

Grand Challenges of Planetary Governance

*To the generations of students who have shared my intellectual
journey*

Grand Challenges of Planetary Governance

Global Order in Turbulent Times

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Preface

The coronavirus pandemic is responsible quite literally for the preparation of this volume of reflections on the grand challenges of planetary governance in the 21st century and the future of the global order. For years, I have traveled the world delivering lectures, participating in conferences, working with colleagues on articles and books, collaborating in brainstorming exercises concerning the shape of new projects, and engaging in the development of international science programs. The onset of Covid-19 brought all that to an abrupt halt. I continue to engage with colleagues in various parts of the world on a range of activities via Zoom and other virtual platforms. But a year into living with the pandemic, I remain grounded. I have not traveled professionally since the imposition of restrictions in response to the virus in the United States during March 2020. That has left me with a substantial block of time that would normally be consumed by traveling to distant locations and living in hotels. Without making a conscious decision about the use of this time, I found myself during the time of Covid-19 motivated to pull together my thoughts on a range of issues pertaining to governance on a planetary scale and to articulate them in a series of papers. Somewhere along the line, it became apparent that the central thread running through the resultant essays is a concern for the future of the global order during a period that may well emerge in retrospect as a time of critical institutional transitions on a planetary scale. With a little effort, I realized, it would be possible to connect these reflections and assemble them into an integrated set of observations about the roles that social institutions play and more specifically about the institutional underpinnings of the global order representing my mature thinking about this subject. The product of this effort is the book you have before you.

Embedded in the central thread is a concern for the nature of change in complex systems. We tend to assume that the existence of international society understood as a society of sovereign states is a fact of life and that we are destined to operate within the confines of this system for the indefinite future. As a result, most discussions of world order focus on detailed analyses of the rise and fall of major powers and the complexities of varieties of unipolar, bipolar, and multipolar systems that may emerge from the interactions of leading actors. Are we approaching the end of the American world order? If so, what is the shape of the world order that will replace it? Are the United States and China destined to fall into what prominent analysts call the Thucydides trap?

Whatever the merits of this line of thinking, I start from the proposition that international society is a complex system subject to nonlinear and sometimes sudden changes that may trigger critical transitions or bifurcations as opposed to oscillations. Of course, even when we know that such occurrences are possible, we are regularly taken by surprise when they occur in specific instances. In the case of the Earth's climate system, for example, we now expend much effort on thinking about tipping elements, thresholds, and triggers that may activate critical transitions. But this does not mean that we are able to predict whether or when a bifurcation will occur, much less what form a successor climate system will take following a critical transition.

Nevertheless, this does not preclude a disciplined effort to make use of this perspective to guide thinking about changes in the character of the global order and what they will mean for efforts to address specific needs for governance. I approach this topic from the perspective of thinking about the role of social institutions in meeting needs for governance on a planetary scale. It is safe to assume, I think, that we will not witness the emergence of anything resembling a world government in the ordinary sense of the term in the coming decades. At the same time, I believe it is perfectly possible that we will see major changes in the constitutive features of international society treated as a society of states. The challenge, under these conditions, is to envision alternative forms of order and to engage in innovative thinking about creating effective institutions to address major needs for governance and to avoid dysfunctional social traps in a setting in which biophysical and socioeconomic turbulence makes decision-making under uncertainty unavoidable. A requirement for success in this endeavor is an ability to create institutions that can adapt easily to changing conditions, while not losing their capacity to guide the actions of key actors effectively on a day-to-day basis. As our experience in seeking to come to terms with the problem of climate change suggests, this is likely to mean moving away from the traditional emphasis in the field of international relations on the central role of rules-based systems articulated in the provisions of international legally binding instruments. But crafting effective institutions will require a better understanding of alternatives to the conventional regulatory model of governance and a willingness to experiment with different sorts of arrangements to deal with a variety of specific needs for governance. A realistic goal in this setting, in my view, is to develop a well-stocked toolkit that includes a range of mechanisms for addressing needs for governance and to cultivate improved diagnostic skills making it possible to improve the fit between the critical features of specific problems and the key attributes of the governance systems we devise to address them.

Those seeking answers to specific questions, like how to strengthen the climate regime or what to do about misuses of cyber age technologies, may find the ideas I set forth in this book disappointing. It is not my intention

to offer concrete prescriptions regarding ways to address specific needs for governance. My goal is to build intellectual capital and to provide new lenses through which to look at problems of governance arising on a planetary scale. I seek to encourage readers to ask new questions about problems of this sort, to embrace fresh ways to think about them, and to consider a wider range of responses rather than to present detailed prescriptions for addressing current problems. If the result is to enrich thinking about the 21st century's grand challenges of governance and to broaden the range of options considered in responding to them, I will regard my effort as a success.

The restrictions imposed by Covid-19 have made the preparation of this book an unusually solitary task. But what I have to say reflects decades of thinking about the roles social institutions play in performing the function of governance in the course of which I have had the good fortune of interacting with a remarkable collection of people. I began thinking about these matters already as a doctoral student at Yale University in the early 1960s, where I learned a lot about institutions from my interactions with Robert Dahl and Myres McDougal and about systems from my interactions with Karl Deutsch. Since then I have been especially fortunate to have had the opportunity to refine my thinking about governance through interactions with a large number of talented students, both in the United States and in other parts of the world, the best of whom have become lifelong friends. While I have spent most of my career as a member of the research community, I have learned a lot also from a number of opportunities to apply my ideas to issues arising on policy agendas. Still, the social distancing required during the time of Covid-19 has proven beneficial in some respects. It has provided me with a rare opportunity for sustained reflection that is hard to come by in normal times. The result is a concentrated effort to move beyond immediate concerns and to focus on building the intellectual capital that will be needed to come to terms with the 21st century's grand challenges of planetary governance.

Oran Young
Santa Barbara, California
March 2021

1. Building intellectual capital for turbulent times

1 THE CORE CONCERN

We live in perilous times. Challenges highlighting the need to construct and implement societal steering mechanisms capable of operating effectively on a planetary scale are becoming increasingly urgent. The Earth is transitioning from the relatively stable and benign climate system of the Holocene to the more dynamic and turbulent climate system of the Anthropocene. The onset of the cyber age has spawned a growing array of novel needs for governance that existing institutions are poorly equipped to address. There are good reasons to expect that new infectious diseases will follow Covid-19 and that they will pose equal and potentially greater challenges on a planetary scale. And problems that have been with us for some time, like the spread of weapons of mass destruction, have not gone away.

At the same time, we are witnessing the rise of populist, nativist, authoritarian, and inward-looking regimes in societies across the world. Our attention is riveted to illiberal developments in the United States as an aging hegemon and in China as a rising superpower, simply because they are the most powerful states in the world today. But similar illiberal trends are unfolding in many other places, including Brazil, Hungary, India, Myanmar, Russia, and Turkey. It is hard to imagine a more serious disconnect between needs for governance now arising on a planetary scale and the actions of disruptive actors bent on tearing down the postwar global order without articulating any constructive plans or strategies for a more appropriate replacement.

The result is a situation that is disconcerting and more than a little frightening. Lest we succumb to gloom and doom, however, it is important to recognize that complex systems can and often do experience nonlinear changes and that these changes can give rise to unexpected and even surprising opportunities to introduce innovations. This places a premium on looking ahead in order to amass the intellectual capital needed to make the most of such opportunities when they do arise. This small book is dedicated to the proposition that a critical element of this effort will involve enhancing our understanding of the roles

that social institutions can play in the development of steering mechanisms to meet needs for governance arising in the Anthropocene.

I have been exploring the institutional dimensions of international and global governance systems now for 50 years, starting with my early work on the rise of international regimes during the 1970s and proceeding to my more recent work on governing complex systems in the 2010s. What I have to say in this book builds on my past thinking about social institutions. But each of the chapters in the book provides a new contribution to this evolving stream of work. In a number of cases, I take issue with ideas that have achieved considerable prominence within research communities associated with the Resilience Alliance and the Earth System Governance Project and within the global change research community more generally. But in all cases, I seek to engage in a constructive dialogue with others who also are endeavoring to understand the role of institutions not only as mechanisms that can help us to meet the challenges of the Anthropocene, but also as obstacles to be overcome in order to introduce the changes needed to meet these challenges. Drafted almost entirely during the course of 2020, I offer the ideas articulated in this book in the form of reflections on planetary governance and global order during the time of Covid-19.

2 LOOKING AHEAD IN TROUBLED TIMES

The last decade of the 20th century was, by and large, a time of optimism regarding the development of global order. The final collapse of the Soviet Union at the end of 1991 put an end to the Cold War. Anxieties caused by the looming threat of a nuclear war subsided quickly thereafter. The early 1990s marked the coming of age of the concern for environmental protection and sustainable development on a global scale. The United Nations Conference on Environment and Development (UNCED) in 1992 was a landmark event. Both the UN Framework Convention on Climate Change (UNFCCC) and the Convention on Biological Diversity (CBD), addressing defining challenges of the Anthropocene, were completed and signed in conjunction with UNCED. The UN Convention on the Law of the Sea (UNCLOS) entered into force in 1994. Despite the unwillingness of the United States to ratify UNCLOS, this convention has provided a constitutive framework for the development of regimes relating to human activities affecting ~70% of the Earth's surface. The World Trade Organization (WTO), created under the terms of the 1994 Marrakech Agreement, commenced operations at the beginning of 1995, replacing the more ad hoc system developed under the preexisting General Agreement on Tariffs and Trade. By the 1990s, the postwar process of decolonization was largely complete, augmenting the membership of the United Nations and globalizing international society as a society of states. Many

believed, under the circumstances, that the vision of world order as a liberal, rules-based system was within reach (Fukuyama 1992).

The contrast between the optimism of the 1990s and the sense of pessimism that has become pervasive as we enter the 2020s is hard to exaggerate. The United States, riven by internal conflict and responsive to resurgent isolationist or nativist sentiments, has lost its way as a global leader. Securitization has highlighted the role of power politics, drawing attention to the conflicts of interest among the United States, China, and Russia as they seek to maximize relative gains and jockey for political advantages in their interactions with one another. The agreements of the 1980s and 1990s limiting strategic weapons systems are expiring. The effectiveness of the WTO is challenged on a number of fronts; obstructionism on the part of the United States has even undermined the ability of the WTO's dispute settlement mechanism to function properly. Despite efforts to strengthen the governance systems for climate and biological diversity, the growing impacts of climate change have produced a global emergency, and the planet is losing species at 100–1000 times the normal or background rate. In the face of the most destructive pandemic of modern times, which many regard as a disruptive event on a par with the Great Depression and World War II, the United States withdrew support for the World Health Organization (WHO), accusing the organization of biased behavior in favor of China and depriving it of a large portion of its financial resources.¹ And many ex-colonies have fallen victim to authoritarian political leaders, though they are recognized by the members of international society as sovereign states. To this litany, we may add a variety of new problems, like domestic repression, interventions in electoral systems, cyberterrorism, and cyberwarfare made possible by the onset of the cyber age. Small wonder, then, that many of us are afflicted by a sense that the progressive trends marking a large proportion of our lifetimes have now come to an end, leaving us with a growing sense of foreboding about what lies ahead.

No doubt, there are reasons to temper both of these characterizations. A critical review of the events of the 1990s reveals a darker side featuring the growth of inequality within many societies, the continuing force of systemic racism, the negative side effects of the expansion of international trade, and the failure to launch processes needed to address problems like climate change and the loss of biological diversity effectively. Conversely, a more optimistic perspective on the 2020s reveals a decline in the frequency of conventional interstate wars, the rise of prosperous middle classes in many parts of the world, a growing awareness of the importance of coming to terms with global

¹ President Biden restored US participation in the WHO as one of his first official acts.

environmental issues like climate change, and an effort in many quarters to think through the requirements of pursuing sustainable development. Even so, it is easy to understand the distress arising from recent developments and the erosion of hope that accompanies the resultant sense of stress.

Taken together, these developments suggest two critical observations about the need to look ahead, even or perhaps especially in turbulent and troubled times. One observation concerns the pace of changes occurring on a global scale. The onset and spread of Covid-19 presents a particularly dramatic example. At the start of 2020, we were generally unaware of this looming threat to human well-being on a global basis. Six months later, the pandemic had upended the lives of people everywhere, disrupting economic systems and shifting the political fortunes of incumbent leaders in the process. Similarly, other major changes now spread on a planetary basis at an unprecedented rate. What this means is that we cannot afford to fixate on our current ills, wallowing in distress about day-to-day problems and paying little attention to early signs of major changes that will unfold at a rapid pace in the coming years. In this setting, there is a critical need to look ahead, not only spotting initial signs of new developments but also thinking in a wide-ranging fashion about options for coming to terms with needs for governance associated with these developments. While a preoccupation with current ills may be understandable in psychological terms, looking ahead is likely to be both healthier emotionally and more productive as a way of preparing for the challenges we will need to confront in the relatively near future.

The second observation has to do with complexity. I address complexity in more general terms in the next section. But the essential point here is that we live in a world of complex systems. Such systems are prone to nonlinear changes that regularly take us by surprise. As a result, it does not make sense to assume that current trends will unfold in a linear fashion, whether they involve positive developments like the campaign to end extreme poverty or negative developments like increases in concentrations of greenhouse gases in the Earth's atmosphere. This puts a premium on efforts to understand critical transitions and the nature of relatively modest triggers that can catalyze dramatic changes in the trajectories of largescale systems (Scheffer et al. 2009). Here, too, looking ahead is important, and all the more so in turbulent times. Rather than focusing on gradual shifts in temperatures at the Earth's surface, for example, we need to think about tipping elements that can cause sharp shifts over short periods of time (Lenton et al. 2008). Rather than thinking mainly about linear trends in the incidence of known diseases, we need to prepare for the possible eruption of new infectious diseases like Covid-19. The combination of speed and nonlinearity makes it essential to look ahead with an understanding that sharp shifts are normal and that there is much to be said

for preparing for windows of opportunity when significant restructuring of seemingly fixed social structures suddenly becomes an option.

