

Meeting the Grand Challenges of Planetary Governance: Is it Time for a Paradigm Shift?

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Abstract. The 21st century has given rise to a growing class of challenges that are difficult – perhaps impossible – to address effectively within framework of the existing global order. While numerous factors play a role in causing this problem, this essay focuses on difficulties arising from the influence of the paradigm of “relative gains maximization” as a determinant of the course of interactions among actors on a global scale. Following an account of the nature and impact of this paradigm, the essay explores prospects both, for reforming the paradigm to ameliorate its effects and for more transformative changes featuring the development of a new paradigm. The way forward is to develop perspectives that highlight the need for cooperative measures to address common concerns arising in a world of complex systems.

Keywords: complex system, paradigm, reform, transformation

1. Introduction

The 21st century has given rise to a growing class of challenges that are difficult – perhaps impossible – to address effectively within the framework of existing global order. While these challenges differ in many respects, they share several key features that are critical from the perspective of launching efforts to create the governance system needed to address them successfully. Consider cases like the control of climate change, the avoidance of pandemics, and the management of transformative technologies such as artificial intelligence as prominent members of this class. All these issues are global in scope. Piecemeal efforts to respond to them in a place-based fashion will not produce effective solutions; individual States cannot hope to isolate themselves effectively from the systemic consequences of these issues. They all call for responses that are non-linear in nature; incremental or gradual step-by-step responses of the sort we habitually adopt in dealing with other needs for governance will not suffice. Above all, a necessary condition for addressing all these challenges effectively is the achievement and maintenance of a high level of cooperation among both States and non-state actors. This applies not only to the stage of reaching agreement on terms of relevant governance systems, but also – and crucially – to the stage of implementing the terms of these agreements in a prompt and responsible manner. Taken together, I call issues exhibiting these critical features the 21st century’s grand challenges of planetary governance.¹

Why is it so difficult to address issues of this sort? There is no simple answer to this question; many interacting factors play a causal role in accounting for the difficulty. But in this essay, I explore the proposition that one significant component of the problem lies in what I call the “relative gains paradigm,” a perspective or mindset

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1 Oran R. Young (2021), *Grand Challenges of Planetary Governance: Global Order in Turbulent Times*, Cheltenham, UK: Edward Elgar.

that dominates much thinking about interactions among States and other actors on a global scale. In essence, we typically adopt the perspective of the individual actor and focus on the development of strategies and tactics designed to maximize relative gains accruing to that actor. We place a premium not only on winning, but also on maximizing returns to the individual actor. To use a metaphor from sports, each actor wants to become the dominant player in its own league. The greater the disparity between an actor's record and the record of its nearest rival, the better. Collaboration with others may be helpful under some conditions, but only insofar as it contributes to the maximization of relative gains for the individual actor. The policy narrative that arises from this mindset highlights competition in contrast to cooperation. We are leery about entering into agreements that call for cooperative efforts and assume that other participants will be likely to violate or repudiate their commitments under the terms of these agreements whenever they conclude that there are short-term gains to be had from doing so. This applies even in cases where a failure to cooperate is likely to lead to mutual losses over the course of time.²

Under these circumstances, the obstacles to dealing with challenges like the control of climate change, the avoidance of pandemics, and the management of transformative technologies are severe. Success is unlikely in the absence of substantial adjustments in this prevailing paradigm. The good news is that such paradigms are social constructs. They are not based on laws of nature that we cannot alter regardless of their consequences. Yet, it is often difficult to bring about real adjustments in prevailing paradigms. The grip of entrenched mindsets can impel individual actors to take actions that prove destructive to the social order they inhabit, causing harm to themselves as well as others. They can drive actors to persist in established courses of action, even when it becomes apparent that doing so will result in destructive consequences for all parties concerned. Fears of being seen as weak and subject to exploitation by others often impel actors to persist in such courses of action regardless of the costs.

