing solution. Nevertheless she does remain suspicious of the other participants even though she knows she depends on them, just as they depend on her; but both she and they monitor one another closely to prevent cheating or shirking — and they keep an eye on outside interlopers as well. Hardin's description of the herder thus had it all wrong for the commoner at this scale. The herder is very far from being coolly indifferent, as Hardin supposed. Quite the contrary, this commoner is *knowledgeable* and *engaged.*

I cannot leave this commoner without noting some of the criticisms that emerged within a few years of Ostrom's publication of *Governing the Commons*. Ostrom herself was fairly matter-of-fact about the commoners she described. But some of the literature on community-based common pool management from the 1980s onward suggested a somewhat idealized view of these self-managing community members, as cooperating easily among themselves while treating gently the surrounding environment — implicitly refuting the

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40 Ostrom, *supra* note 7, at 68 (citing M. A. McKean, *Management of Traditional Common Lands (Iriaichi) in Japan*, in National Research Council, Proceedings of the Conference on Common Property Resource Management 533, 561 (1986)).

41 James M. Acheson, The Lobster Gangs of Maine 73-76 (1988).

42 Netting, *supra* note 27, at 139.

dog-eat-dog assumptions of the cold warriors of early game theory, as well as the rational utility-maximizing premises of law and economics.[43] But some other authors noticed that these do-it-yourself commons regimes often included unattractive and not-so-romantic aspects. Some observed that community-based management can be quite insular; the participants are not necessarily hostile to outsiders, but they sometimes *are*, particularly when they fear encroachment on the resources most valuable to them. Whether hostile or not, the complexity of the insiders' institutional arrangements makes it difficult for outsiders to understand them or gain a foothold.[44] For insiders the situation is the opposite: they may not be able to get out easily. Their familiarity with the community and its rules makes them difficult to replace, and indeed they are effectively held in place by limitations on departure. Insiders' property is often held subject to the decision of the community or its leaders, and departure would mean divestment for the one who leaves.[45] This prospect seems likely to influence community members to stay on, whatever their personal preferences. Thus, taken as a whole, complex community governance means that outsiders cannot easily enter, while insiders cannot easily escape.

These limiting arrangements can contribute to a certain institutional rigidity and even fragility.[46] Community-based regimes have often had difficulty dealing with large numbers of heterogenous outside influences and pressures, particularly those driven by commerce with a wider world; those pressures can overwhelm the web of community understandings and ultimately the management regimes that common understandings support.[47]

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43 *See, e.g.*, David Bollier, Think Like a Commoner 147-59 (2014) (describing commons as a new mode of life, disrupting the assumptions of market economics and the liberal state); *see also* Paul Greenough, Naturae Ferae: Wild Animals in South Asia and the Standard Environmental Narrative, Agrarian Studies: Synthetic Work at the Cutting Edge, 141-47 (James C. Scott & Nina Bhatt eds., 2001) (criticizing the "standard" account of traditional communities as forest keepers).

44 Stuart Banner, *Two Properties, One Land: Law and Space in Nineteenth-Century New Zealand*, 24 L. & Soc. Inquiry 807, 811-15 (1999).

45 *Id*.

46 *See* Brigham Daniels, *Emerging Commons and Tragic Institutions*, 37 Envtl. L. 515 (2007) (particularly criticizing institutional rigidity in community-based management regimes celebrated by Ostrom and her colleagues).

47 *See, e.g.*, Banner, *supra* note 44, at 830-47 (describing the simultaneous collapse of Maori property and political organization under the pressure of English demand for land); *see also* Lee J. Alston, Gary D. Libecap & Bernardo Mueller, Titles, Conflict and Land Use: The Development of Property Rights and Land Reform on the Brazilian Amazon Frontier 14-15 (1999) (arguing that greater

Quite aside from these institutional issues, other features of community-based regimes run contrary to modern views of civil order. Boundary-guarding by insiders can turn into violence against outsiders[48] — a trait that some community-based resource management groups share with another kind of middle-sized commons regime, the organized crime circle. Then too, community rules often include markedly hierarchic features, including misogyny.