3 PLANETARY COMPLEXITY

Natural scientists have long understood the need to think about the Earth in systemic terms. We know, for example, that developments occurring anywhere on the planet (e.g., emissions of greenhouse gases, the melting of glaciers and ice sheets) will produce effects at the level of the Earth system. But social scientists have seldom thought in these planetary terms. There is an interest in the processes through which our species, which originated in Africa, spread out over time to populate all of the Earth's continents with the exception of Antarctica. Still, our thinking is typically place-based, focusing on the rise and fall of societies rooted in the biophysical conditions of specific regions. A hallmark of the onset of the Anthropocene, however, is not only the intensification of the impacts of human actions on their biophysical surroundings but also the expansion of the human enterprise to the planetary level. Where we once were able to contemplate the rise and fall of specific civilizations with little or no concern about the consequences for humans living in other parts of the Earth system (Diamond 2005), we now realize that we are engaged in activities likely to affect the fate of the species as a whole. What is more, the margin for error has become smaller and smaller when it comes to the future of humans on Earth. A sobering prospect, under these conditions, is that our ability to come to terms with the challenges arising today may have fundamental consequences for the fate of the species.

Even before the onset of the Anthropocene, complexity was a defining feature of the Earth system. What makes systems complex is a combination of hyperconnectivity, nonlinear dynamics, directional change, and emergent properties (Young 2017). Telecoupling, for example, means that events occurring in distant locations such as the melting of glaciers and ice sheets in the Antipodes and in the Himalayas can have drastic impacts on low-lying Pacific Island states endangered by sea-level rise and on farmers in East and Southeast Asia reliant on dependable supplies of water carried by the major rivers of the region. Nonlinear dynamics produce critical transitions that flip large biophysical systems from one basin of attraction to another. The data retrieved from ice cores drilled on the ice cap in Greenland, for instance, document sharp shifts in temperature occurring over a few years' time (Gertner 2019). Directional changes take the form of what systems analysts refer to as bifurcations in contrast to oscillations. Whereas oscillating systems show a tendency to go through recognizable cycles over time, systems subject to bifurcations move from one state to another without cycling back to states that resemble earlier states. The prominence of emergent properties constitutes

a natural corollary of hyperconnectivity, nonlinearity, and directional change. The idea of emergence refers to the rise of successive states driven by the internal workings of a system that are so multidimensional that it is difficult if not impossible to anticipate the outcomes arising from the interactions of major drivers. A common way of characterizing the effects of emergence in complex systems is to say that the behavior of such systems is full of surprises.

In the human-dominated systems of the Anthropocene, all these features of complex systems are intensified. In the past, natural scientists have tended to abstract away the impact of human actions, seeking to model the behavior of the Earth's climate system or the evolution of major ecosystems, while setting aside human actions as external factors. However understandable it may be as an analytic strategy, this mode of analysis has always run the risk of missing critical features of the systems in question. In the Anthropocene, this strategy is no longer tenable. Anthropogenic emissions of greenhouse gases are now the most important driving force affecting the Earth's climate system by a large margin. Human actions play a dominant role as determinants of the fate of large ecosystems like the rainforests of the Amazon Basin. Of course, the challenges of finding ways to analyze these systems in holistic terms are daunting. But there is no alternative. Disaggregating these highly complex systems into their biophysical components and their human components and then assuming that we can simply combine the results to achieve a holistic picture of the behavior of these systems will not work. What we need is new intellectual capital that can be brought to bear to improve our understanding of the complex systems of the Anthropocene.

From the point of view of those concerned with protecting or promoting human values under these conditions, however, several things are clear already. For one thing, we are in need of governance systems that are both robust in the sense that they have the capacity to steer the actions of a variety of actors under a range of conditions and agile or nimble in the sense that they are able to adjust easily and quickly in response to nonlinear developments in complex systems. Many see a tension between these requirements. We tend to formalize institutional arrangements in order to maximize the willingness of actors to pay attention to their provisions and to construct more or less elaborate administrative arrangements to ensure that they operate smoothly under a variety of conditions. But doing so is apt to increase the difficulty of achieving agility in adjusting to changing circumstances. Adjusting formalized arrangements requires an ability to navigate more or less stringent procedures relating to the amendment of legally binding agreements. Administrative arrangements tend to become increasingly entrenched over time. One major challenge associated with governing complex systems, then, is to develop innovative procedures for reconciling the tension between robustness and agility.

Another concern is a consequence of hyperconnectivity. In complex systems, it is hard to separate problems, so that they can be tackled discretely on a case-by-case basis. It is difficult to avoid the issue of climate change, for instance, in developing strategies to reduce the loss of biological diversity. The eruption of pandemics greatly complicates efforts to come to terms with economic issues on a global scale or to fulfill the goals articulated in the UN's 2030 Agenda for Sustainable Development. Issues relating to the global trade system quickly morph into matters of high politics as leading countries interpret the negotiation of trade agreements as exercises in soft power that can make a difference in strategic terms. All this complicates the application of normal procedures through which we seek to disaggregate issues to make it possible to tackle them on a somewhat self-contained basis. One way to think about this matter is to observe that the rise of hyperconnectivity makes it increasingly costly to operate on the basis of reductionism in the policy sphere (Young and Stokke 2020).

Similar remarks are in order regarding the matter of uncertainty. In all situations, it is an illusion to think that we can eliminate uncertainty regarding the consequences likely to flow from the choice of specific policy options. But in complex systems, uncertainty becomes a central feature of the policy process. One response to this is to highlight the precautionary principle, avoiding actions likely to take us too far into the realm of the unknown. In complex systems, however, there may be no way to avoid the necessity of making clearcut choices in the face of high levels of uncertainty. This is a source of serious concern under any circumstances. But when we are dealing with issues like climate change where the consequences of our actions will play out at the level of the Earth system as a whole, the concern becomes especially severe. If we fail to act in a timely manner or make choices that turn out to be seriously maladaptive, we may not get a second chance. The challenge of decision-making under uncertainty has confronted human societies for millennia. Now, we know a good deal more about many things than we did in the past. Paradoxically, however, when it comes to making major choices in the face of Earth system complexity, our level of understanding regarding the likely consequences of the options we face remains extremely limited.

4 THE ROLE OF SOCIAL INSTITUTIONS

These observations make it clear that we must devote increased time and energy to understanding and responding to what I call in this book the grand challenges of planetary governance in the 21st century. Governance is a social function centered on the development and operation of mechanisms to steer human societies toward outcomes deemed desirable in collective terms and away from undesirable outcomes. At the core of every governance system is

a set of institutions – formal, informal, or some combination of the two – that guide the actions of a variety of actors ranging from individuals to large corporate entities under a variety of circumstances. Accordingly, we must strive to improve our understanding of the evolution and operation of social institutions in complex systems. The goal of this book is to augment our understanding of the roles institutions play on a planetary scale. Starting with an account of the grand challenges framed in institutional terms, I seek throughout the book to sharpen our understanding of the nature of institutions, the processes through which they influence behavior, and the ways in which they evolve in response to a variety of pressures.

To set the stage for this journey, it will help to start with some general observations about social institutions. While some analysts dismiss social institutions as epiphenomena in the sense that they are surface manifestations of the underlying power structures of human societies, most of us see institutions as significant determinants of the course of events occurring in social systems and, by extension, socioecological systems. In fact, the two perspectives are not as incompatible as this initial formulation would suggest. Consider the case of structures of property rights, including various forms of private property, public property, and common property, for purposes of illustration. No doubt, the ability of individuals and especially organized interest groups to exercise power plays a significant role in determining the content of the structures of property rights that arise in specific social settings. But once a structure of property rights is fixed in place, it tends to take on a life of its own. Prevailing property rights exert a significant influence on the course of events in most settings. It is not easy even for the rich and powerful to ignore entrenched rules, to make an informal practice of bending them to serve their own interests, or to reform them in more formal terms. This is particularly true in settings in which there are many powerful individuals or interest groups whose preferences regarding matters like the contents of prevailing structures of property rights do not coincide. Structures of property rights are apt to become sticky once they are firmly in place and more or less extensive arrangements have been created to administer them on a day-to-day basis and to settle disputes regarding their application to specific situations. Efforts to introduce significant changes in prevailing structures of property rights frequently give rise to protracted political processes and often end in stalemate. In most cases, the preexisting structure remains in place, unless and until the efforts of reformers come to fruition. Nothing in this argument contradicts the proposition that an ability to exercise power effectively is an important driver of outcomes in social or socioecological systems. But neither does it undermine the proposition that institutions play a major role in determining the course of human interactions in a wide range of social settings.

Several factors, taken together, make it hard to reach firm conclusions about the role of social institutions and, as a result, to make informed decisions regarding the creation and implementation of arrangements intended to move us toward socially desirable outcomes. For one thing, institutions are intangible. We can observe the buildings that house government offices and count the number of people who work for government agencies, for example, but we cannot see the constitution of a country like the United States as a material object. We know that the provisions of the constitution make a difference regarding the trajectory of collective decision-making, and it is understandable that individuals and interest groups expend enormous amounts of time and energy arguing about the proper interpretation of specific provisions of the constitution, mobilizing support for the interpretations they prefer, and seeking to induce courts to make rulings favoring their views. Still, we cannot see the provisions of this institutional arrangement in operation in the way that we can document the behavior of individuals or groups of people in a variety of settings.

In addition, we must deal with limited universes of cases and restricted opportunities to engage in experimentation in our efforts to understand the impacts of institutions. In extreme cases, such as the institutional provisions that define international society as a society of sovereign states, there is only a single case and virtually no opportunity to introduce adjustments on a controlled or experimental basis. But even in other domains, these restrictions are severe. We may think of categories like liberal democracies or capitalist economies as universes of cases, but it is obvious that there is so much variation among the members of these universes that efforts to construct generalizations applying to all the members of these universes are apt to end in failure. We are all familiar with experiments in which college students are asked to make choices in stylized situations that resemble collective-action problems like prisoner's dilemma or that feature principles of equity like the game known as divide the dollar. No doubt, the results of these experiments are illuminating. They have played a significant role, for example, in the rise of what we now know as behavioral economics (Kahneman 2011). But it does not take much reflection to realize that the relevance of these results to real-world situations is severely limited.

Beyond this lies the problem of complex or conjunctural causality (Ragin 1987). Whether we are thinking about the behavior of the Earth's climate system or the outcomes produced by a given electoral system, it is apparent that numerous drivers play a role and that individual drivers often interact with one another. In analyzing the role of institutions, this means that it is difficult, often impossible, to determine what proportion of the variance in outcomes can be attributed unambiguously to the influence of the institutions in question. Clearly, this does not mean that institutions are unimportant as determinants

of the course of events in social settings. But it does mean that we need to be cautious at all times in making claims about the role of institutions. It means also that we need to avoid overconfidence in thinking that all we need to do to solve a particular problem is to make suitable adjustments in the character or content of the prevailing institutions.

When we think about the challenges of coming to terms with the problems of the Anthropocene, from avoiding uses of weapons of mass destruction to limiting the disruptive impacts of climate change and controlling misuses of cyberspace, it quickly becomes apparent that institutions can be a source of the problems we face as well as important features of strategies designed to address the problems. A prominent case in point involves the constitutive provisions of international society understood as a society of sovereign states. Frequently, we simply take it for granted that the world is organized as a society of states in which there are well-defined rules regarding requirements for membership, and the institution of sovereignty is understood to mean that member states have full control over their internal affairs and are not bound by any rules regarding their interactions with others that they have not accepted explicitly. We proceed to address a wide range of topics without asking probing questions about the fate of these constitutive arrangements.

It is possible to point to specific situations in which these arrangements do not produce perfect compliance. There are numerous instances, for example, in which powerful members of international society intervene without permission in the internal affairs of others. But in the context of this discussion, several more general observations are worthy of emphasis. For starters, the constitutive institutions of international society are socially constructed. They do not reflect natural laws. They are relatively recent in their origins, and they will not last forever. One of the goals of this book is to explore the prospects for change in the constitutive provisions of international society that may occur as we seek to confront the grand challenges of the 21st century.

Despite the limitations imposed by the constitutive provisions of international society on the availability and effectiveness of strategies for coming to terms with the problems of the Anthropocene, there are success stories in efforts to respond to needs for governance in this setting. We have achieved some success in addressing problems by negotiating legally binding instruments, including several strategic arms limitation treaties, the Marrakech Agreement establishing the World Trade Organization, and the Montreal Protocol dealing with ozone-depleting substances. Still, as numerous observers have pointed out, efforts to solve many problems through the use of this strategy have proven ineffective. A prominent case in point is the problem of climate change where the UNFCCC and a series of supplemental agreements including the Kyoto Protocol, the Copenhagen Accord, and the Paris Climate

Agreement have failed to put a stop to increases in concentrations of greenhouse gases in the Earth's atmosphere.