In the body of this essay, I tackle this subject in several steps. The next section explores the impact of the relative gains paradigm with particular reference to the ways in which it influences behavior within the current global order, emphasizing features of the paradigm that inhibit efforts to address the grand challenges of planetary governance. The following sections consider prospects for adjusting or replacing this mindset first from what I call a reformist perspective and then from a transformationist perspective. The concluding section reflects briefly on practical implications of this analysis for those seeking to make progress in creating governance system to address 21st century challenges.

2. The Impact of the Relative Gains Paradigm

Social interactions ranging from interpersonal relations to international relations generally feature elements of both conflict and cooperation. They are, as Thomas Schelling often emphasized, competitive-cooperative or mixed-motive interactions.³ To understand the implications of this observation, it is essential to think of a spectrum running from pure conflict at one extreme to pure cooperation at the other. Pure conflict occurs when any gain for one party results in an equivalent loss for the other party or parties. This is what game theorists, focusing initially on two-party interactions, characterize as zero-sum conflict.⁴ More concretely and as exemplified by games like chess or social practices like winner-take-all elections, a win for one side in such situations amounts to a loss for the other. This is world of winners and losers, a setting that offers no possibility of intermediate outcomes. Conversely, pure cooperation occurs when any gain by one party results in equivalent gains accruing to the other party or parties. Members of task teams who share equally in the fruits of their collective efforts exemplify this case, though even here there may be differences regarding the contributions individual members make to the achievement of their collective success. In principle, however, this is a world in which cooperation can produce outcomes in which all are winners.

A little reflection will suffice to make it clear that most real-world interactions fall somewhere along the spectrum between these extreme types; they feature some combination of conflict and cooperation. Participants

2 Brian Skyrms (2004), *The Stag Hunt and the Evolution of Social Structure*, Cambridge, UK: Cambridge University Press.

3 Thomas C. Schelling (1960), *The Strategy of Conflict*. Cambridge, MA: Harvard University Press.

4 R. Duncan Luce and Howard Raiffa (1957), *Games and Decisions*. New York, NY: John Wiley and Sons.

experience, at one and the same time, a desire to maximize payoffs to themselves and an awareness that there are gains to be had from cooperating with others. In many cases, some measure of cooperation is required to create the conditions needed to allow for competition aimed at maximizing relative gains. As an example, consider the situation of corporations competing with one another to maximize market share, while joining forces to ensure that institutional arrangements pertaining to matters of property rights, contracts, and dispute settlement needed to allow the market to operate in an orderly manner are in good order. Similarly, at the international level, actors are often willing to join forces to ensure that the provisions of trade regimes are in good order, even as they compete with one another to take advantage of opportunities to promote their own interests within the institutional frameworks provided by these regimes. Interestingly, those whose thinking is dominated by the influence of relative gains paradigm often dismiss or lose track of the observation that they would be unable to pursue their individual goals in the absence of well-defined rules of the game generally accepted by all participants. It makes no sense to think about “playing” chess, for example, in the absence of an agreement on the part of the players to accept the rules of this game.

Pure conflict and pure cooperation are extreme types that are easy to understand in conceptual terms, even though real-world situations seldom approach these extremes. This may account for the preoccupation with zero-sum interactions in game theory and for the tendency of many actors to approach real-world situations as though the only outcomes are winning and losing. The problem arises when we turn to the spectrum of mixed-motive interactions between these extremes and seek to determine where specific situations fall along this spectrum. In most real-world situations, there is no simple and operational metric for determining where to place specific issues along the spectrum. Much depends on the influence of paradigms or mindsets that shape the thinking of both the parties to these interactions and outside observers. In general, those who see the world through the lens of the relative gains paradigm will have a propensity to locate issues closer to the pole of extreme conflict, to focus on the development of strategies for engaging with others designed to enhance their own interests and, above all, to avoid being taken advantage of by others whose actions they assume also will reflect the influence of the relative gains paradigm.