Given the perceived anti-libertarian flaws of the middle-sized, community-based commons, some authors of the 1990s and 2000s began to speak somewhat more favorably of the relatively uniform and simplified institutions of the modern state.[49] Hanoch Dagan and Michael Heller, for example, called for a "liberal commons," particularly stressing the importance of an outlet of at least limited "exit" as an antidote to the illiberal characteristics that they saw in Ostrom's commons.[50] It is not clear that the Ostrom-type commons can withstand easy exit, however, since exit could entail an exodus of the very people who know how things are supposed to work. In any event, Dagan and Heller's emphasis on exit as an antidote to community illiberality suggests another cognitive feature of some of the participants in the middle-sized commons: while many commoners might feel themselves engaged and enfolded in the bosom of their own normative communities, others might feel trapped.

Just as closely related to the topic of cognition is the work of Henry Smith, who has devoted considerable attention to the simplified rules of modernist property regimes. In a 2003 article, Smith used linguistic analysis to compare differing conceptions of property. He argues that people understand property claims through patterns of signals, but that these patterns are not all alike: different types of property signals reflect a tradeoff between the richness of information on the one hand, and the extension of the linguistic audience on the other.[51] Very rich and complex signals of entitlements — as in the commons that Ostrom celebrated — convey nuanced information that is understood by a limited audience, whereas simplified signals give off less information but can be communicated to larger audiences. Hence the commoner in the Ostrom-type commons understands the complex sets of norms embodied in Ostrom's design principles, but he or she may not be able to explain them

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numbers and heterogeneity of claimants dissolve community understandings, leaving state institutions as the only viable guarantor of property rights).

48 *See, e.g.*, Acheson, *supra* note 41, at 73-76.

49 Carol M. Rose, *Ostrom and the Lawyers: The Impact of Governing the Commons on the American Legal Academy*, 5 Int'l J. Commons 28, 33-34 (2011).

50 Hanoch Dagan & Michael A. Heller, *The Liberal Commons*, 110 Yale L.J. 549, 566 (2001).

51 Henry E. Smith, *The Language of Property: Form, Context, and Audience*, 55 Stan. L. Rev. 1105 (2003).

easily to an outsider, or may not even realize that the outsider does not understand. By contrast, the relatively simple rules of a modernist property regime may be grasped with a modicum of effort by total strangers, who do not need initiation into an "in-group" to understand the rules, and who can buy and sell entitlements without great concern about becoming embroiled in hidden or complicated obligations.

Ostrom argued that community-based management can cover wider areas through the "nesting" of institutions.[52] But the possibilities for scaling up her design principles appear to be limited, and Smith's work explains why: the design principles cover a multitude of differing norms and practices, and their intense character may limit the extent to which outsiders can comprehend them, at least without substantial study and exertion. One might think of the difference between New York and London. The Londoner can come to know one or two neighborhoods intimately, but it takes her some time and effort to learn how to move from one part of the complex city layout to another. In Manhattan, even an arriving tourist can figure out her location almost immediately, and she knows how to get from one part of the city to another with a glance at the grid on the map – but she knows little or nothing about the special characteristics of any particular area.

The social science version of Hardin's herder, then, is a quite different person from the indifferent calculator that Hardin supposed. The real-life herder is not at all indifferent; he knows a great deal about his community and its members and about their respective roles in exploiting a common resource; he is watchful of their behavior and even more vigilant about strangers; and above all, he is engaged — though he may sometimes dream of escape.

III. The Giant Commons: Large-Scale Open Access Situations, Pollution and Climate Change

Several writers, particularly Scott Gordon, discussed the economic theory of large-scale commons resources well before Hardin's essay. Gordon's work used fisheries as an example, and like Hardin, Gordon described the theoretical fisherman as making a calculation before entering the fishing ground: the fisher considers the average cost to each fisher in equipment, time and effort, and decides whether it is worth his while.[53] Gordon's fisher thus knows something

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52 Ostrom, *supra* note 7, at 101-02.