While it would be a mistake to underestimate the prospects for creating and implementing effective institutions to address specific needs for governance through the negotiation of international legally binding instruments, there is no need to put all our eggs in this basket. We are now witnessing the rise of a variety of nonstate actors and growing efforts to involve these actors in the creation of institutions designed to address problems at the planetary level. Whether we are approaching a threshold beyond which the activities of these actors will trigger the onset of a bifurcation regarding the constitutive provisions of international society is difficult to determine at this stage. But, increasingly, a range of nonstate actors make a difference with regard to the creation and implementation of institutions addressing global concerns. Sometimes, the result is the development of institutions that operate outside the framework of international legally binding instruments like the Forest Stewardship Council and the Marine Stewardship Council dedicated to the achievement of sustainable forestry practices and commercial fishing. In other cases, nonstate actors exert influence on the course of negotiations dealing with the terms of international agreements. A striking recent example involves the influence of nonstate actors on the negotiations leading to the 2016 Kigali Amendment to the Montreal Protocol mandating the phasing out of the production and consumption of hydrofluorocarbons on the grounds that they are greenhouse gases. In still other cases, states and nonstate actors form partnerships to create and implement regimes addressing specific needs for governance (Andonova 2017). It follows that any assessment of the prospects for coming to terms with the problems arising in the Anthropocene must pay careful attention to the role of nonstate actors, even in the absence of dramatic change in the character of international society.

Beyond this, it would be a mistake to dismiss discussions of more fundamental changes in the character of international society as idle fantasies. On a planetary scale, the dominance of the prevailing constitutive arrangements is a surprisingly recent development, reflecting the spread of the influence of Western social thought in the 19th and 20th centuries. There are growing indications that the intellectual dominance of the West is weakening and may decline dramatically during the course of the 21st century (Morris 2011). Rising levels of complexity on a planetary scale make it increasingly difficult to devise institutions that can address largescale problems effectively. Due to the effects of hyperconnectivity, institutions that seem to work well under one set of conditions can fail or even produce counterproductive outcomes under other conditions. Nonlinear changes can lead to sudden failures of institutions that seemed to produce satisfactory results in previous time periods. And the prominence of surprises means that we are often caught off guard by such

limitations and failures. Under the circumstances, there is no reason to confine our thinking to the conventional repertoire of responses as we consider innovative approaches to addressing the grand challenges of governance of the 21st century.

One implication of these observations is that the practice of institutional diagnostics, which is an imprecise enterprise under the best of circumstances, is becoming increasingly complicated as we move deeper into the Anthropocene. A common but fundamentally inadequate response to this situation is to fall back on proposals reflecting familiar recipes or formulaic prescriptions that are easy to grasp, despite the fact that they often fail to solve problems and may even lead to undesirable results in specific situations (Young, Webster et al. 2018). For example, advocates argue that the introduction of individual transferable quotas can be counted on to reduce stock depletions and increase efficiency in marine fisheries or that cap-and-trade systems surely will create incentives that will reduce reliance on technologies producing greenhouse gas emissions. The point is not that such institutional measures are never appropriate. Rather, all institutional arrangements need to be designed with a clear understanding of the complexity of the conditions likely to influence their performance in specific situations and, as a result, the need to include provisions making it possible to adjust them easily to circumstances that may change quickly or more or less dramatically. One response to this situation centers on the desirability of developing a well-stocked toolkit of institutional options and of honing our skills regarding the process of matching institutional measures with the conditions under which they are expected to operate.

5 A GUIDE TO THE SUBSTANTIVE CHAPTERS

The seven substantive chapters that follow all involve an effort to build intellectual capital that will help us to devise institutional arrangements that are well suited to addressing problems of planetary governance. I begin in Chapter 2 with an account of what I call the grand challenges of planetary governance in the 21st century. In my judgment, these challenges include protecting the Earth's climate system, controlling the eruption of pandemics, suppressing destructive misuses of cyberspace, and guiding the biotechnology revolution. These are all global concerns that are difficult, perhaps impossible, to address effectively within the familiar confines of international society. A discussion of the underlying nature of the challenges, the actors whose behavior is critical in each case, the behavioral mechanisms available to steer or guide their behavior, and the policy instruments available for operationalizing these mechanisms provides a set of empirical examples that can be used to ground the analytic themes of the following chapters in an ongoing effort to address substantive issues that are coming to the fore in the Anthropocene.

Chapter 3 deals with what I call behavioral mechanisms, identifying and differentiating a number of ways in which institutions can steer or guide the actions of those who are subject to their provisions. Mainstream thinking tends to focus on the role of rules and various types of regulatory measures, giving rise to an interest in matters of compliance and enforcement and the settlement of disputes about the application of general rules to specific situations. Many institutions, especially in Western societies, do conform to this model. But this is not the only way in which institutions can guide the behavior of subjects. I investigate alternative mechanisms including what I call principles-based governance and goal-based governance. The interesting challenge in this regard is to analyze the conditions under which one or another of these mechanisms is likely to produce the best results measured in terms of their ability to come to terms with issues arising at the societal level.

In Chapter 4, I take a new look at what we mean in talking about the effectiveness of governance systems. I differentiate among constitutive effectiveness, problem-solving effectiveness, and positional effectiveness. This opens up the prospect that institutions may make a difference in shaping the character of social practices and determining who gets what, whether or not they are successful in producing solutions to specific problems. The defining features of international society treated as a society of sovereign states, for example, are highly influential in determining the options available for coming to terms with largescale problems like the control of weapons of mass destruction, the protection of the Earth's climate system, and the suppression of misuses of cyberspace. But this may serve to limit innovative responses to these problems as attention centers on the ins and outs of efforts to negotiate and implement the terms of international legally binding instruments to the exclusion of alternative ways of addressing the problems.

Drilling down on these concerns, I ask in Chapter 5 whether formalization increases the effectiveness of international instruments developed to deal with specific problems. That is, can we expect that legally binding instruments, which are widely regarded as the gold standard among international lawyers and specialists in international relations, are generally superior to more informal arrangements when it comes to solving major problems? This way of thinking assumes that informal arrangements are properly understood as underdeveloped institutions and that they should be moved toward more formalized arrangements as quickly as possible. But if the evidence fails to support this line of thinking, we may want to pay more attention to the value of relying on more informal arrangements in a variety of specific situations.

Chapter 6 takes up what I call the dark side of resilience, arguing that one of our challenges is to find ways to escape from social traps and that resilience in such situations can become part of the problem rather than part of the solution. Many see resilience as a desirable property of social systems because resilient

systems are able to deal with a variety of perturbations by adjusting their internal features in ways that allow them to continue to function effectively and to avoid the onset of critical transitions. This line of thinking has produced numerous insights of interest to those concerned with the performance of institutions embedded in governance arrangements. But it is important to consider the flip side of resilience, looking into the ways in which societal dynamics can make traps difficult to escape or even increase their severity. A challenge for governance in such situations is to provide escape mechanisms rather than to emphasize the development of rules that can keep complex systems on an even keel.

This sets the stage for Chapter 7, which turns to what I characterize as the technological dimensions of governance. No one doubts that technological innovations constitute a major social driver, though arguments pointing to various forms of technological determinism are highly controversial. In this chapter, I address three major themes relating to the relationship between technology and governance. Is the course of technological innovation itself governable, or is technology a kind of juggernaut in the sense that we have little capacity to steer the direction and pace of innovation? Conversely, there are questions regarding the role(s) that technological innovations can play in coming to terms with needs for governance, especially those arising on a global scale like the problem of dealing with climate change. A particular concern in this realm centers on the differences between those who look to technology for solutions to problems and those who take the view that “technological fixes” are part of the problem rather than a key to solving problems. Leaving aside this fundamental question, there is much to be said about more practical roles for technology in addressing needs for governance. These include the contributions of technological innovations to identifying emerging needs for governance and moving governance systems from paper to practice once the relevant parties have agreed to their substantive provisions.

Finally, Chapter 8 tackles the question of the future of the global order on a macro scale. There has always been a sizable gap between the ideal and the actual with regard to the idea that the global order takes the form of an international society treated as a society of sovereign states. There is no reason to expect this gap to narrow during the foreseeable future. If anything, the impact of several change agents is likely to widen the gap. Individual sections of the chapter pursue this theme, looking specifically to the spread of globalization, the rise of nonstate actors, and the onset of the cyber age as forces that are stimulating significant changes in international society. The grand question concerns the extent to which these forces are likely to bring about changes of a fundamental nature in the character of the global order during the foreseeable future. The concluding section of the chapter tackles this question, noting that the constitutive institutions of international society are not immutable facts of

life but recognizing also that institutional arrangements of this sort are often sticky and slow to change even when underlying societal realities are experiencing major shifts. The discussion deals with this critical question through the lens of complex systems, which are notable for the extent to which they feature nonlinear dynamics, directional patterns of change, and emergent properties.

2. Grand challenges of planetary governance in the 21st century

1 INTRODUCING THE 21ST CENTURY'S GRAND CHALLENGES

Four grand challenges top the list of 21st-century needs for governance requiring urgent and sustained responses on a planetary scale. For shorthand purposes, I will refer to these challenges as: (i) protecting the Earth's climate system, (ii) controlling the eruption of pandemics, (iii) suppressing disruptive misuses of cyberspace, and (iv) guiding the biotechnology revolution. Each of these challenges is anthropogenic in nature. Human actions are among the principal driving forces generating needs for governance in each case; human well-being, from the level of the individual person up to the level of our species as a whole, is at stake in all four cases. All these challenges are embedded in highly complex systems featuring rising levels of systemic connectivity, non-linear and often exponential patterns of change, and recurrent surprises (Young 2017). This makes them difficult – if not impossible – to address effectively using familiar steering systems centered on the efforts of sovereign states to negotiate and administer international legally binding instruments. The four grand challenges differ with regard to the nature of the problem involved and the character of the responses required to solve or manage them. But in each case, there is an urgent need to create and implement a governance system to avoid socially undesirable and potentially disastrous consequences. We can learn a lot about governance in the 21st century by comparing and contrasting the efforts of leading actors to create effective governance systems dealing with one or another of these four challenges.

We should be under no illusion about the prospects for coming up with some new approach to Earth system governance that will prove effective in addressing these grand challenges. Many efforts to address ordinary transnational needs for governance produce disappointing results; some end in outright failure (Speth 2004; Hale et al. 2013; Conca 2015). The problems embedded in the grand challenges are even more imposing. Nevertheless, a careful assessment of the character of each of these challenges and the nature of the governance system needed to address it can tell us a great deal not only about

the repertoire of strategies that will be required to meet an array of 21st-century needs for governance, but also about the ways in which the strategies required to deal with these needs must differ from the approaches to governance familiar to us from mainstream thinking about international institutions.

This chapter addresses this subject in several steps. I begin with a series of thumbnail sketches, introducing each of the grand challenges with an eye toward revealing the core of the relevant problem. This leads to a discussion of problem types, an enquiry designed to explore the extent to which common analytical distinctions among basic types of problems giving rise to needs for governance can help us to grasp the issues embedded in the grand challenges. The discussion then turns to a consideration of agency, asking questions about those actors whose behavior is critical in each case and about the principal sources of their behavior. This sets the stage for an analysis of alternative behavioral mechanisms that may prove effective in steering or guiding the actions of the key actors. A final substantive section addresses policy instruments in the sense of specific procedures used to operationalize behavioral mechanisms that may provide leverage in coming to terms with each of the grand challenges. The concluding section offers some projections about the probable trajectory of efforts to create governance systems to address these grand challenges and highlights key differences among them we need to bear in mind going forward. Running through the entire analysis is a consideration of the role of technological innovations both as sources of 21st-century needs for governance and as elements in the institutions we put in place to address each of the grand challenges.

2 CONSTRUCTING THUMBNAIL SKETCHES

The 21st-century grand challenges are all planetary in scope in the sense that our responses to them will affect the well-being of all human beings and the fate of the Earth system more generally. But as the following thumbnail sketches make clear, they differ in ways that have major consequences for the character of the governance systems needed to address them.

Protecting the Earth's Climate System

In contrast to weather, the climate system is planetary in scope (Archer and Rahmstorf 2010). Emissions of greenhouse gases occurring everywhere raise the concentration of such gases in the Earth's atmosphere; reductions in emissions anywhere will slow the rate of increase in the overall concentration of these gases in the atmosphere. Human actions, largely in the form of the combustion of fossil fuels used to drive industrialization, have increased atmospheric concentrations of carbon dioxide from about 280ppm at the start

of the Industrial Revolution to ~415ppm today. The level is higher when other greenhouse gases are included and is expected to continue to rise during the coming years. While the consequences of climate change in such forms as increases in ambient air temperatures, sea-level rise, severe weather anomalies, shifts in the composition of ecosystems, the spread of wildfires, and so forth will vary from place to place, no place on Earth will escape the impacts of climate change. This means we are leaving the Holocene, an era of remarkable stability in the Earth's climate system lasting roughly 10,000 years and coinciding with the rise of human civilizations, and entering a new era commonly called the Anthropocene. With regard to the Earth's climate system, we have reached a planetary boundary (Rockström et al. 2009). Efforts to protect the climate system, focused on the 1992 UN Framework Convention on Climate Change (UNFCCC) and several additional measures elaborated within this framework (e.g., the 2015 Paris Climate Agreement) have failed to put a stop to rising concentrations of greenhouse gases, much less reversing this trend. The disruptive impacts of climate change are already becoming apparent, most dramatically but by no means exclusively in the high latitudes of the northern hemisphere. It is clear that more decisive steps must be taken if we are to avoid what the UNFCCC calls "dangerous anthropogenic interference with the climate system" (UNFCCC 1992).