Thinking of this sort is what underlies the paradox associated with the classic game-theoretic situation known as prisoner’s dilemma (PD).⁵ In this situation, there are mutual and sometimes substantial gains to be derived from cooperative behavior. Yet, if either player defects, the defector will achieve unilateral gains, while the victim is left to bear the costs of their interaction. The attractions associated with the desire for unilateral gains coupled with the fear of becoming a sucker produce a situation in which both players are motivated to choose “dominant” strategies, a pattern of behavior that leaves them both worse off than they would be if they chose to cooperate. As a result, the influence of the relative gains paradigm produces situations in which actors are hesitant to acknowledge the significance of incentives to cooperate in their interactions, systematically opting for interpretations of issues that highlight the conflictual elements in ways that make it difficult for them to understand, much less act on, the cooperative elements of important issues.

What makes these observations particularly relevant in thinking about 21st century challenges of planetary governance is that a necessary condition for coming to terms with these challenges is a recognition that it is essential to place them considerably farther toward the cooperative pole of the conflict-cooperation spectrum, a requirement that leaves many actors feeling uncomfortable. While the outcomes will not be uniform for all parties concerned, it makes no sense to think of climate change as an issue that will produce winners and losers. Even those with the resources to protect themselves from the initial impacts of climate change will experience increasingly severe losses as the global impacts of climate change become more and more severe. Similar observations are in order regarding the consequences of the spread of infectious diseases. In today’s interconnected world, the idea that anyone can erect barriers making it possible to immunize themselves effectively from the impact of such diseases is an illusion. And as many thoughtful observers have noted, the dangers associated with completely unregulated development in applications of artificial intelligence are immense.⁶ Without denying the significance of concerns about the stultifying consequences of excessive regulation, everyone is likely to experience the harmful impacts of an artificial intelligence free-for-all in which there are no rules of the game within which healthy competition can proceed.

5 Anatol Rapoport and Albert M. Chammah (1965), *Prisoner’s Dilemma*. Ann Arbor, MI: University of Michigan Press.

6 Mustafa Suleyman (2023), *The Coming Wave: Power and the Twenty-First Century’s Greatest Dilemma*, New York: NY: Crown.

The principal inference to be drawn from these observations is that there is a growing need to reduce the grip of the relative gains paradigm on the thinking of these whose actions will determine the outcomes of efforts to come to terms with what I call the grand challenges of planetary governance. This does not mean that diluting the influence of this paradigm is the only thing that matters or that we should approach this matter in dichotomous terms, arguing that the only solution is to replace this paradigm with some alternative focused on maximizing mutual or collective gains. But a consideration of ways to shift the discourse regarding the paradigms that guide our thinking is one important focus of attention for those concerned about the prospects for planetary governance in the 21st century. In the following sections, I tackle this issue from two distinct perspectives, one featuring what I call reformation and the other centered on transformation. The next section explores ways to adjust the calculus used by those whose thinking is rooted in efforts to maximize payoffs accruing to individual players in human interactions. The following section adopts a more radical perspective, asking whether there are options for replacing the relative gains paradigm with an alternative that may offer a more appropriate guide to thinking about governance in the 21st century.

3. Reformation: Adjusting the Calculus

The idea of maximizing relative gains is easy to understand in simple situations where there is no ambiguity regarding the possible outcomes of interactions and there is a simple quantitative metric for calculating gains or losses. In situations where there is a winner and a loser and it is understood that the winner takes all, for instance, the idea that the participants play to win seems clear. In somewhat more complex cases, where there are multiple players who interact with one another in a round-robin fashion, we commonly think of ranking the performance of players in terms of the concept of standings. In sports like baseball or football, each team competes not only to lead the league but also to maximize its lead over its nearest rival. Yet even in highly stylized situations, playing to maximize relative gains can lead to outcomes that are undesirable for all participants. What makes the game-theoretic situation known as prisoner's dilemma fascinating is that each player has a dominant strategy, but the selection of this strategy by both players produces an outcome that is worse for both of them than a readily available alternative outcome. In situations of this sort, choosing to cooperate can yield mutual gains, whereas competitive behavior produces mutual losses. But choosing to cooperate requires some measure of assurance or trust regarding the willingness of the other party to cooperate.