53 Gordon, *supra* note 5, at 131. Gordon was one of a number of scholars writing about fisheries as a commons problem at this time — that is to say, well before Hardin's famous article. See Harry N. Scheiber's critique of Hardin's neglect

about the productivity of the ground, and he also knows something about the costs that current fishers are encountering when they fish there. What he does not consider, or alternatively, does not care about, is the point that his entry increases the marginal cost of fishing on this ground by reducing the fish population, and thus raises costs for all the fishers. Moreover, the next entrant also raises the marginal cost, so that our original fisher will have to work just a bit longer to fill his boat — and on and on, until the fish population declines to a level at which the cost of catching a fish equals (or possibly even exceeds) the returns from doing so. At that point, as the economists say, all rents are dissipated. As Gordon laconically remarked, "this is why fishermen are not wealthy."[54]

What our fisher seems not to know (or possibly knows but discounts) is that he is actually enmeshed in a commons problem, where the best result for all would be to restrain themselves and allow the fish to regenerate at a richer rate. That course would result in fewer fish landed but the highest return for each unit of fishing effort. But for each fisher, the best individual result, at least in the short run, would seem to be to fish even more — either because he is unaware of the coming shortage, or because he *is* aware of it and wants to take what is available before someone else does.

Aside from considering the current average cost of fishing effort, what is Gordon's fisherman thinking about the larger fishing resource? No doubt different fishers think different things. The "highliner" for example, appears to think that a declining stock will not affect him; he knows he will always be able to catch more because he is an expert at his trade and knows how and where to fish. That is to say, he is indifferent to the collective action problem because he thinks his skill permits him to evade the consequences. And he may be right: declining stocks may drive out the less-skilled competition without affecting the highliner so much. Or another fisher may also be indifferent, but for another reason: there are too many fishers out there to organize any kind of joint action, so why bother? Still other fishers may not see that there really is any collective action problem at all, either because they are sure that there are still many fish in the sea, or that any decline is due to something other than fishing pressure. Indeed, fishermen are notorious for denying that fishing resources are in decline, or that their actions play a role.

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of this extensive literature in Harry N. Scheiber, *The "Commons" Discourse on Marine Fisheries Resources: Another Antecedent to Hardin's "Tragedy,"* 19 Theoretical Inquiries L. 489 (2018). Gordon's article was one of economic theory, whereas many of those described by Scheiber were ecological and empirical studies.

54 *Id*. at 132.

In short, Gordon's fishermen give a preview of the cognitive state of many participants in large-scale commons: either they do not know that their actions degrade the common pool resource, or they do know and don't care. They may simply not know or acknowledge the collective action issue, or they are indifferent to it.

That cognitive pattern — ignorance or indifference — persists in other large-scale commons situations. It is noticeable how frequently commons problems are simply unknown to those who create them.[55] Some of this ignorance has to do with the size of the common pool resource, and the relatively minute character of the damage that any individual actor perpetrates. Take the farmer who drills a well for water in the American Midwest: he or she is tapping the immense Oglala Aquifer, which extends from the upper Midwestern states to Texas. Here is where Hardin's depiction of the herder's calculation seems most recognizable: the farmer can enjoy the full value of the water she takes, while sharing the costs with a very, very large N of other users as the water table declines — and without benefit of considerable scientific investigation, she may not really know that she does share the resource with the other N users, or that the resource itself is declining. The draining (really, mining) of the aquifer comes as a surprise when the water table drops below the level at which the farmer's well can reach it.

Another reason why large-scale commons issues come as a surprise is this: many of the depleting activities are not those that take something out of the commons, but rather put something in – particularly polluting substances. This factor is related to size because, even though pollution can be quite local, it can also spread over large areas like rivers, lakes, and especially widely in ambient air. Moreover, pollution is often more difficult to discern than extractive activities. One takes note when trees are felled in a wooded area where one was planning to cut some trees for one's own use. But one might well not notice a gas that seeps into the air, including the gas from one's own cook stove. Few people try to capture the air for commercial purposes, and so the damage from pollution may not be felt sharply until it reaches dangerous levels. Add to that the point that a polluting gas may be invisible and odorless, and it is easy to see why participants in this common pool degradation are ignorant of any problem. James Krier and Edmund Ursin's 1977 book, *Pollution and Policy*, is a history of Californians' response to Los Angeles' air pollution, and among other things it describes the very slow dawning of the realization that smog derived from the ever-increasing number of automobiles.[56] As Krier and

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55 Carol M. Rose, *Surprising Commons*, 2014 BYU L. Rev. 1257 (2014).