Controlling the Eruption of Pandemics

There is nothing new about the spread of devastating infectious diseases responsible for the death of large numbers of human beings (Snowden 2019). The bubonic plague pandemic of the 14th century killed an estimated 30–60% of Europe's population. In the period following European contact at the end of the 15th century, smallpox (sometimes combined with measles) killed an estimated 80–90% of the Indigenous population of the Americas, a population that may have numbered 20–25 million people prior to European contact. The great influenza epidemic of 1918–1919 infected a third of the Earth's human population and killed an estimated 50 million people. The later decades of the 20th century brought a wave of enthusiasm regarding the prospects of eradicating infectious diseases. A focused effort produced notable success in the case of smallpox. Nevertheless, as the cases of SARS, avian bird flu, Ebola, and most recently Covid-19 make clear, we now face the prospect of global pandemics that have the potential to kill huge numbers of people, wreaking havoc with the economic and social systems of industrialized societies in the process. In the absence of vigorous and coordinated efforts to address this problem, pandemics that make Covid-19 seem mild by comparison will occur in the future. Effective mechanisms to address this challenge must encompass a combination of concerted efforts to prevent outbreaks from occurring, rigor-

ous measures to control the spread of disease once an outbreak does occur, and ample support for the development and distribution of vaccines to combat the worst cases. The mechanisms presently in place to address this problem (e.g., the World Health Organization) are entirely inadequate to respond to this need for governance successfully (Cueto et al. 2019). As experience with Covid-19 has made clear, there is an unfortunate tendency for both governments and members of the general public to react to the outbreak of a pandemic in a narrowly self-interested manner, turning inward, suppressing information, blaming others, and failing to take the steps needed to mount a coordinated global response to the problem.

Suppressing Severe Misuses of Cyberspace

The emergence of digital technologies giving rise to virtual reality, the growth of cyberspace, and the subsequent increase in interactions between digital systems and physical or material systems has transformed the human experience (Isaacson 2014). The development of the internet, the establishment of the world wide web, and the introduction of a host of technologies that allow for the transmission of audio, visual, and graphic data widely and inexpensively has allowed humans to engage in a range of activities that were literally inconceivable prior to the onset of the cyber age. While many of the results are undoubtedly positive, the cyber age has brought with it an array of needs for governance that did not exist and had no counterparts in earlier times (DeNardis 2014). These range from dealing with smallscale misuses of cyberspace in such forms as identity theft and virtual bullying or harassment to largescale misuses including clandestine financial transactions, foreign interventions in electoral systems, cyberterrorism, and cyberattacks on national security systems. Those who engage in such misuses run the gamut from individual hackers motivated by idiosyncratic desires to promote social disruption to criminal organizations exploiting digital technology to engage in illegal commercial activities and on to government agencies seeking to control the behavior of people through various forms of electronic surveillance. There is every reason to expect opportunities to misuse cyberspace to grow in both variety and significance in the coming years (Perlroth 2020). There is no basis for assuming that states making use of conventional measures like international legally binding instruments will be able and willing to address such misuses effectively (Young, Yang, and Guttman 2020). In some cases, governments endeavoring to control their own citizens or to disrupt social order in other states will be part of the problem rather than part of the solution. The grand challenge in this case is to find ways to avoid or mitigate the worst consequences of this problem, without limiting the positive results afforded by the rise of cyberspace.

Guiding the Biotechnology Revolution

Just as breakthroughs in physics gave rise to several of the great issues of the 20th century (e.g., the control of nuclear weapons), breakthroughs in biology today are being put to use to produce an array of forms of biotechnology giving rise to some of the great issues in the 21st century (e.g., the management of genetic editing). The last several decades have brought a cascade of advances in biotechnology, including but not limited to, biofuels, genetically modified crops (GMO), gene drives, synthetic biology, and gene therapy in humans. Perhaps the most dramatic development from the perspective of global governance is the emerging prospect of germline editing, a procedure making it possible not only to take steps to reduce or even eliminate diseases caused by monogenetic mutations like cystic fibrosis, Huntington's disease, and sickle cell anemia, but also (at least in principle) to "design" human beings by selecting for heritable traits relating to matters like intelligence, looks, and strength (Renneberg and Lorocho 2017; Davies 2020; Isaacson 2021). Biotechnology presents exciting opportunities in areas like enhancing food security and repairing or avoiding genetic defects. But it opens up profound issues relating to governance, both because specific applications of biotechnology trigger major value conflicts (e.g., the fight over GMO crops) and because biotechnology may lead to deep-seated concerns in the realm of human rights and social justice as well as social distortions that would undermine key features of major streams of thought regarding what it means to be a good society (Greeley 2021; Isaacson 2021). While governments may endeavor to regulate the development and application of various uses of biotechnology, it is far from clear whether these institutions have either the authority or the capacity to address such issues effectively. At a minimum, meeting this grand challenge will require initiatives that are coordinated on a planetary scale where the challenge is to develop systems of governance in the absence of a government in the conventional sense (Rhodes 2010).

3 CONCEPTUALIZING THE PROBLEMS

Analysts who think about governance broadly as a social function centered on societal steering have devised a number of analytical models to help in differentiating among types of problems giving rise to needs for governance and calling for different responses. These models point to key differences among what are commonly known as collective-action problems, externalities or problems of social cost, and problems involving incommensurable values. Collective-action problems are situations in which groups of two or more actors make choices that seem perfectly reasonable from an individual perspective but generate outcomes that are harmful to all members of the group.

Familiar examples include the tragedy of the commons in which the seemingly rational actions of the commoners lead to the depletion of a common pool resource (e.g., a pasture or a fishery) and the free-rider problem in which the seemingly rational unwillingness of individuals to contribute leads to the failure of a group to produce a public good beneficial to all (e.g., an intact climate system) (Olson 1965; Hardin 1968). In Thomas Schelling's well-known phrase, understandable micromotives produce macrobehavior that is disadvantageous to all (Schelling 1978).

Contrast such problems with another class of problems centered on externalities or unintended (and often unforeseen) byproducts of self-interested actions of individuals that affect the welfare of others. Though analysts have noted that some externalities are positive, problems of governance come into sharp focus in the case of negative externalities or what are often called social costs, ranging from smallscale interactions in which the self-interested actions of one person detract from the well-being of a neighbor to largescale cases, such as the disruption of the stratospheric ozone layer resulting from the production and consumption of ozone-depleting substances (Mishan 2011). Yet a third class of problems features incommensurable values in which proposed actions that are compatible with or even demanded by values motivating some members of a group are incompatible with the values of others (Hsieh 2016). Some conflicts of this sort are mild enough to allow for what is often called "logrolling" in which the members of two or more groups make tradeoffs to promote their highest values. But others (e.g., many conflicts over animal rights or the rights of future generations) cut deep and lead to irreconcilable differences between advocates of conflicting positions regarding specific issues (e.g., the killing of whales). When problems are framed in this way, it is difficult to avoid outcomes that produce distinct winners and losers.

What can a consideration of analytic distinctions among problem types tell us about the core problems associated with the grand challenges of global governance? The first thing to note is that it is seldom straightforward to map real-world needs for governance onto these simple analytic distinctions. Consider the example of long-range air pollution. From one perspective, long-range air pollution is an externality arising from the construction of tall smokestacks associated with industrial facilities, which are themselves typically a response to complaints from those living nearby about the effects of local pollution. On the other hand, we can think of clean air as a common pool resource in the sense that it is depletable or degradable but non-excludable. From this perspective, air pollution emerges as a collective-action problem. Micromotives drive individual members of a society to take actions that result in the degradation of the resource to the detriment of all. As this example suggests, moreover, efforts to conceptualize problems giving rise to needs for governance often devolve into political exercises. If air pollution is simply an

externality caused by the emission of particulates from tall smokestacks, it stands to reason that the proper response is to impose regulations requiring the owners of the relevant facilities to internalize these social costs. If we approach the problem as a matter of avoiding the degradation of clean air treated as a common pool resource, on the other hand, it seems appropriate to ask all members of the relevant community to make contributions to ensure that the tragedy of the commons does not occur. As a result, there is every reason to expect that efforts to address needs for governance associated with the grand challenges will be political from the outset.

Turning now to the specific challenges, we can begin with the observation that no one intends to take actions that disrupt the Earth's climate system. Increases in the concentration of greenhouse gases in the atmosphere are byproducts or side effects of a variety of human activities involving the burning of fossil fuels, the clearing of land, the consumption of ozone-depleting substances, and so forth. This suggests that we should think of this grand challenge as a matter of internalizing social costs. But who should assume responsibility for the harm caused by emissions of greenhouse gases? To take the case of fossil fuels, is it the producers of hydrocarbons, those who burn coal, oil, and natural gas to generate electricity or power industrial plants, or the consumers of all the goods and services they produce? On the other hand, we can approach the problem of climate change from an entirely different perspective. The Earth's climate system is a kind of common pool resource; it is both non-excludable in the sense that everyone experiences it and depletable or degradable in the sense that climate change is eroding the stable and generally benign climate system of the Holocene. Despite the fact that some harbor the illusion that they may benefit from climate change, all stand to suffer from largescale climate change over time. If this is the case, we may find it helpful to think about climate change as a collective-action problem, one that requires us to think about ways to encourage everyone to assume responsibility for contributing to the public good of an intact climate system rather than about devising means to compel specific emitters to internalize the costs arising from emissions of greenhouse gases. While neither of these conceptualizations is objectively correct, there are good reasons to expect adherents to advocate actions that differ sharply in political terms in efforts to tackle this grand challenge.

The grand challenge of controlling the eruption of pandemics presents a different set of issues. Everyone wants to avoid being blamed for causing the eruption of a pandemic. Many hope that they can take steps to isolate or insulate themselves, so that the disease becomes someone else's problem that they can safely ignore. The Covid-19 pandemic offers striking examples. It is tempting for political reasons to "blame" China for failing to control the outbreak and the World Health Organization for failing to respond quickly enough. Similarly, there is a temptation among some – especially younger

people who may feel less vulnerable – to refuse to take proper precautions including social distancing, wearing masks, and avoiding unnecessary interactions with others. It is true, of course, that the incidence of the disease is highly unequal. The statistics regarding the prevalence of infection and the likelihood of death among certain vulnerable groups (e.g., prison inmates, nursing home residents, people of color) are shocking. Nevertheless, there are compelling reasons to think about controlling pandemics in collective-action terms. The avoidance of pandemics is a type of public good. Everyone benefits from avoiding an eruption; the benefits accruing to individual members of the community do not detract from the benefits accruing to others. If this is the case, the challenge is to avoid free-riding on the part of individuals who hope that they can benefit from the efforts of others to maintain a disease-free environment, while making little or no contribution themselves.

The onset of the cyber age featuring the development of the internet and the world wide web has triggered remarkable innovations in the realm of governance on a global scale. For example, the governance system for the internet, arising to a large extent spontaneously, has evolved to encompass a cascade of technical developments and has proven surprisingly effective as a steering mechanism (DeNardis 2014). But the increasing power and sophistication of digital technologies has opened up opportunities for actors, ranging from single individuals to government agencies, to use cyberspace for purposes that lack social legitimacy or are likely to produce socially disruptive outcomes (Klimburg 2017). In some cases (e.g., identity theft, illegal financial transactions), the activities in question are criminal in nature, and the problem becomes a matter of law enforcement. In other cases (e.g., invading and disrupting the computer systems of large corporations), the activities can cause major economic damage, and the problem is to find ways to avoid serious harm not only to the initial targets but also to the well-being of those who are employees or customers of the victims. In still other cases (e.g., foreign interference in electoral systems, the use of digital technology to disable military systems), the perpetrators are either sponsored by governments or are government agencies, and the problem is to avoid the escalation of hostile interactions on an international scale (Kaplan 2016; Perlroth 2020). The need for governance in all these cases centers on the challenge of preventing or preempting illegitimate uses of cyberspace without restricting ordinary users' enjoyment of the benefits made possible through applications of digital technologies. This is a concrete example of a need for governance that all societies face: how to establish societal norms regarding the bounds of legitimate behavior. On a global scale, this involves determining who should make decisions about such matters, where exactly to draw the line between legitimate and illegitimate behavior, and how to elicit compliance with the relevant norms from a diverse range of actors.

Rapid advances in biotechnology are generating novel needs for governance. Some of these needs, involving matters like intellectual property rights and the procedures governing the licensing of new drugs, are subject to treatment through the operation of existing governance systems. The grand challenge of guiding the biotechnology revolution centers on two major concerns. One arises from the extremely destructive potential of biowarfare and bioterrorism; the other centers on the potential of germline editing not only to give rise to far-reaching issues of social justice but also eventually to pose profound normative questions about the nature of human life (Doudna and Sternberg 2017; Greeley 2021). It seems reasonable to approach the problem of biowarfare and bioterrorism, like the problem of chemical warfare, as a collective-action problem. While there may well be temptations to cheat in this realm, it is hard to argue with the proposition that the imposition of tight limits or even a total ban on uses of bioweapons is desirable from a collective or societal point of view. The case of germline editing, on the other hand, may give rise to conflicts between or among incommensurable values that are difficult to resolve. Most are likely to agree that it makes sense to use new knowledge regarding genetics to address problems resulting from genetic defects, such as Down syndrome. But how can we deal with conflicts between those who want to be allowed to make designer choices regarding individual human lives and those who believe that it is morally unacceptable to permit such interventions in the human reproductive process (Evans 2020)?

4 IDENTIFYING THE PRINCIPAL AGENTS

Responding to needs for governance invariably requires identifying key actors and finding ways to induce these actors to alter or adjust their behavior in ways that allow for the establishment and operation of institutions designed to solve the relevant problems. But we ordinarily confront choices regarding whom to identify as the key actors and need to think about issues regarding the sources of their behavior. Consider the problem of avoiding the depletion of fish stocks due to overfishing as an example. Are the key actors harvesters, processors, distributors, retailers, or consumers of fish products? There is no correct answer to this question. But as we will see, choices regarding the identification of key actors can make a big difference in terms of the nature of the governance system put in place and the prospects that the system will prove effective in solving the problem that led to its creation. Once the key actors have been identified, it becomes important to think carefully about the sources of their behavior. This is a complex subject. But to provide an introduction to the issues involved, we can ask whether the behavior of the key actors conforms to the logic of consequences, the logic of appropriateness, or some mix of the two (March and Olsen 1998). Whereas incentive mechanisms may prove

effective in steering the behavior of actors whose decisions reflect the logic of consequences, normatively grounded principles may produce better results in steering the behavior of actors who respond to the logic of appropriateness.