This intriguing problem has generated a large literature dealing with the question of what can be done to encourage cooperative behavior, even in situations of this sort located toward the conflictual end of the conflict-cooperation spectrum. Notably, players who engage in simulations structured to resemble PD do not always opt for the non-cooperative choice.⁷ Perhaps the most well-known theoretical work in this realm is Robert Axelrod's analysis of the "evolution of cooperation."⁸ He demonstrates that when actors engage in PD played iteratively, the optimal strategy for each player involves conditional cooperation in which each player chooses to cooperate so long as the other player has behaved cooperatively during the previous round.

Turning to situations that are less stylized, what it means to maximize relative gains becomes more and more difficult to determine in a straightforward fashion. This opens up the possibility of adjusting the calculus of relative gains in ways that offer new perspectives on 21st century challenges of planetary governance. For starters, there is no simple, much less quantitative, metric available for assessing outcomes arising from interactions among actors in many real-world situations. As a simplifying device, analysts often approach the assessment of outcomes in monetary terms, assessing outcomes in terms of monetized results, seeking to maximize net gains to themselves, and assuming that money is a reasonable proxy for some broader concept of utility. But, it is apparent that this procedure breaks down when it comes to dealing with issues like the control of climate change or the management of artificial intelligence. Following the dictates of narrow self-interest, oil companies and oil producing states may oppose efforts to take vigorous steps to address the challenge of climate change. But, their calculations are likely to be misguided, once we adopt a broader perspective on the assessment of outcomes. The impacts of climate change, even over a short period of time, may produce severe consequences that are harmful to everyone despite

⁷ Rapoport and Chammah (1965), n.5.

⁸ Robert Axelrod (1984), *The Evolution of Cooperation*, New York, NY: Basic Books.

the difficulty in attaching monetary values to the outcomes. As a result, the absence of a generally accepted metric for evaluating outcomes may lead rational actors to reach differing conclusions regarding what they should do to maximize relative gains in addressing major policy problems.

In many cases, moreover, actors find it difficult to reduce their assessments of the outcomes of interactions to results that can be expressed in terms of a single metric. It is fashionable in some circles, for instance, to argue that corporate leaders should focus exclusively on maximizing monetized returns to their shareholders. No doubt, some leaders do think in these terms. But, as the growing influence of the movement to include considerations pertaining to matters of environmental quality, social impacts, and governance (ESG) makes clear, there are many situations in which those engaged in social interactions assess gains and losses in terms of two or more distinct dimensions that are difficult or impossible to reduce to a single assessment of measurable payoffs. Even shareholders in major corporations often share these concerns. The result is that actors commonly find themselves thinking in terms of tradeoffs in weighing their options in specific situations. Individuals confront tradeoffs between career advancement and lifestyle considerations. Corporate leaders find themselves considering whether the pursuit of environmental or social goals justifies the acceptance of some reduction in net profits. States find it necessary to weigh the relative merits of maximizing the growth of GDP and taking steps to protect the environment and secure public health. In the absence of a common metric, there is no simple way to determine the proper way to treat these tradeoffs in order to arrive at simple conclusions regarding choices likely to maximize relative gains. It is reasonable to expect considerable diversity in the choices that individual actors make, even when confronted with seemingly similar tradeoffs.

An additional complication in efforts to come to terms with choices of this sort centers on the role of time. The normal assumption is that gains (or losses) accruing in the future are worth less than gains (or losses) received today. This gives rise to the idea of discounting future gains and losses. Those who have high discount rates will pay less attention to the future than those who have low discount rates. In the extreme case, a discount rate of zero would lead an actor to devote as much attention to the future consequences of today's choices as to the immediate consequences. It is easy to see how this concern applies to discussions regarding 21st century governance challenges. Those concerned about the long-term consequences of climate change or the devastation associated with future pandemics will argue that we need to adopt a low discount rate in addressing matters of this sort. Those who believe that the future can take care of itself, on the other hand, are likely to prefer a higher discount rate. There is no way to arrive at conclusions regarding the correct discount rate in dealing with various classes of issues. Actors can and do vary considerably in the choice of discount rates; the same actor may use different discount rates in addressing different types of issues. As a result, it is easy to see how efforts to influence the thinking of actors regarding discount rates can have far-reaching consequences regarding behavior, even among those whose actions are influenced by the paradigm of relative gains maximization.