56 James E. Krier & Edmund Ursin, Pollution and Policy: A Case Essay on California and Federal Experience with Motor Vehicle Pollution 1940-1975,

Ursin recount, after decades of increasing automobile usage, Californians did come to realize that air quality was deteriorating, but they did not attribute this degradation to automobiles until after they erroneously blamed other supposed culprits. And indeed, they could not have understood their own role until scientists demonstrated the rather complex smog-producing interactions between sunlight and automobile exhaust.

Hence it is understandable that activism about pollution often ignites in sudden spurts, in the wake of a crisis or dramatic revelation that suddenly draws attention to an issue about which no one cared and to which no one paid much heed before. In the United States, active attention to air pollution, leading to an early version of the Clean Air Act, followed a smog in Donora, Pennsylvania, that contributed to the deaths of twenty persons in 1948.[57] Indeed, some major wakeup calls about pollution arrived more or less in the same era with Hardin's *Tragedy of the Commons*. Particularly salient was Rachel Carson's 1962 book, *Silent Spring,* which informed a largely unsuspecting public that the indiscriminate use of pesticides could have a devastating ecological impact, of which bird die-offs were only a dramatic piece.[58] It takes a shock to move the participant in a large-scale commons out of the cognitive state of ignorance and indifference.

Environmental law teaching materials in the United States often include an excerpt from Hardin's *Tragedy,* or at least a reference to it, and with good reason. Environmental problems, especially those relating to pollution, generally do look like large-scale versions of Hardin's Tragedy. But in recent years, the issue that has very much dominated environmental attention is the largest-scale commons problem of all: climate change. One could scarcely imagine a commons problem so intractable: the main culprit is a gas, carbon dioxide (CO_2), that is invisible and odorless; this gas is produced all over the globe by combustion of any kind (including breathing); moreover the effects — heat trapping in the atmosphere, acidification of the oceans — are not intuitively linked to the production of CO_2 and have only been discovered through sophisticated scientific investigation, which is nevertheless plagued by noise from other factors; and most importantly, the effects are spread throughout the globe, creating an N of immense size and diversity.

Climate change has generated vast volumes of literature, and some of that literature takes up the cognitive issues that have emerged in the politics of climate change. Perhaps more than any other large-scale commons problem, climate change reveals an important reason why large commons are different

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52-54 (1977).

57 *Id*. at 8.

58 Rachel Carson, Silent Spring (1962).

from others: the heterogeneity of participants. By comparison, even middle-sized commons of the Ostrom variety tend toward homogeneity, centering on some central resource in which most participants have an intense and roughly similar interest, like a forested area or pasture or reef fishing ground. Climate change, on the other hand, results as a by-product from a vast number of different activities — cutting trees, generating electricity, driving trucks, raising cattle, and on and on — creating a great diversity of interests in any effort to cope with causes. By the same token, the impacts of climate change are also exceedingly diverse, including flooding, heat waves, water shortages, stresses on wildlife and storm damage — all having differing effects in different locations and among different income and cultural groups. It is not surprising, then, that one cannot plausibly expect a single cognitive framing of climate issues, as in the way that Hardin's herder calculates his chances, or in the way that Ostrom's common pool resource participants think about their central resource and the other users.

Having said that, however, there is one climate-related cognitive attitude that has interested if not bedeviled many commentators: climate change denial (or more softly put, climate change skepticism). Climate change "denial" has been ascribed to several different positions, but at this point, we are beyond flat-out ignorance, which might have been plausible a generation ago. In this respect, climate change differs from many other large-scale commons issues, where, as discussed above, ignorance is quite ordinary. By this time, given the enormous public attention to climate change, no reasonably well-informed person can have failed to notice the scientific discussion of and even consensus on the issue of anthropogenic influence on climate. "Denial," then, generally refers to a different cognitive stance: an awareness of the consensus view but an unwillingness or inability to take it seriously, because one either discounts the consensus or thinks the phenomenon unimportant.[59] To avoid the condescension of the label "denier," however, I will instead use the term "skeptic."