A number of practical questions come into focus right away in thinking about the principal actors associated with a need for governance. Thus, we want to know: how many key actors are there, will they have incentives to cheat, how hard is it to monitor their behavior, and does the situation lend itself to the creation and operation of effective compliance mechanisms? Once again, the case of ozone-depleting substances (ODSs) is helpful in thinking about the significance of these issues. When negotiators reached agreement in 1987 on the terms of the Montreal Protocol on Substances that Deplete the Ozone Layer, one company (DuPont) produced ~25% of the known substances that deplete the ozone layer; these products accounted for only ~3% of the company's annual income stream, and the company's leaders had confidence in their ability to lead the way in the research and development needed to come up with (seemingly) benign alternatives for most uses of ODSs (Parson 2003). What is more, a small number of other companies accounted for the rest of the production of ODSs. Under the circumstances, it made sense to highlight the role of producers rather than consumers in developing the core provisions of the ozone regime. This did not eliminate concerns about the development of a black market in existing ODSs or the argument for creating a multilateral fund to assist developing countries to avoid becoming dependent on ODSs. But the structure of the industry provided clear guidance regarding whom to treat as key actors and how to think about influencing their behavior in the effort to protect and restore the stratospheric ozone layer.

What are the implications of these observations for efforts to come to terms with the four grand challenges of the 21st century? One difficulty facing those seeking to deal with climate change is that it is not easy to reach clearcut conclusions regarding the identity of the key actors. In the case of fossil fuels, for example, should we concentrate on altering the behavior of the producers of coal, oil, and gas, the refiners of these energy sources, intermediate users (e.g., power plant operators, producers of motor vehicles), or the ultimate consumers of energy (e.g., homeowners, owners of motor vehicles)? There is no consensus regarding answers to questions of this sort. As a result, the provisions of international agreements aimed at solving the problem of climate change are either silent regarding the identity of the key actors (e.g., the UNFCCC) or leave it to member states to make their own choices regarding this matter (e.g., in crafting the Nationally Determined Contributions called for in the 2015 Paris Climate Agreement). There are legitimate arguments in favor of different responses to questions about the key actors in the case of climate change. But a scattershot approach featuring desultory efforts to guide the actions of a wide range of actors is unlikely to prove successful in solving the problem.

Reducing emissions of greenhouse gases both drastically and rapidly to avoid breaching the planetary boundary regarding climate with highly disruptive consequences for human societies will require a concentrated effort to bear down hard on the behavior of a set of actors located at well-defined links in the behavioral chain involved in the emission of greenhouse gas.

Controlling the eruption and spread of diseases is a critical concern of public health authorities in all societies. But the grand challenge of avoiding the eruption of pandemics is a matter of preventing diseases that originate in one place from spreading across national boundaries killing large numbers of people on a planetary scale (Snowden 2019). In today's globalized system, there are numerous vectors along which a disease can spread from one country or part of the world to another; there is no way to eliminate the possibility of pandemics occurring. What this suggests regarding the control of pandemics is that the key actors will be agencies (e.g., the World Health Organization) able to monitor outbreaks of disease closely and provide early warning regarding the onset of pandemics coupled with public health authorities within countries (backed by political leaders) who are able and willing to cooperate effectively in taking steps to respond quickly and effectively to any signs of the spread of diseases across national boundaries. Two critical issues arise from this observation. One involves the challenge of maintaining effective early warning systems to respond to events that occur infrequently. This is a matter of combatting a natural tendency toward complacency and the degradation of systems that are used infrequently, though their role is critical when they are needed. The other issue arises from the tendency of political leaders to blame outbreaks of diseases on others rather than cooperating to minimize the spread of diseases across international boundaries. The challenge here is to combat calculations based on narrow and short sighted conceptions of political self-interest that can lead to behavior that is counterproductive from an Earth system perspective.

What makes it hard to avoid or respond effectively to misuses of cyberspace is that perpetrators may range all the way from isolated individuals exhibiting various forms of antisocial behavior to governments seeking to exploit cyberspace as a weapon in efforts to advance their own interests. This means there is no way to come to terms with this grand challenge without developing a range of strategies tailored to the actions of a variety of key actors. While the capacity of individuals to wreak havoc may be limited, dealing with their actions is difficult both because they are often hard to track down and because they may be unresponsive to efforts to impose more or less severe sanctions on their actions. Misuses of cyberspace involving illegal business activities or impermissible financial transactions, on the other hand, are often the work of actors responsive to the logic of consequences. While it may be difficult to track them down, the availability of effective enforcement measures is likely to make a difference regarding the choices they make. Misuses of cyberspace

on the part of governments or government agents present a different challenge. Such actions may well give rise to collective-action problems in the sense of situations in which everyone would be better off, at least in the long run, if it were possible to prohibit such activities on the part of each individual member of international society. They are, in other words, a subset of the broader category of arms control problems (Schelling 1966). But it is not easy to see a way to shift from the status quo to an alternative state featuring an effective ban on misuses of cyberspace to achieve national objectives. Overall, the onset of the cyber age, which features the development of numerous beneficial technologies, has brought with it a diverse and highly complex set of needs for governance (DeNardis 2020).

Although they are far from simple, many applications of biotechnology are subject to governance through familiar procedures. Existing regulations governing the award of licenses or patents, for example, can be extended to cover a variety of applications of biotechnology. While the tradeoff between food security and the production of biofuels may pose a hard choice, it does not present an unprecedented problem. But guiding the biotechnology revolution comes into focus as a grand challenge when serious value conflicts arise and especially when applications may generate irreversible changes in *homo sapiens* as a distinct species (Harari 2018; Isaacson 2021). This is what makes it hard to resolve conflicts over the production and use of GMO crops. And it is what leads many observers to see the issue of germline editing as one of the most difficult challenges regarding governance we have confronted as a species. A critical question in these cases concerns the identity of key actors and the recognition of who can speak for them. It is not sufficient to leave issues regarding GMO crops to commercial patenting processes when major groups object to their use on moral or ethical grounds. It is not acceptable to leave matters regarding germline editing to public health agencies or scientific establishments when these matters raise profound issues of concern to all members of society. We know that these issues are planetary in scope; there is no way to address them effectively on a national or even regional basis. But progress in meeting this grand challenge will depend, in the first instance, on determining who should be authorized to make the critical choices within what venues.

5 ASSESSING BEHAVIORAL MECHANISMS

Mainstream thinking, at least in the Western world, generally reflects a regulatory perspective on governance (Chayes and Chayes 1995). Analysts assume that the way to respond to needs for governance is to introduce and implement rules treated as prescriptions telling more or less well-defined categories of subjects what they are required to do or prohibited from doing under speci-

fied conditions. For example, fishers must adhere to gear restrictions and not exceed quotas; emitters of sulfur dioxide or nitrogen oxides must have permits covering their emissions; coastal states must allow transit passage through recognized international straits; members of the ozone regime must ban the production and consumption of designated chlorofluorocarbons beyond agreed upon dates. The regulatory approach to societal steering directs attention to matters of compliance with the relevant rules, including monitoring and reporting to document whether subjects are adhering to requirements and prohibitions, the imposition of sanctions as a means of enforcing compliance, and the development of procedures to arrive at authoritative interpretations in cases where there are disagreements regarding the application of rules to specific cases (Mitchell 1996; Raustiala and Slaughter 2002). Where needs for governance extend beyond the jurisdiction of individual nation states, this way of thinking presupposes that the rules should be articulated in the provisions of international agreements and that legally binding or hard-law agreements are to be preferred to informal or soft-law agreements.

In thinking about the 21st century's grand challenges of global governance, however, it is important to recognize that there are alternatives to the regulatory approach. All governance systems must make use of behavioral mechanisms structured in such a way as to influence the behavior of those actors whose activities are (or may become) the source of the problem. But relying on rules is only one way to meet this challenge. Some governance systems emphasize the role of principles construed as normative guidelines or codes of conduct rooted in the application of the logic of appropriateness rather than the logic of consequences. Others highlight the use of standards that actors must meet before they are certified or licensed to engage in specified activities. Still others make use of goals (e.g., the goals set forth in five-year plans) to focus attention on key issues, guide the allocation of resources, and galvanize the efforts of groups to solve specific problems within a limited period of time. The point is not that one behavioral mechanism is better than others or more well suited to address needs for governance in some general sense. Rather, we need to include a range of options regarding behavioral mechanisms in our governance toolkit, and develop expertise in determining which of the options or combination of options is likely to produce the best results in addressing particular needs for governance.

With all due respect to the attractions of geoengineering, including both solar radiation management and carbon dioxide removal, any lasting solution to the problem of climate change will require transformative change in economic systems dependent on the combustion of fossil fuels. There is no shortage of emerging technologies that can play a role in this transformation, including solar, wind, and hydrogen energy, electric vehicles, increased reliance on virtual meetings, and so forth. The problem is to restructure existing

incentives in such a way as to alter the behavior of producers and consumers of fossil fuels and products derived from the combustion of fossil fuels. It is unlikely that market forces alone can bring about these changes. Vested interests are powerful, and collective-action problems (e.g., the tendency to engage in free-riding) constitute a form of market failure in this realm that seems insurmountable in the absence of public intervention. When societies are ready to take this challenge seriously, it may make sense to opt for a mix of governing through goals and regulatory measures. There may well be a role for carbon taxes or cap-and-trade procedures. But real progress is likely to require the setting of ambitious goals combined with measures designed to prioritize these goals and to exert effective pressure on actors to pursue them vigorously (Kanie and Biermann 2017). The introduction of the idea of Nationally Determined Contributions (NDCs) in the 2015 Paris Climate Agreement represents a step in this direction. But the initial NDCs are not ambitious enough to do the job. Coming to terms with the grand challenge of climate change will require mobilizing the political will needed to ratchet up the level of ambition reflected in the NDCs substantially and rapidly through what the 2015 agreement describes as a “global stocktake” process.

Two distinct issues relating to the choice of behavioral mechanisms arise in the case of controlling the eruption of pandemics. Addressing needs for preparedness, early warning, testing, and contact tracing is relatively straightforward. Public health specialists are trained to tackle needs of this sort. So long as resources are available and political posturing does not interfere with their efforts, these specialists can be expected to tackle such tasks in a professional manner. The more difficult issue concerns the politics of controlling pandemics. The problem here is an instance of the situation that arises when actors guided by micromotives generate macrobehavior that is undesirable for all. Thus, it is tempting for political leaders to suppress news regarding the outbreak of a disease in order to avoid criticism from outsiders and to blame others for outbreaks within their own jurisdictions rather than cooperating to minimize the spread of the disease. But this sort of self-interested and shortsighted behavior will lead to outcomes that are undesirable for all under a variety of conditions. It is worth noting in this regard that many actors faced with situations of this sort behave in ways that do not conform to the expectations of those who assume all behavior is rooted in rational choice calculations (Kahneman 2011). It may be that what is needed in coming to terms with the grand challenge of pandemics is a concerted effort to promote behavior that is more responsive to the logic of appropriateness than to the logic of consequences.

In the case of misuses of cyberspace, there are at least three separate problems: suppressing antisocial behavior on the part of immoral individuals, controlling illicit activities motivated by a desire for financial gain, and combatting

the actions of governments or their agents designed to promote national interests or the interests of authoritarian leaders. It seems clear that addressing these problems will require distinct behavioral mechanisms. Immoral individuals care little about rules and may develop great ingenuity in avoiding detection or the imposition of ordinary sanctions. Ostracism or expulsion from society may be the only remedy in such cases. Controlling the use of digital technologies to pursue illicit activities, on the other hand, is a matter of adjusting rules to cover new situations and enhancing enforcement procedures. This may call for strengthening the capacity of organizations like the International Criminal Police Organization (Interpol). Perhaps the toughest challenge arises in cases where governments or their agents employ digital measures to interfere in the electoral processes of other countries or to destroy or disable weapons systems of others (Kello 2017). This sort of mischief is rooted in interactions among states motivated by a desire to maximize relative gains and the dynamics of power politics. As cases like the prohibition on the use of poison gas and the campaign against the use of landmines suggest, regulatory measures are not altogether ineffectual in situations of this sort. But achieving success in the development of regulatory measures designed to control digital interference in the domestic affairs of others will not be easy.

The cases of bioterrorism and biowarfare bear some resemblance to the cases of misuses of cyberspace discussed in the preceding paragraph. Dealing with bioterrorism is a matter of developing suitable rules and establishing effective enforcement mechanisms. Prohibiting or at least limiting biowarfare requires the development of regulatory arrangements in a setting that lacks a government in the ordinary sense of the term or, in other words, what is often called governance without government. What is novel in this realm is the challenge of responding to applications of germline editing that could produce profound problems of social justice and raise serious ethical conflicts relating to the legitimacy of some types of intervention in human reproductive processes. It seems doubtful whether public authorities employing conventional regulatory approaches to governance will be able to address this challenge effectively. For one thing, it is difficult to legislate solutions to ethical or moral problems. For another, there is no way to avoid the need for a coordinated international response to a set of developments that are planetary in scope. Research and development in this field is a global enterprise; there is little prospect of controlling the development of technological applications on a state-by-state basis. The best prospect for meeting this grand challenge may lie in the creation of principles or codes of conduct regarding activities like germline editing that are planetary in scope and that are linked to some system of licensing or certification designed to ensure that those who have the skills and access to the resources needed to engage in such activities understand the ethical or moral significance of their actions and are held accountable for the consequences.