Even greater complications arise when we turn to issues in which outcomes are probabilistic in nature. In cases where there is some basis for calculating objective probabilities (e.g. the probability of drawing a specific card from a normal deck of cards), this factor does not present serious problems for those operating on the basis of the relative gains paradigm and comfortable with the idea of maximizing expected utility. But this is not the case with regard to the class of issues we are concerned with here. What is the probability of the outbreak of new and potentially more severe pandemics under a business as usual scenario regarding the global regime for public health? What is the likelihood that the continuing development of artificial intelligence will lead to destructive consequences in the absence of the creation of an effective regulatory regime dealing with this family of technologies? The best we can do in cases of this sort is to resort to the use of subjective probabilities. And as these examples suggest, different analysts are likely to arrive at profoundly different conclusions in their responses to questions of this sort. While optimists are inclined to believe that technological advances will save us from the worst effects of climate change, for example, pessimists are apt to regard technology as part of the problem rather than as a source of solutions.

Under these conditions, any effort to make use of the relative gains paradigm to choose among available options will be subject to the effects of calculations regarding probabilities that are not only subjective in nature, but also likely to vary widely from one decisionmaker to another. Those who fear the consequences of negative developments in such cases are likely to recommend adopting policies based on the precautionary principle and taking steps to minimize the dangers. But others, who think the risk of pandemics is exaggerated and the benefits of artificial intelligence are great, are likely to oppose the introduction of regulatory measures.

The significance of these concerns is enhanced when we find ourselves operating in a world of complex systems featuring the regular occurrence of non-linear and often abrupt changes, critical transitions, and frequent surprises.⁹ The Earth's climate system is a prominent case in point. We are not able to calculate the probability that activating any of a number of tipping elements will precipitate dramatic disruptions in the climate system in the coming years. But clearly this probability is not zero.¹⁰ How should this realization affect the behavior of participants in the annual Conference of the Parties to the climate regime? It is easy to continue with business as usual, setting aside any serious effort to take into account the dynamics of complex systems. But there is no compelling basis for justifying this approach as a straightforward application of the relative gains paradigm.

So, where does this leave those who are struggling to come to terms with the challenges of planetary governance? Some may argue that we should focus on central concerns, avoid distractions arising from a consideration of tradeoffs, adopt high discount rates regarding future developments, and pay little attention to low probability events, even if their potential impacts could be highly disruptive. But, there is nothing in the relative gains paradigm that requires such choices. That is, there is nothing in this paradigm that dictates the choice of values giving rise to tradeoffs, the proper discount rates to employ, or the right way to think about the dynamics of complex systems. Those who take the view that we should adopt a reformist perspective, may argue that enlightened self-interest requires a consideration of tradeoffs among multiple values; that low discount rates are called for in dealing with matters of planetary governance, and that the dangers of extreme events justify the adoption of a precautionary approach in addressing this class of issues. The result would be a way of thinking about matters of planetary governance that highlights the importance of paying attention to the need for cooperation and precautionary actions rather than focusing on winning or maximizing the position of individual actors in the planetary standings. The prospects for success in efforts to promote such an approach to the problem are difficult to evaluate. But this perspective does have the virtue of avoiding the challenge of mobilizing the resources required to bring about a more radical change in familiar ways of structuring our thinking about engaging in social interactions.

4. Transformation: Replacing the Paradigm

Adjusting the calculus associated with the relative gains paradigm constitutes one approach to alleviating the obstacles arising from the influence of this paradigm encountered by those seeking to come to grips with 21st century challenges of planetary governance. There is every reason to pursue this approach vigorously. But at the same time, it makes sense to consider the prospects for introducing an alternative, more radical, alternative featuring the development of a new way of organizing our thinking about ways to address challenges like the control of climate change, the suppression of pandemics, and the regulation of transformative technologies such as artificial intelligence. In this section, I consider this prospect, focusing on a way of thinking about such issues arising from the observation that all these issues feature a need to survive and thrive in a world of complex systems.