What, then, could climate change skeptics be thinking, and why? Commentators from the 1990s onward have chewed over this question, as conference after conference and book after book appeared to reaffirm the existence of unusual anthropogenic climate change. One answer is that climate change skeptics are swayed by their own interests more than they are by the

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59 A third attitude that is sometimes called "denial" is the view that while climate change is real and serious, effort and expense are better channeled to other issues like education or the alleviation of poverty, at least at present. This does not seem to me a stance of "denial" or even skepticism, but more a conventional cost-benefit calculation, whether one agrees with it or not.

information lobbed at them in one report after another. Troy Campbell and Aaron Kay describe the phenomenon as "motivated disbelief," arguing that facts can be eclipsed by aversion to the solutions posed.[60] This is, of course, a game that two can play; economist Bruce Yandle, for example, takes exactly the opposite stance. He has long deployed the polemical nickname "Bootleggers and Baptists" to argue that the climate change *believers* are the ones masking self-interest, at least among the Bootleggers like natural gas firms, who have something to sell in a clean energy market and a strong motivation to convince everyone that climate change is a real danger.[61] But Yandle is in a definite minority in focusing on the motives of those who take climate change seriously; by far most attention has gone to trying to understand the skeptics.

In recent years, several authors have linked climate change skepticism to newer psychological theories. Some have based their work on cognitive psychological theories pioneered by Amos Tversky and Daniel Kahneman, which explore the systematic but non-rational "heuristics" through which people make more or less snap judgments about events and situations.[62] Thus Jeffrey Rachlinski and Barton Thompson in separate studies have both used cognitive psychology to explain some people's unwillingness to recognize climate change.[63] One of their prominent examples is the phenomenon of loss aversion — weighing losses of current assets more heavily than prospective gains — which can make people unwilling to take climate change seriously, since the major gains from greenhouse gas reduction will lie in the future; moreover, doubters cite lingering uncertainties about the causes of phenomena so complex as those linked to climate change.[64] Added to that is a cognitive

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60 Troy H. Campbell & Aaron C. Kay, *Solution Aversion: On the Relation between Ideology and Motivated Disbelief*, 107 J. Personality & Soc. Psychol. 809 (2014).

61 Bruce Yandle, *Bootleggers and Baptists: The Education of a Regulatory Economist*, 7 Reg. Mag. 12 (1983); Bruce Yandle & Stuart Buck, *Bootleggers, Baptists and the Global Warming Battle*, 26 Harv. Envtl. L. Rev. 177 (2002). Yandle treats "Baptists" as some version of zealots, but is not so clear about their motivations.

62 *See* Daniel Kahneman, Thinking Fast and Slow (2011). *See also* Tamsin Shaw, *Invisible Manipulators of Your Mind*, N.Y. Rev. Books (April 20, 2017), at 62-65, http://www.nybooks.com/articles/2017/04/20/kahneman-tversky-invisible-mind-manipulators/ (discussing later developments and critiquing practical implication of Kahneman & Tversky's work).

63 Jeffrey J. Rachlinski, *The Psychology of Global Climate Change*, 2000 U. Ill. L. Rev. 299 (2000); Barton H. Thompson, *Tragically Difficult: The Obstacles to Governing the Commons*, 30 Envtl. L. 241 (2000) (discussing climate change and several other large-scale commons issues).

64 Thompson, *supra* note 63, at 256-58 (discussing loss aversion, uncertainty).

psychological propensity to seek out information that confirms what one already believes.[65] Experimental studies in cognitive psychology have also found that people are likely to regard those solutions as "fair" that most benefit themselves, a phenomenon that can paralyze progress toward solutions to common pool problems.[66] Certainly such distributional disagreements also paralyze those who confront middle-sized commons like grazing fields or community forests, or even two-player PD situations; but the heterogeneity and size of climate change multiplies these distributional disagreements exponentially.