6 CRAFTING POLICY INSTRUMENTS

The analysis of behavioral mechanisms is a matter of distinguishing among different sources of behavior that are relevant to societal steering and thinking about which source(s) to focus on in efforts to respond to any given need for governance. But issues of institutional design do not come to an end once a behavioral mechanism has been selected. Policy instruments are techniques or procedures developed to operationalize behavioral mechanisms with regard to specific needs for governance. Consider efforts to control emissions of sulfur dioxide or nitrogen oxides through regulatory measures as a case in point. There are vigorous debates in this context regarding the relative merits of command-and-control regulations, cap-and-trade systems, and taxes as instruments for moving from a general preference for regulation to operational procedures to be used in applying a regulatory approach to the specific circumstances associated with the problem of reducing emissions of the relevant chemicals. Similar questions regarding policy instruments arise with regard to other behavioral mechanisms used in the creation and implementation of institutions to perform the function of societal steering.

An important observation in this context is that it is essential to avoid panaceas in the selection of policy instruments needed to operationalize behavioral mechanisms (Young, Webster et al. 2018). Individual transferable quotas (ITQs), for example, are currently in fashion regarding efforts to manage marine fisheries. While this instrument makes sense in some cases, ITQs run into serious market failures under some conditions and may produce results that are unacceptable from the point of view of compelling concerns regarding equity or social justice. Similar remarks are in order regarding the use of incentive mechanisms to internalize social costs like the dangers of air pollution to human health. In cases where too many permits are issued or it is difficult to monitor whether actual emissions are covered by valid permits, what looks like an efficient way to operationalize regulations on paper may yield little progress toward solving the problem in practice. The point is not to embrace or reject particular policy instruments in general terms. Rather, what is called for is a well-stocked toolkit containing a range of instruments, the development of sophisticated procedures for matching instruments to specific situations, and the flexibility to choose preferred instruments on a case-by-case basis rather than seeking to establish preferences among instruments in general terms.

Most thinking about policy instruments in the case of climate change has focused on crafting procedures designed to provide emitters of greenhouse gases with incentives to reduce their emissions. This has led to elaborate assessments of the relative merits of different types of carbon taxes and cap-and-trade systems (Nordhaus 2008; Stern 2009). Underlying this approach

is the presumption that the problem is to find ways to internalize social costs without altering the basic character of the prevailing system of decentralized markets. But there are legitimate reasons to question whether this approach is capable of making real headway in addressing the challenge of climate change. If what is required is a wholesale restructuring of industrial societies, regulatory measures that aim to shift behavior at the margin may be doomed to failure. This suggests the desirability of considering the merits of alternative behavioral mechanisms, such as the approach known as governing through goals. Interestingly, the 2015 Paris Climate Agreement takes some tentative steps in this direction, coupling a quantified formulation of the overall goal with a procedure for fulfilling the goal often characterized as pledge-and-review. As many observers have noted, the initial Nationally Determined Contributions are woefully inadequate to fulfill the goal of holding temperature increases at the Earth's surface to a maximum of 2°C, let alone 1.5°C, and there are serious doubts about the effectiveness of the agreement's instrument for ratcheting up the pledges incorporated in the NDCs over time vigorously enough to make progress toward meeting the goal. Still, this initiative has the virtue of drawing attention to a distinct perspective on policy instruments and recognizing that individual member countries differ in ways that make it sensible to allow them to devise instruments for fulfilling their pledges in ways that are compatible with their own circumstances. The result is a way of thinking about policy instruments that differs sharply from the approach embedded in conventional regulatory perspectives.

With regard to policy instruments, a prime concern in the case of controlling pandemics is to reduce the temptation to engage in behavior that seems appealing from a shortsighted, self-interested perspective but that makes things worse for all parties concerned over time. Blaming others while refusing to contribute to coordinated efforts to control the spread of a disease constitutes a prominent example. The critical issue here, as those familiar with the analytic model known as prisoner's dilemma will understand right away, is to provide assurance to all members of the group that they will not be exploited by others if they opt for a cooperative strategy. Fortunately, there is some evidence to suggest that many actors are inclined to behave cooperatively, even when they run a risk of being exploited. But it is possible to devise policy instruments that can provide assurance to others regarding an actor's willingness to behave cooperatively. The key point is to demonstrate that commitments to cooperation are credible. Specific procedures for enhancing credibility include staking one's honor on a pledge to cooperate, posting a bond to be forfeited in the event of a failure to cooperate, agreeing to accept public sanctions for uncooperative behavior, and so forth. As usual, the trick is to design procedures for maximizing assurance that take into account the specific features of the case at hand.

Suppressing misuses of cyberspace is complicated by the fact that the relevant behavior is driven by different forces. Whereas antisocial behavior on the part of individuals may arise from a variety of psychological problems, the actions of criminals seeking to maximize financial gains often reflect careful benefit–cost calculations, even though they center on activities that break the law or violate established norms. Misuses of cyberspace on the part of states or government agents, on the other hand, generally involve efforts to achieve influence or exercise power in pursuit of the national interest or the interests of a ruling elite. It seems clear that there are no policy instruments that will prove effective in dealing with the full range of misuses of cyberspace. One thing that is likely to be useful in all these cases, however, is the development of procedures for monitoring, reporting, and verifying that can provide accurate and timely warning regarding the occurrence of various misuses. As the case of determining exactly who is meddling in various ways in electoral processes makes clear, it can be extremely difficult to devise effective procedures of this sort, especially in settings where actors are considered innocent until proven guilty and there is sensitivity about intrusive measures that constitute violations of rights to privacy. It follows that devising procedures for information-gathering that are both effective and normatively acceptable will constitute a cutting-edge concern in this realm during the foreseeable future.

Because private companies and even individuals will be able to engage in applications of biotechnology in such forms as germline editing, governance in this realm is a matter of finding effective ways to guide the actions of those who have access to the relevant technologies. While regulatory measures may be helpful in this regard, it may make more sense in a variety of cases to rely on principled governance, an approach that features the development of ethically based codes of conduct, the use of various forms of licensing or certification, and the creation of accountability mechanisms to verify proper conduct and to impose sanctions on misconduct. The basic idea here is to socialize individuals to ensure that they have a clear sense of right and wrong regarding the relevant activities, to update their understanding in situations featuring rapid change, and to provide sanctions in cases of wrongdoing. As the examples of medical ethics and legal ethics make clear, there is no way to make such arrangements foolproof in the sense that they rule out all forms of corruption. But policy instruments involving systems of professional ethics that are grounded in normative or moral principles, well maintained, and regularly updated may offer the best way forward in dealing with applications of biotechnology. The choice of this approach opens up numerous detailed questions concerning the policy instruments needed to operationalize it in specific settings.

7 PROJECTING FUTURE PATHWAYS

The 21st century's grand challenges have a number of things in common. They are all embedded in complex systems; they are all difficult to cope with using familiar approaches to governance; they all require responses that are planetary in scope; and they all call for urgent and sustained attention. But this does not mean that all four present challenges that are broadly similar in nature. And it most assuredly does not mean that one size will fit all when it comes to devising governance systems to solve or manage the relevant problems. In closing this chapter, I draw on the preceding analysis to highlight what I see as the likely pathway to the future in each case.

The problem of climate change is, at least in principle, solvable. That is, we can envision a world that is not dependent on technologies generating emissions of greenhouse gases as a byproduct of their operation. But making the shift from the existing socioeconomic system to an alternative climate-friendly system will require transformative change rather than a more limited reformation of the existing system (Scheffer 2009). Whether or not the trigger that precipitates transformative change is a matter of conscious choice or involves biophysical forces set in motion by the onset of a climate catastrophe remains to be seen. From the point of view of governance, however, the central question is whether it is possible to achieve a managed transformation in contrast to more chaotic transformation occurring in the absence of effective guidance. It is unlikely that familiar regulatory approaches to governance will prove effective in either case. The entrenched interests resisting fundamental changes in the existing system will not yield to regulatory measures. Changes resulting from the biophysical impacts of climate change are not subject to conventional regulatory guidance. Under the circumstances, alternative approaches to governance, such as governing through goals, may offer more scope for effective governance than a more conventional regulatory approach when policymakers are ready to take climate change seriously.

The problem of infectious diseases that spread broadly and rapidly, by contrast, is not solvable even in principle. There will be eruptions of novel diseases from time to time; some of them are likely to pose severe threats to the lives of large numbers of people. The best we can hope for is the development of a governance system that prioritizes the development and maintenance of effective early warning systems and that emphasizes coordinated responses in contrast to shortsighted and self-interested responses on the part of major players. Providing competent early warning systems is a technical challenge that should not prove excessively difficult to handle. The coordination problem will be more difficult to address, since there will always be incentives to cheat driven by narrow individualistic motives. The governance challenge in this

connection is a matter of emphasizing the benefits of coordination and taking steps to assure individual members of the global community that they do not need to fear being exploited as a consequence of defections on the part of others.

The governance system for various uses of cyberspace (e.g., the internet, the world wide web, social media) emerged and has evolved over time in a largely spontaneous or self-generating manner, giving rise to a remarkable example of the efficacy of governance without government. But it has become increasingly clear that the same technologies that allow for constructive interactions are subject to misuse on the part of a diverse collection of actors. And the destructive potential of these misuses is on the rise. This problem, too, is not solvable in any definitive way. The best we can hope for is the development of a governance system that makes it possible to manage the problem, tracking the activities of those engaged in various misuses as promptly and accurately as possible and providing a measure of protection against the destructive consequences of specific misuses. A variety of regulatory arrangements and licensing procedures may prove useful in differentiating between legitimate and illegitimate uses of cyberspace. Nevertheless, it is clear that this problem will not go away during the foreseeable future. There is no alternative to settling for a set of procedures designed to deter illegitimate uses and to minimize the harmful impacts of such uses when they do occur.

For its part, the case of the biotechnology revolution presents a classic challenge of developing community standards regarding acceptable and unacceptable applications of novel technologies like germline editing and ensuring that those in possession of the relevant knowledge and resources are socialized to behave in ways that are compatible with these standards. This is not a new challenge; it resembles the familiar problem of developing effective codes of conduct applicable to members of the medical and legal professions. What makes the case of biotechnology a grand challenge for the 21st century is that the stakes are extremely high and the relevant code of conduct must be accepted and applied on a planetary basis. We have no relevant models to draw on in developing and applying such a code of conduct on a global scale. The steps we take and the results we achieve will not only be critical for this case; they will also have profound consequences for the future of planetary governance.

3. Steering mechanisms for social and socioecological systems

1 AN INTRODUCTION TO SOCIAL STEERING

Governance is a social function centered on steering societies away from collectively undesirable outcomes and toward collectively good ones. For example, we have a shared interest in finding ways to avoid extreme depletions of renewable natural resources or severe shortfalls in the provision of clean air resulting from the impacts of collective-action dilemmas like the tragedy of the commons or the free-rider problem. Similarly, we want to achieve sustainability featuring a proper and lasting balance among economic development, sociocultural integrity, and ecological resilience. Needs for governance dealing with matters relating to socioecological systems arise at all times and at all levels of social organization. But the onset of the Anthropocene, an era featuring the emergence of human-dominated systems on a planetary scale (Vitousek et al. 1997), has brought with it a growing concern regarding the need to avoid transgressing “planetary boundaries” involving matters like climate change and the loss of biological diversity (Steffen et al. 2004; Rockström et al. 2009; Steffen et al. 2018). A critical challenge coming into focus today is to provide a “safe operating space for humanity” in a setting characterized by high levels of uncertainty arising from the dynamics of complex systems featuring extensive telecouplings, nonlinear dynamics, and critical transitions (Rockström et al. 2009; Scheffer 2009; Scheffer et al. 2009; Young 2017).

Governance systems established to address needs for governance are social institutions, developing spontaneously, as in the case of many traditional systems guiding human uses of local commons (Ostrom 1990), or resulting from deliberate actions, as in the case of regimes articulated in legislative acts or international agreements (Young 1999). Every society develops institutions of this sort to perform the function of governance. Like all social institutions, the resultant governance systems are dynamic. They arise, adapt to changing circumstances, sometimes morph into significantly altered arrangements, and eventually recede into the background or give way in the face of efforts to respond to new or increasingly urgent needs for governance.

Often, it makes sense to assign the task of creating, administering, and adjusting governance systems to changing circumstances to governments construed as organizations authorized and supported by societies to deal with the function of governance. But this is not always the case. Although needs for governance arise in all settings, some societies (e.g., many smallscale traditional societies, international society) lack a government in the ordinary sense of the term (Bull 1977; Rosenau and Czempiel 1992). Even in settings where they do exist, governments are expensive to operate, consuming societal resources that otherwise could be applied to the pursuit of other objectives. And governments are (more or less) vulnerable to corruption, ranging from the diversion of resources from their intended uses to degeneration into profoundly corrupt or increasingly authoritarian regimes. This makes it worth thinking carefully about options for meeting needs for governance that do not rely on actions on the part of a government. My intention in identifying these concerns is not to prepare the way for a libertarian critique of the important roles that governments can and often do play in meeting needs for governance (Hayek 1973). But it is always a good idea to engage in critical assessments of proposals calling for expansions in the roles assigned to governments. In situations where there is no government to play this role and proposals to create a government (e.g., the establishment of some sort of world government) are not likely to bear fruit during the foreseeable future, there is no substitute for thinking creatively about what we have come to refer to as governance without government (Rosenau and Czempiel 1992).