As Thomas Kuhn makes clear in his classic study of scientific revolutions, existing paradigms do give way when unexplained anomalies pile up and alternative perspectives are able to produce better explanations or predictions regarding matters of common concern.¹¹ But as his analysis also makes clear, the process of replacing an entrenched paradigm can be arduous and protracted, especially when powerful interests are tied to the continuing influence of an entrenched mindset. Consider prominent examples like the theory of evolution, which was anathema to powerful religious leaders committed to the proposition that God created the world at a fixed point in time, or the precepts of modern welfare economics, which run counter to the views of powerful people committed to the proposition that the invisible hand will ensure that the operation of unregulated markets will produce results that are desirable from the perspective of all members of society, including those who occupy the lower social strata.

9 Marten Scheffer (2009), *Critical Transitions in Nature and Society*, Princeton, NJ: Princeton University Press.

10 Timothy Lenton et al. (2023), *The Global Tipping Elements Report*, Exeter, UK: University of Exeter.

11 Thomas S. Kuhn (1962), *The Structure of Scientific Revolutions*, Chicago, IL: University of Chicago Press.

Yet these examples also demonstrate that there are cases in which previously dominant paradigms have fallen by the wayside or been forced to accept major adjustments to accommodate the power of competing ideas. Darwinian thinking about evolution did eventually triumph in mainstream thinking, despite the fact that ideas regarding the omnipotence of God remain influential in some quarters. The idea that the State can and should play a significant role in regulating the operation of markets is now widely accepted. Even thinkers such as Hayek who are generally regarded as libertarians have acknowledged the importance of the regulatory role of the State, though they may not subscribe to the more expansive arguments that progressives espouse regarding the role of the State in promoting social welfare.¹² What drives these transitions? In my judgment, such transitions generally involve a combination of the development of compelling new ideas and the force of real-world events. To illustrate this proposition with particular relevance to the domain of planetary governance, consider the rise of the idea of collective security during the 20th century and of the idea of the Anthropocene during the last several decades.

The idea of collective security achieved prominence in the wake of World War I and World War II, events that were so profoundly destructive that they discredited the paradigm based on the idea of the balance of power which had dominated the diplomacy of the 19th century. By the close of World War II, there was agreement on the proposition that it was imperative to relaunch global governance on some new basis. In the meantime, analysts were developing various strands of thinking that coalesced into the theory of collective security, a perspective highlighting the proposition that it would be essential for all to join forces to suppress acts of aggression and threats to the peace as a precondition for engaging in competitive-cooperative interactions in other issue areas.¹³ Concretely, this paradigm is embedded in the Charter of the United Nations and most explicitly in the provisions of Chapter 7 on threats to the peace, breaches of the peace, and acts of aggression. Nothing in this formulation precludes vigorous competition between and among members of the United Nations regarding a wide range of issues. The point is that a precondition for such interactions must be a mutual commitment to renouncing military action as a means of seeking to maximize payoffs to individual participants or groups of participants.

More recently, we have entered an era in which human actions are producing profound impacts on the Earth's biophysical systems on a planetary scale.¹⁴ While human actions, especially since the onset of the agricultural revolution, have long played an important role in the dynamics of biophysical systems, what has become apparent recently is that human actions are now significant drivers of change on a planetary scale. Nowhere is this more apparent than in the realm of climate change, where 2023 was the hottest year on record; temperatures at the Earth's surface are already $\sim 1.2^{\circ}\text{C}$ above pre-industrial levels, and the current trajectory is toward a continued rise in temperatures on a global scale. Accompanying these biophysical developments is the rise of the idea of the Anthropocene, a perspective suggesting that we now live on a human-dominated planet and that cooperation on a global scale will be required to ensure that the Earth's climate system remains in a state that is conducive to human well-being.¹⁵ Clearly, a new paradigm based on the idea of the Anthropocene has not replaced its predecessor. It does not take an in-depth analysis of the struggle to achieve significant progress in the negotiations taking place within the Conference of the Parties to the UN Framework Convention on Climate Change to recognize the continuing grip of the relative gains paradigm. Nevertheless, there are clear signs of a paradigmatic shift occurring in this realm. The onset of dramatic impacts of climate change, already manifesting prominently in the Polar Regions, may provide the impetus needed to drive the emergence of a serious interest in fleshing out the content of an alternative to the relative gains paradigm.¹⁶