In spite of widespread information about climate change, however, I would argue that in these cognitive psychological analyses, the basic topic of interest is a kind of *ignorance*. People are thinking too fast and in some intuitive but ultimately treacherous way, and this leads them to fail to grasp the significance of climate change or to take actions that might alleviate it. That central topic distinguishes the cognitive psychological approach from a second kind of psychological study, which focuses on a subtly different topic: not so much ignorance as *indifference*. Commentators in this approach link climate change skepticism to a psychological theory currently known as "cultural cognition," deriving especially from the work of Yale Law professor Dan Kahan.[67]

Kahan argues that people tend to adopt the beliefs and attitudes of reference groups with which they identify, and indeed, they can become practically immovable on topics that take on a group or "cultural" valence. Unfortunately, climate change is one of those topics. Kahan is quite critical of liberal activists who treat with contempt the people attached to reference groups whose commitments fix on guns, religion, family hierarchy — and rejection of the reality or significance of climate change. Kahan thinks that one can only expect to move these persons by working with the beliefs and preferences that they themselves think important. Fleshing out Kahan's views with respect to cultural cognition and climate change, authors like Robert Verchick, Hari Osofsky and Jaqueline Peel have explored the possibilities for wooing climate change skeptics to soften their stances, stressing less confrontational measures such

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65 Rachlinski, *supra* note 63, at 304-05; Thompson, *supra* note 63, at 272.

66 Thompson, *supra* note 63, at 260. *See also* Gary D. Libecap, Contracting for Property Rights (1989) (early statement of a long-standing argument that distributional issues take a central role in solutions to common pool problems).

67 Dan M. Kahan, *Foreword: Neutral Principles, Motivated Cognition, and Some Problems for Constitutional Law*, 125 Harv. L. Rev. 1 (2011); Dan M. Kahan & Donald Braman, *Cultural Cognition and Public Policy*, 24 Yale L. & Pol'y Rev. 149 (2006).

as adaptation to altered weather patterns, instead of harping on mitigation of greenhouse gases.[68]

Interestingly enough, the two major legal academic proponents of cognitive psychology and cultural cognition, respectively, are Harvard's Cass Sunstein and Yale's Dan Kahan, and on the pages of the Harvard Law Review they have engaged in an intellectual battle as to which has more salience for legal ordering.[69] As mentioned above, my own view is that each author is addressing a somewhat different aspect of these issues, with Sunstein focusing on the reasons for ignorance and Kahan on the reasons for indifference.

Without taking sides between these authors, however, my own view is that these cognitive aspects of commons problems can also be understood at a more basic level, that is, in considering their sources in the character of collective action. A common pool resource is one with no owner, and that fact is the root of a great many of the cognitive stances of persons who participate either in their exploitation or in their management. While there are many functions served by property, one of the most important is to encourage investment and effort on the part of the owner. The reason is that the owner of property can take the gains of her own efforts, just as she will feel the sting of loss if she neglects the property. But if no one owns a given resource, no one takes a payoff from investing in it; indeed, one's investment would just go to others without conserving the resource. But by the same token, if there is no payoff from investment, there is no payoff from *learning* much about the resource either. Indeed, learning itself is a form of investment. Sheer curiosity will undoubtedly lead to some learning, but it is uncertain, late, and paltry by comparison to the investment in learning about resources from which there is some payoff. Consider the automobile pollution described in Krier and Ursin's classic study of California's pollution control legislation: much effort and expense went to learning how to build faster, more efficient and more convenient automobiles, but no one invested much in finding out about their relation to smog until Los Angeles reached a crisis — and even then Los Angelenos initially blamed smog on the wrong source.

Thus the cognitive stance of *ignorance* is rooted in collective action itself. The larger the common pool resource and the larger the collective action

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68 Hari M. Osofsky & Jacqueline Peel, *Energy Partisanship*, 65 Emory L. J. 695, 715-16, 751-58 (2016); Robert R. M. Verchick, *Culture, Cognition and Climate*, 2016 U. Ill. L. Rev. 969, 1007-10 (2016).