To make progress toward meeting needs for governance, all governance systems must put in place mechanisms to steer or guide the actions of those subject to their provisions. In Western neoliberal thinking, there is a pronounced tendency to assume that this means introducing rules in the sense of authoritative requirements and prohibitions telling subjects what they are obligated to do or not to do under specified circumstances. Often described in terms of the idea of the rules of the game, such prescriptions constitute the hallmark of rules-based governance (North 1990). Nevertheless, rules-based governance is not the only option available to those thinking about the mechanisms available to steer the behavior of a society's members or others subject to its governance systems. Even in Western settings, a range of other behavioral mechanisms arise in specific situations to steer the behavior of relevant actors.

These observations suggest a number of questions that together constitute the principal concern of this chapter. What are the distinct types of behavioral mechanisms employed in the operation of governance systems and how exactly do they differ from one another with respect to the methods they use to influence the actions of subjects? What conditions are likely to determine the effectiveness of individual mechanisms? Or, to put this question another

way, how should we think about the fit or the match between behavioral mechanisms on the one hand and the nature of specific needs for governance, the character of the relevant actors, and the distinctive features of the broader social setting on the other? What are the major sources of the gap between the ideal and the actual in this realm, and what strategies are available for minimizing this gap in specific situations, without triggering unintended and costly side effects? Can considerations of fairness or justice make a difference regarding the performance of behavioral mechanisms used to address a variety of needs for governance? The goal of this effort to address these questions is not to determine whether some behavioral mechanisms are better than others in some general sense, much less to arrive at some conclusion regarding the best mechanism to use in thinking about ways to meet needs for governance arising in socioecological systems in today's world. What is needed instead is critical thinking about the range of mechanisms available and about the circumstances under which it makes sense to select one of these mechanisms (or some combination of them) in the effort to meet specific needs for governance.

My current applied work focuses on a class of needs for governance that are particularly difficult to address within the framework of international society treated as a society of states (Young, Yang, and Guttman 2020). Representative examples include the avoidance of disruptive climate change, the management of cyberspace, and the regulation of innovations in biotechnology including germline editing. But the issues I address in this chapter are universal. Social steering requires the operation of mechanisms to guide the behavior of relevant actors in a wide range of settings. Conclusions derived from experience with efforts to address needs for governance in any given issue area or sociocultural setting are well worth examining with care to determine whether they provide insights of interest to those concerned with meeting needs for governance arising in other issue areas or in other settings.

2 A TYPOLOGY OF BEHAVIORAL MECHANISMS

Our point of departure, then, is the proposition that, to be effective, all governance systems must establish mechanisms capable of inducing subjects to behave in ways that differ from how they would behave if left to their own devices. Governance systems make use of a range of differentiable mechanisms to perform this function in a variety of settings. This makes it important to seek clarity regarding the distinctive features of each of these mechanisms as well as the character of the governance systems within which they are embedded. The resultant distinctions are analytic; hybrid systems that make use of two or more distinct mechanisms are common in real-world situations. The construction of a typology, moreover, tells us nothing about those factors likely to determine the effectiveness of specific mechanisms in guiding behav-

ior under a variety of conditions. These issues will come into focus later in the chapter. For starters, however, my objective is to develop a well-crafted typology covering the major types of behavioral mechanisms used in governance systems in a range of societal contexts. Here, I discuss rules-based governance, principles-based governance, pledge-based governance, goals-based governance, standards-based governance, and hybrid systems.

Rules-Based Governance

Rules are authoritative prescriptions telling the members of designated groups of subjects what they are obligated to do or not to do under more or less well-defined circumstances. Many analysts – particularly those schooled in Western intellectual traditions – take it for granted that rules-based governance is the norm and that the rule of law represents the gold standard in responding to needs for governance (Chayes and Chayes 1995; Zaelke et al. 2005). Rules are enacted through the operation of authoritative procedures (e.g., legislative actions in liberal democracies) and implemented by public agencies whose mission is to translate rules from paper to practice, starting with the promulgation of regulations intended to operationalize rules for application to a range of real-world situations. In the typical case, the rules are expected to remain in place indefinitely. Two distinct but interlocking types of rules are prominent in such systems: constitutive rules and operating or regulatory rules. Constitutive rules provide general “rules of the game” relating to a broad range of issues. They are articulated typically in the form of constitutions or charters (e.g., the Charter of the United Nations). Operating rules, by contrast, consist of more focused measures (requirements and prohibitions) relating to specific issues or spatially defined areas (e.g., the regime dealing with ozone-depleting substances, the regime for Antarctica). For the most part, regulatory rules operate under the auspices of relevant constitutive rules. In the case of the ozone regime, for example, we think of this governance system as a regulatory arrangement whose elements are set forth in legally binding instruments negotiated by states operating under the auspices of the United Nations.

The development of rules-based governance systems involves several distinct steps. Once agreement is reached on the content of the rules, attention turns to the processes involved in moving them from paper to practice: operationalizing the rules in the form of regulations; establishing arrangements for monitoring, reporting, and verification; setting up compliance procedures including enforcement mechanisms if necessary; and making arrangements to produce authoritative interpretations regarding the application of the rules to specific situations when disagreements about such matters arise. Governance systems composed of sets of rules evolve over time either through the adoption of amendments or through new interpretations arising in response to changing

circumstances or shifts in relationships among members of the subject group. This makes it important to think about institutional dynamics in any effort either to understand the operation of governance systems or to evaluate their performance in addressing the needs for governance that led to their creation (Young 2010).

Principles-Based Governance

Despite its prominence in Western thinking, rules-based governance is not the only option available to those endeavoring to devise behavioral mechanisms to meet needs for governance arising in a variety of settings. Principles, in contrast to rules, are normatively grounded prescriptions indicating what subjects should or ought to do under a variety of circumstances (Young 2017). Taken together, interlocking sets of principles add up to codes of conduct or ethical systems (e.g., legal or medical ethics). Whereas rules constitute legally or politically binding obligations, principles take the form of normatively grounded codes of proper conduct. Subjects normally think in terms of the logic of consequences in deciding whether or not to comply with rules or authoritative judgments regarding applications of the rules to specific situations (March and Olsen 1998). They are more likely to be influenced by the logic of appropriateness in responding to the prescriptive implications of principles (March and Olsen 1998). Prominent international examples of principles-based governance arrangements include the Equator Principles, dealing with environmental and social risk management, and the Sullivan Principles, dealing with corporate social responsibility, particularly in situations involving racial prejudice.

Unlike rules, which are articulated in the decisions of authoritative bodies, principles normally arise and take effect through processes of socialization; they often apply to the behavior of individuals rather than the actions of states. Actors often make explicit decisions about compliance with rules, taking into account the probable consequences of noncompliance (Young 1979). By contrast, they are socialized to internalize principles, so that compliance typically takes the form of habitual behavior rather than becoming a matter of weighing the costs and benefits associated with (non)compliance on a case-by-case basis. As a result, compliance with principles is better understood as a response to social pressure rather than as a matter of enforcement. Those who think about rules-based governance commonly focus on the (prospective) use of formal sanctions as a means of enforcing compliance with rules; those who focus on principles-based governance pay more attention to normative mechanisms like naming and shaming as a means of guiding the behavior of subjects. Violators of principles are subject to ethical condemnation on the part of others; violators of rules are subject to enforcement actions on the part of designated authorities.

Pledge-Based Governance

Pledges are voluntary commitments that subjects of governance systems (e.g., regime members and other key actors) make regarding their contributions to the achievement of collectively defined objectives. Superficially, the power of pledges may seem limited by comparison with the power of legally or politically binding rules or the effects of normatively grounded principles, especially in settings where the bonds of community membership are not strong. Yet it would be a mistake to underestimate the behavioral consequences of pledges under a variety of circumstances. Consider the role of tithing in religious settings or the pledges that philanthropists make in support of good causes as examples of the behavioral significance of pledges. As the history of charitable giving makes clear, there are even cases in which those in possession of wealth compete with regard to the generosity of their contributions to worthy causes. In concrete situations, pledges are likely to vary both in kind and in size depending upon the circumstances of individual actors. A prominent case in point involves the Nationally Determined Contributions (NDCs) made by states that have subscribed to the provisions of the 2015 Paris Climate Agreement. Whereas developed states are expected to make pledges regarding quantified reductions in their aggregate emissions of greenhouse gases, developing states are more likely to make pledges emphasizing reductions in the energy intensity of major industries.

A common feature of pledge-based governance is the use of “pledge and review” procedures as a means of steering behavior toward desired ends. The Paris Climate Agreement, for example, includes a provision calling for a periodic “global stocktake” intended to operate as a means of ratcheting up the pledges of members over time (Paris Climate Agreement 2015). Members are expected to participate in a systematic review process conducted at five-year intervals in order to assess progress toward meeting common objectives regarding efforts to address the problem of climate change. The results of the review process should provide incentives for individual members to strengthen or ratchet up their NDCs during the next commitment period. Over time, the objective is to launch a stepwise progression toward solving the common problem of climate change. There is nothing automatic about such processes; they may fail to generate timely progress toward meeting needs for governance in specific situations. Still, pledge-based governance may set in motion movement in the right direction in situations where the scale of commitments needed to solve a problem is not known or pledges of the required magnitude are not feasible at the outset.

Goals-Based Governance

Goals are collectively determined priority objectives to be pursued as a matter of urgency during a specified period of time. As a steering mechanism, this governance strategy involves setting priorities, allocating resources to the pursuit of priority goals, assigning personnel, launching campaigns to galvanize action, and monitoring progress with an eye toward redoubling efforts if needed to make progress in a timely manner (Kanie and Biermann 2017). A classic case in point is the American Apollo Project launched at the beginning of the Kennedy Administration to put a man on the moon by the end of the decade of the 1960s. Prominent international examples include the objective of Millennium Development Goal No. 1 calling for a campaign to halve the number of people living on less than \$1.25 a day by 2015 and the campaign spearheaded by the World Health Organization during the 1970s–1980s to eradicate smallpox (Sachs 2015; Cueto et al. 2019). Whereas rules are normally meant to remain in place indefinitely, goals are intended to galvanize concerted efforts to meet targets during a specific time period, with the expectation that subsequent time periods will highlight new goals.

In some respects, goals-based governance constitutes an alternative to the general Western preference for the rule of law. Rules-based governance features binding prescriptions operationalized in the form of regulations that are expected to remain in place indefinitely and that are enforceable through the operation of a legal system. Governing through goals, by contrast, involves the concentration of societal resources to galvanize action toward the achievement of collectively determined objectives. This suggests that the choice between rules-based and goals-based steering mechanisms is likely to be related to underlying differences in societal structures or cultural preferences (Zhao et al. 2020). In systems featuring a clear separation between the private sector and the public sector, private actors are likely to control the lion's share of society's material resources. The role of the public sector is to regulate the behavior of private actors in the interests of avoiding collectively undesirable outcomes and achieving desirable ones. Systems featuring central planning (e.g., through the development and implementation of five-year plans), on the other hand, are not marked by such a clear separation between the public sector and the private sector. In such systems, central authorities are able to make overall decisions regarding the allocation of society's resources, a situation that lends itself to setting societal priorities and mobilizing the resources needed to pursue them collectively.

Standards-Based Governance

Standards are performance criteria that actors must meet in order to qualify for some privilege or to receive some beneficial certification. The use of standards as a behavioral mechanism is common in a variety of settings. For example, students are expected to demonstrate a certain measure of proficiency at lower levels before being allowed to enroll in higher-level courses of instruction. Those desiring to receive certification regarding green building standards (e.g., LEED silver, gold, or platinum certification) must show proof of conformance with well-defined standards. Similar arrangements are becoming increasingly common at higher levels of social organization. The Forest Stewardship Council and the Marine Stewardship Council operate certification systems dealing with sustainable harvesting practices; the International Organization for Standardization (ISO) provides standards in a number of areas (e.g., ISO 26000, which sets forth standards for businesses and organizations desiring to operate in a socially responsible way). More often than not, standards are intended to guide the actions of private actors, though there are cases in which national authorities adopt standards promulgated by organizations like ISO and proceed to apply them to those operating under their jurisdiction.

Given the voluntary nature of many standards, why do corporations and other actors accept them and make a concerted effort to live up to the relevant requirements (van der Ven 2019)? Part of the answer to this question undoubtedly lies in the logic of appropriateness. Owners of LEED-certified buildings may act, at least in part, out of a general commitment to norms of environmental sustainability. But in many cases, there are perfectly good reasons for adhering to standards rooted in the logic of consequences. Corporations, for example, may benefit from branding their products as sustainable or acquiring a reputation for adhering to high standards of corporate social responsibility. Others may value the credibility in the eyes of important constituencies expected to result from visible commitments to high standards in relevant areas. In all cases, standards-based governance raises issues of monitoring and periodic recertification. Although there are cases in which certification is a one-shot proposition (e.g., standards regarding the use of certain building materials), most situations involve a need to demonstrate continued conformance to the relevant requirements over time. Whether the issue is green building standards or sustainable harvesting practices, a critical issue involves the extent to which actors adhere to commitments to maintain high standards following initial certification. Typically, recertification practices are just as important to the performance of standards-based governance as the procedures governing initial certification.