How should we think about the foundational elements of a paradigm that could provide a suitable basis for thinking about the 21st century challenges of planetary governance? In my judgment, a suitable response to this question lies in a focus on complex systems featuring concepts emphasizing the role of telecoupling, the prominence of non-linear change, the occurrence of critical transitions, and the importance of emergent

12 Angus Deaton (2023), *Economics in America: An Immigrant Economist Explores the Land of Inequality*, Princeton, NJ: Princeton University Press.

13 Inis L. Claude (1962), *Power and International Relations*, New York, NY: Random House.

14 Will Steffen et al. (2004), *Global Change and the Earth System: A Planet under Pressure*, Heidelberg, Germany: Springer Verlag.

15 Will Steffen et al. (2011), "The Anthropocene: Conceptual and Historical Perspectives," *Philosophical Transactions of the Royal Society*, 369: 842-867.

16 Johan Rockström et al. (2024), "The Planetary Commons: A New Paradigm for Safeguarding Earth-Regulating Systems in the Anthropocene," *Proceedings of the National Academy of Sciences USA*, 121(5): 1-10.

properties.¹⁷ This perspective calls for major adjustments in prevailing mindsets. Individual actors cannot hope to shield themselves from the impacts of events occurring in other parts of the Earth system. The assumption that we can count on changes to occur gradually so that there is no reason to act promptly to address their challenges is not a suitable approach to policymaking. Dramatic changes will occur from time-to-time, even though more gradual developments are the norm on a day-to-day basis. Relatively small differences in initial conditions can lead to radical differences in outcomes over fairly short periods of time. As a result, surprises will occur on a regular basis, and there is a need to avoid entrenched practices that make it difficult to respond agilely to rapid and often unforeseen developments. Consider examples like the challenges associated with the rapid spread of Covid-19 during the early months of 2020 or with the surprising public release of ‘ChatGPT’ at the end of 2022 as cases in point.

The implications of this perspective for policymaking remain to be explored in detail. But some insights are readily apparent. Above all, it does not make sense to focus exclusively on efforts to maximize relative gains on the assumption that the systemic setting in which such interactions occur will remain unchanged. It makes little sense for individual actors to think only in terms of immediate self-interest in a setting in which cooperative efforts to respond to growing challenges on a planetary scale are increasingly essential. In addition, it is essential to recognize the importance of developing improved approaches to decision making under uncertainty. In the world of complex systems, it is an illusion to suppose that we can exercise effective control over the course of events by introducing more and more powerful technologies. As the case of artificial intelligence makes clear, technological developments may become part of the problem rather than a source of solutions. In settings of this sort, it is important to respond to challenges promptly, but to do so in such a way as to monitor the results closely and to be ready shift to alternative responses nimbly when it becomes clear that initial responses are not proving effective.