69 Dan M. Kahan et al., *Fear of Democracy: A Cultural Evaluation of Sunstein on Risk*, 119 Harv. L. Rev. 1071 (2006) (review of Cass R. Sunstein, Laws of Fear: Beyond the Precautionary Principle (2005)); Cass R. Sunstein, *Misfearing: A Reply*, 119 Harv. L. Rev. 1110 (2006).

needed to address it, the less likely it is that anyone will invest in investigating it because the payoff for learning is so diminished. Hence we are so often surprised by large-scale commons problems, and hence ignorance is such an ordinary feature of large-scale commons issues. Climate change at least in recent years has indeed garnered considerable investigation, and in that sense it differs, at least now, from many other large-scale common pool resources. But one striking factor about climate change investigations is their lateness. The loading of greenhouse gases into the atmosphere is generally thought to have accompanied the industrial revolution — that is to say, beginning in the eighteenth century, and literally gathering steam in the later nineteenth century. But no one owns the atmosphere, and no one owns the now-carbon-acidified oceans. And so, no one paid much attention until the 1970s, and information about climate change has only spread in subsequent decades. If there is widespread knowledge now, it is only because we appear to be approaching a crisis, though there is even argument about that.

The other salient cognitive attitude to climate change is *indifference*, but indifference too has roots in collective action. Larger collective action problems, among heterogeneous groups, are extremely difficult to solve because of the difficulties of finding common grounds among the participants. Smaller and more homogenous groups, sharing an intense interest in the preservation of a particular resource, may indeed be able to find such common grounds, and they may be able to establish the core design principles that Ostrom's work outlined. But the design principles do not seem to scale up easily, and if they do not scale up to a given large-scale common pool problem, that problem will appear to be insoluble. And that perception leads to indifference. Once an issue is considered insoluble, there is not much point in thinking about it any longer or even to define it as a problem — except possibly to consider ways to adapt.

Because they can be more localized or even individualized, adaptation measures do seem more tractable, even to the most recalcitrant of climate change skeptics. Once again, consider the difference between climate change and ordinary property arrangements: the atmosphere is huge and unowned, and getting agreement on controlling greenhouse gases is impossibly daunting. But my house near the water? Well, I own that, and I care about it, and I can do something about putting it on stilts without having to deal with a lot of other people. It remains to be seen whether confidence in smaller-scale climate precautions on the adaptation front can create confidence about dealing with the much larger issues of mitigation — or whether instead, adaptation will make mitigation seem less pressing once the adapting locality feels relatively safe.

Conclusion

When Hardin described the tragedy of the commons, his leading example was that of the herder, who makes a rational calculation about the prospects for grazing his cattle on an open access field. Aside from that, the basic cognitive stance of Hardin's herder is incurious and affectless indifference, both to other herders and to the fate of the grazing field. Hardin then went on to imply that the same coolly calculating mentality applied to the other instances of commons-es that he named. But on closer analysis, participants in commons situations show quite different cognitive characteristics, depending in large measure on the size of the commons or collective action problem involved.

For the smallest of these collective action problems, the PD, the participants know about the looming problem and care about it, but they are paralyzed by distrust of the counterpart payer — at least if they view the counterpart as making the same rational calculation that they themselves make. Experience, of course, teaches us that in fact, participants often do solve PD problems. One reason is that the game may be altered; if contract law or other third-party influences change the payoff structure to punish defection and favor cooperation, then the rational calculation about the payoff matrix also changes. A more interesting reason for PD solutions is that the PD players themselves may not play in what is supposed to be a rational manner: they may take a chance on a cooperative first move; or they may attribute "nice" irrationality to their counterparts and respond in kind; or they might care about social esteem — one of the factors that permits third-party influences to change the payoff structure of the game.

The middle-sized commons situation is in a way the most interesting. Here experience shows that the participants may be able to self-organize and manage the commons problem without anything like an external contract law. Like the PD players, the participants know and care about the resource in question and devise ways to cooperate in spite of rational calculation. Moreover, perhaps even more than the PD players, they do not entirely trust one another, and much of their organizational effort aims at cabining distrust, through various methods of observation, commitment, and internal dispute resolution rules. These methods are not perfect. The middle-sized commons community may insufficiently restrain shirking or overuse of the common resource. Moreover, it may be hostile to outsiders and inegalitarian with respect to insiders; the community's devices for social control may stifle innovation; and ultimately the middle-sized commons governance may only weakly resist larger commercial pressures. Moreover, it is not at all clear that control measures in the middle-sized commons can scale up to manage larger common pool resource issues. But oddly enough, it seems that Hardin's

example of the herder was quite misleading; participants in middle-sized commons like the herder's field in fact have had consistent track records of success, sometimes for very long periods.

In the very large commons, the most distinctive cognitive stance of the players is quite different. It is most likely to be ignorance — that is, not recognizing that there is a commons problem at all, at least until it reaches some level of drama or crisis. Thereafter distrust may follow, when numerous and heterogeneous players realize that their own efforts may just make them suckers. The phenomenon of "leakage" in climate change efforts is a case in point, where Country A's efforts to control greenhouse gases merely move industry to Countries B through Z — causing Country A to reconsider and drop its efforts. And indifference may follow too — not as an initial stance, as in Hardin's description of the rationally calculating herder, but rather as a secondary effect of the seeming insolubility of the giant commons problem itself. Indeed, while Hardin ascribed indifference to the middle-level commons herder, this mental state would seem to characterize some of his other examples much better, especially pollution and no doubt Hardin's main target, overpopulation, supposing that one can describe population as a direct resource problem at all.[70]

Ostrom's self-organizing design principles are of limited use in the giant commons. An alternative is enforcement of rules through a third party, particularly state institutions. Here again, Hardin's call for coercion, mutually agreed upon, applies to the very large commons much more than those at smaller levels. But then, as Krier points out, the creation of a third-party enforcer just entails another collective action problem.

Once again, experience shows that even these very large commons problems do get solved at least some of the time, at least up to the level of the nation-state and several multistate coalitions, although the number of failed or failing states around the globe should be an antidote to complacency. What helps at this very large scale? More specifically, might there be cognitive elements that help, even marginally?

One such cognitive element is suggested in John Jay's Second Federalist Paper in the late eighteenth century debates over ratification of the United States Constitution. Jay enumerated some of the background factors that would enable the people of the various states to form an effective national government; after mentioning the fertility and favorable geography of the

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70 Controlling population apparently acts as a proxy for controlling common pool resources that are stressed as the numbers of users grow. But direct controls on resource use — e.g., appropriate pricing — should eliminate concerns about excess resource use due to population.

country, he spoke of the people's common ancestry, language, and religion, along with a commitment to republican government and the experience of a successful prior common effort in the break from England.[71] Jay was effectively pointing to the tendency to have greater trust and interest in persons whom one sees as being like oneself, and with commitments like one's own.

Apparent likeness can be a slippery ground for trust, of course. In the intelligence world, one need only consider the spies who held the trust of their colleagues because they had gone to all the right schools and belonged to all the right clubs.[72] More importantly, the salient categories — what counts as "like" and "unlike" — are crucial and can serve not just to unite but to divide, sometimes tragically.[73] Jay's enumeration of common characteristics now seems quite far removed from the great diversity of citizens of the modern-day United States. But Jay's example does suggest that a cognitive basis for giant commons solutions may lie in efforts to divert attention from unlikenesses and to concentrate on likenesses — particularly likenesses of interests and commitments, even more or less fictional ones, as more recently in Americans' supposed common pursuit of the American Dream. Other nations too have their unifying mental images of likenesses, whether fictitious or not.

To be sure, we live in an age in which many forms of large-scale commons management seem rickety or nonexistent, not only in newly-forming or newly-collapsing states, but also in international alliances and of course in the efforts to deal with climate change. On the other hand, and quite aside from uncertain national and international initiatives, in the climate change arena, non-state and semi-state actors' burgeoning references to a common humanity and commitments to greenhouse gas reduction suggest at least some version of Jay's stress on likeness.[74] In this as in many other matters of global collective action, it remains to be seen whether directing our attention to likenesses and to like commitments can help to overcome the vast countervailing arrays of heterogeneous interests — and the ignorance, distrust and disinterest that so often dog the largest commons Tragedies.

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71 The Federalist No. 2 (John Jay).

72 Carol M. Rose, *Trust in the Mirror of Betrayal*, 75 Bos. U. L. Rev. 531, 550-52 (1995).

73 Even the most trivial distinctions can form the basis for intergroup discrimination. *See* Michel Diehl, *The Minimal Group Paradigm: Theoretical Explanations and Empirical Findings*, 1 Eur. Rev. Social Psychol. 263 (1990).

74 *See* Michael Vandenbergh & Jonathan A. Gilligan, *Beyond Gridlock*, 40 Colum. J. Envtl. L. 217 (2015).