5. Implications for Planetary Governance

The relationship between paradigms and governance systems is complex. Not all paradigms are reflected in the provisions of agreements setting up governance systems to address specific issues. Not all governance systems are founded on coherent paradigms, especially under conditions in which the provisions of key agreements are hammered out through processes of bargaining among actors whose behavior reflects divergent interests. Yet the effectiveness of governance systems is often linked to the presence of a widely accepted paradigm. It is no accident that the international trade regime worked well in the postwar era when all parties concerned accepted the propositions of neoclassical economics regarding the mutual benefits to be derived from adherence to the principles of free trade. The deterioration of this regime over the last several decades has much to do with the erosion of the prior consensus regarding these propositions. Chapter 7 of the UN Charter reflects the proposition that there is a need to substitute the paradigm of collective security for the preexisting precepts of balance of power politics. The failure of this innovative initiative to take root as an effective system of governance is closely tied to the outbreak of the cold war during the years following the end of World War II followed by the reemergence of balance of power politics in recent decades.¹⁸

In thinking about issues like the control of climate change, the avoidance of pandemics, and the management of artificial intelligence, then, it makes sense to ask whether we can formulate and introduce effectively sets of propositions that motivate actors to pay increased attention to requirements for cooperation, even though though there is no reason to expect them to disavow the pursuit of their own individual goals on a more limited basis. As we know, markets cannot work properly without widespread agreement on institutional arrangements pertaining to matters of property rights, contracts, and dispute settlement. Today, even conservative thinkers accept the need for intervention on the part of the state to moderate the disruptive effects of business cycles and to ensure sufficient attention to the well-being of all citizens to prevent revolutionary behavior on the part of those who are disadvantaged or disenfranchised. The question is whether we can achieve a similar level of awareness of

17 Oran R. Young (2017), *Governing Complex Systems: Social Capital for the Anthropocene*, Cambridge, MA: MIT Press.

18 Henry Kissinger (1995), *Diplomacy*, New York, NY: Simon and Schuster.

the need for cooperation when it comes to dealing with 21st century challenges relating to matters like climate change, pandemics, and artificial intelligence.

One way forward is to treat the Earth System as the appropriate focus of attention and to apply our knowledge of the behavior of complex systems as a basis for organizing thinking about matters of planetary governance. For starters, this means recognizing the central importance of telecoupling. Greenhouse gases emitted anywhere contribute to the increases in the concentration of these gases in the Earth's atmosphere that are the principal driver of climate change. There is no prospect of restricting the diffusion of advances in key technologies like artificial intelligence in spatial terms. Added to this is the prospect that the dynamics of important Earth system processes are non-linear or, in any case, likely to trigger non-linear developments from time to time. Though our technological prowess may lead us to overlook such developments, there is nothing new about the role of non-linear processes affecting human well-being in significant ways. What is new is the occurrence of such processes on a systemic or planetary scale.

A prominent corollary of these features of the Earth System centers of the frequent occurrence of major surprises. Another way of putting this is to observe that we live in a world of uncertainty when it comes to efforts to anticipate consequences of the actions we take with regard to matters of critical importance. What this means is that we need to set aside illusions about our ability to dispel uncertainty arising from the power of advanced technologies in areas like sophisticated observing systems, powerful computing systems, and the remarkable capabilities of artificial intelligence. Under the circumstances, we need to monitor the results flowing from our actions early and often to be prepared to make course corrections or even to switch to alternative courses of action in addressing major issues when early feedback makes it apparent that our initial choices are based on erroneous expectations about the complex behavior of the Earth system. The force of this observation is especially strong in cases where the power of path dependence is likely to lock us into irreversible pathways of change at a relatively early stage in causal chains.

6. Conclusion

There is nothing in this way of thinking about 21st century challenges of planetary governance that rules out healthy competition among actors whose interests diverge to a considerable degree. Competition among those seeking to produce and install various forms of renewable energy, for example, may be a good thing from the perspective of efforts to come to terms with the planetary climate emergency. Similarly, so long as actors are prepared to agree to reasonable rules of the game designed to minimize the dangers inherent in the development and deployment of artificial intelligence, competition in this realm may lead to advances that can contribute to human well-being on a planetary scale. In short, there is no need to strive to achieve a conflict-free or purely cooperative world. There is much to be said for the benefits that can flow from controlled competition. What is needed is cooperation with regard to the development and implementation of governance systems that allow us to avoid highly disruptive changes in the Earth's climate system, prevent the spread of deadly infectious diseases, and circumvent the collective dangers associated with advanced technologies like artificial intelligence.