Hybrid Systems

As I noted at the beginning of this section, these are analytic distinctions. They are useful in understanding key differences among the behavioral mechanisms used in a variety of social settings to steer or guide the behavior of relevant actors in efforts to meet needs for governance. Although some governance systems rely exclusively on a single behavioral mechanism, hybrid systems are common. Consider the case of the 2015 Paris Climate Agreement for illustrative purposes (Paris Climate Agreement 2015). This agreement articulates a well-defined goal. Specifically, it seeks to operationalize the rather vague commitment set forth in Article 2 of the UN Framework Convention on Climate Change by setting a goal of limiting temperature increases at the Earth's surface to 2°C above pre-industrial levels and striving to limit these increases to 1.5°C. It then proceeds to adopt a pledge-and-review procedure governing efforts to fulfill this goal. As noted previously, this procedure takes the form of the submission of NDCs on the part of member states coupled with the Global Stocktake process designed to ratchet up the strength of pledges over time. At the same time, the agreement highlights certain normatively grounded principles intended to guide the actions of members of the regime. A particularly prominent example is the principle of common but differentiated responsibilities introduced to separate developed countries and developing countries with regard to the nature of their obligations to contribute to meeting the common goal. Nor is the agreement lacking in rules. There are, for example, well-defined requirements relating to monitoring, reporting, and verification, which are seen as essential to the performance of the regime in meeting the relevant need for governance over time. Of course, none of this offers any guarantee that the Paris Climate Agreement will prove effective in solving the problem of climate change. At this writing, the evidence is not particularly encouraging. Nevertheless, this regime does provide a clear example of the common practice of joining two or more behavioral mechanisms together in efforts to address complex needs for governance such as the problem of addressing climate change.

Alternative Perspectives

This account of behavioral mechanisms expands the scope of mainstream thinking about governance considerably. But I do not claim that the typology I have presented is exhaustive. For one thing, it is probably fair to suggest that the forms of governance I have discussed all derive in some general sense from Western experiences and Western perspectives on ways to address the social function of governance. Governance is a social function centered on societal steering, and steering requires finding ways to guide the behavior of relevant

actors. This much seems universal. Still, there may be distinctive modes of thought regarding ways to perform this function grounded in non-Western experiences. It seems to me particularly important at this juncture to consider Chinese perspectives on governance, both because China has become a leading player on the global scene and because China's leaders, including President Xi, regularly make use of the idea of governance in discussing China's role in the world (Young, Yang, and Guttman 2020). The cultural and historical roots of Chinese thinking about governance go deep, including Confucian thinking about steering through education. But there is as yet no fully articulated modern discussion of the major sources of Chinese thinking in this area, much less sophisticated accounts of the application of the relevant ideas to contemporary needs for governance. Among the most interesting prospects in this realm that have come to my attention are the ideas associated with what Chinese thinkers describe as *tianxia* theory and *gongsheng*/symbiotic theory (Zhao 2019; Ren no date).

3 DETERMINANTS OF EFFECTIVENESS: THE PROBLEM OF FIT

There is nothing to be gained from seeking to weigh the merits of these behavioral mechanisms in an effort to determine whether one or another of them is to be preferred in some general or overall sense. Taken together, the collection of mechanisms discussed in the preceding section can be treated as a toolkit containing a range of options that will prove more or less helpful in addressing particular needs for governance. Approached in this way, the relevant question becomes: What mechanism or combination of mechanisms will produce the best results in specific situations? We can think about the resultant problem of fit from (at least) three distinct perspectives. Are specific behavioral mechanisms more or less well suited to addressing various types of problems? Are particular mechanisms likely to work better in guiding the behavior of some types of actors in contrast to others? To what extent are the different mechanisms compatible with the broader social settings within which they operate? To respond to these questions in a comprehensive manner will require extensive research. In this section, my purpose is simply to provide some initial thoughts intended to seed a more systematic treatment of the issue.

Fit 1 – Problem Types

Not all problems giving rise to needs for governance are alike. As a result, it makes sense to eschew panaceas, examining the defining characteristics of problems case-by-case in search of insights relevant to the selection of behavioral mechanisms likely to prove effective in achieving socially desirable

outcomes (Young, Webster et al. 2018). Consider the following examples as illustrations of this proposition. It is possible to solve some problems once and for all (e.g., the eradication of smallpox), whereas other problems (e.g., the control of nuclear weapons) require attention on an ongoing basis. Goals-based governance may provide an effective and efficient strategy for addressing problems like the eradication of smallpox. But rules-based governance makes more sense in a case like the control of nuclear weapons, where there are good reasons to believe that the challenge will remain a prominent concern over time. In some cases, the choice of behavioral mechanisms may be sensitive to the way we choose to frame a need for governance. If we approach the problem of climate change as a matter of transforming economies to eliminate or drastically reduce the use of fossil fuels, for instance, it makes sense to think of the challenge as a matter of pursuing the goal of economic transformation. If we take the view that some form of geoengineering will be necessary to meet the challenge of climate change, on the other hand, there will be a need to devise a regulatory regime imposing requirements and prohibitions on the practice of geoengineering over the long run.

Collective-action problems (e.g., the control of ozone-depleting substances) differ from problems featuring externalities (e.g., long-range air pollution, marine dead zones) in ways that have important implications for the selection of behavioral mechanisms. Whereas actors involved in collective-action problems have (more or less strong) incentives to cooperate on their own, those whose actions produce externalities have little incentive to alter their behavior in the absence of intervention on the part of society. This suggests that pledge-based governance coupled with reassurance procedures may work in a case like controlling emissions of greenhouse gases where individual subjects are willing to make good on their pledges so long as they are confident that other members of the group are able and willing to do the same. But it is hard to avoid the conclusion that regulatory measures will be needed to steer the behavior of those who are sources of externalities, unless and until they make fundamental changes in the activities that cause the problem (e.g., switching to energy sources that do not generate emissions of greenhouse gases).

Some problems are more volatile than others in the sense that they involve complex systems subject to nonlinear and often surprising changes. In dealing with volatile systems, there is a need to avoid lock-in so that it is possible to adapt governance systems relatively easily and quickly to changing circumstances (Young 2017). This is apt to present a (more or less) serious problem in the context of rules-based systems, especially where altering or even amending the rules is likely to involve contentious processes and may fall victim to gridlock. On the other hand, since rules-based systems may have advantages arising from the willingness of subjects to comply with requirements and

prohibitions they accept as legitimate, there will often be a tradeoff between the advantages of rules-based governance and the virtues of other behavioral mechanisms featuring pledges or standards. Achieving an optimal balance between the two may prove difficult. But especially in today's setting, which features increasingly complex and volatile systems, there are good reasons to recognize the importance of this tradeoff and to make a concerted effort to achieve a suitable balance on a case-by-case basis.

What these examples have in common is a concern for matching the character of the behavioral mechanism(s) employed to the key features of the problem to be solved (Galaz et al. 2008). Obviously, such examples are merely illustrative of a major challenge confronting those interested in meeting needs for governance in a wide range of settings. Addressing the problem of fit does not lend itself to the conduct of routinized analysis, especially as we find ourselves dealing with increasingly complex systems. To meet this challenge, we need critical thinking both about the intrinsic character of different needs for governance and about alternative ways to frame specific problems that have important implications for the choice of mechanisms to steer the behavior of key actors in specific settings.

Fit 2 – Types of Actors

Just as not all problems are alike when it comes to matters of steering, there are also variations among types of actors that have significant implications for the operation of behavioral mechanisms. Consider the following examples as illustrations of this proposition. Whereas many conventional models start from the assumption that all actors are rational and self-interested utility maximizers who employ some sort of benefit–cost calculations in making choices, the contributions of behavioral economics over the last several decades have revealed the limits of this assumption (Kahneman 2011; Thaler 2015). We now know, for instance, that some actors are absolute gains maximizers while others are concerned with relative gains, that actors have different discount rates in thinking about the future consequences of the choices they make today, that actors vary in terms of their sensitivity to the logic of appropriateness in contrast to the logic of consequences, and that some actors are more concerned than others about the impacts of their actions on the welfare of others. The implications of these and other similar findings regarding the operation of behavioral mechanisms are far-reaching. Principles-based governance may work well among actors sensitive to the logic of appropriateness. Actors with low discount rates are likely to be more receptive to pledge-based governance dealing with long-term concerns like climate change than those with high discount rates who care little about longer-term consequences. Steering the behavior of relative gains maximizers, on the other hand, is apt to require

rules-based governance systems backed by well-developed compliance procedures including a capacity to make use of meaningful sanctions. Clearly, the range of variation in this realm is broad; the use of simplistic assumptions in the interests of achieving analytic tractability is not likely to help in meeting real needs for governance.

There is an important distinction in this context between actors that are collective entities versus those that are individuals. To be sure, individuals may experience more or less severe inner conflict regarding their behavior in situations featuring needs for governance. There is nothing surprising, for example, about cases in which individuals are torn between normative pressure to abide by ethical principles and a self-interested desire to take advantage of opportunities to maximize material rewards accruing to themselves. Nevertheless, there is an important difference between individuals and collective entities (e.g., states, corporations) whose behavior is subject to the logic of two-level games (Putnam 1988). The external behavior of collective entities is subject to internal bargaining processes involving interest groups whose motivations and preferences may vary dramatically. From the perspective of governance, this suggests the value of making use of two or more behavioral mechanisms at the same time. While principles-based or standards-based governance may attract the support of some factions in the internal bargaining processes of subjects, for instance, others may be more responsive to rules-based governance calling attention explicitly to procedures emphasizing matters of compliance and enforcement.

There are as well cases in which the group of subjects whose actions are relevant to a need for governance includes individual members that differ greatly from one another regarding the sources of their behavior. A prominent case in point arising in efforts to address problems like climate change involves the distinction between liberal democracies characterized by a clear separation between the public sector and the private sector and centrally planned systems featuring some form of top-down or authoritarian decision-making (Young et al. 2015). It is difficult to devise rules-based arrangements that work equally well in steering the behavior of both types of actors. In such cases, a combination of rules-based and goals-based governance may prove attractive. The essential feature of such arrangements, exemplified by the Paris Climate Agreement, is the articulation of a common goal coupled with an arrangement allowing individual subjects to make pledges reflecting the distinctive features of their own internal systems. As in the case of problem types, the message here is straightforward. Addressing the problem of fit requires a willingness to devise behavioral mechanisms whose defining features are well matched to the character of the actors involved.

Fit 3 – The Broader Setting

What is more, governance systems are sensitive to the character of the broader settings within which they operate. Most governance systems are specific arrangements developed, whether spontaneously or intentionally, to address particular needs for governance. But they operate within broader socio-economic and political settings that affect their ability to steer or guide behavior effectively. This suggests the importance of thinking about the design of behavioral mechanisms for use in specific cases with an eye toward achieving compatibility with the established practices of the setting in which they will operate. Whereas a governance system that fits comfortably within the ambit of a society's normal or conventional practices may experience relatively smooth sailing, a system that departs in important ways from mainstream practices may run into trouble before it gets off the ground.

In some cases, issue-specific governance systems can take advantage of the existence of overarching arrangements to avoid the need to address some functions on a case-by-case basis. Consider arrangements dealing with matters of compliance and authoritative interpretation as cases in point. Where societies have properly functioning enforcement agencies and legitimate judicial institutions, issue-specific systems may be able to make use of these arrangements to deal with matters of compliance and dispute settlement, avoiding the need to create costly and potentially controversial arrangements of their own. Similar observations are in order regarding procedures for adjusting the provisions of issue-specific governance systems to meet changing conditions. Nevertheless, some words of caution are in order regarding the advantages of ensuring compatibility with overarching social practices. In some cases, established practices may be part of the problem rather than part of the solution. There is a legitimate question, for example, whether Western practices grounded in what analysts think of as the rule of law are capable of introducing the transformative measures needed to come to terms with a problem like climate change.

It is also worth noting that the social practices we associate with the broader setting may be subject to change themselves. While some see international society as an unchanging anarchical system of sovereign states seeking to maximize relative gains in the absence of anything like a government, others take the view that this system is experiencing significant change regarding both the character of its members and the defining features of its social practices (Bull 1977; Hurrell 2007; Zürn 2018). In a setting of this sort, issue-specific governance systems may become agents of change in contrast to subordinate arrangements that must conform to established societal practices in order to become effective. To return to the case of climate change, the actions required to come to grips with this problem may well call for significant adjustments in

the character of international society. As the history of efforts to address the problem of climate change makes clear, such adjustments do not come easily. Nonetheless, when this problem precipitates a severe systemic crisis, there may be no other way to solve it.

4 CAN CONSIDERATIONS OF FAIRNESS OR JUSTICE MAKE A DIFFERENCE?

There is a growing interest in discussions of governance in considerations of fairness or justice. What should we make of this development with regard to the concerns of this chapter? Many of the resultant contributions focus on issues of substantive justice. Do behavioral mechanisms treat the rights and interests of (groups of) subjects fairly? Do outcomes flowing from the operation of governance systems accord with relevant criteria of distributive justice? Clearly, these are important questions. But it is equally clear that they are difficult to answer persuasively in many – perhaps most – real-world settings. Part of the problem lies in disagreements regarding the appropriate standards of fairness to employ in evaluating the performance of the behavioral mechanisms involved in efforts to deal with specific needs for governance. Those looking at the same governance system from different vantage points can and often do arrive at fundamentally different conclusions regarding the fairness of the outcomes. A striking contemporary example involves proposed solutions to the problem of climate change, which many Americans regard as unfair to the United States, while most others see them as unfair to themselves. Another part of the problem arises from difficulties in establishing clear causal connections between the operation of governance systems and outcomes evaluated from the perspective of fairness or justice. As those struggling to assess the performance of international regimes know well, establishing causality in this realm is difficult both because multiple drivers play more or less significant roles in specific situations and because what is often described as conjunctural causation makes it hard to attach specific weights to the importance of governance systems (Ragin 1987; Young 2011). As a result, debates about the extent to which the operation of specific institutions yields outcomes that are fair or just in distributive terms often degenerate into acrimonious and inconclusive arguments.

There is another perspective on issues of fairness or justice that may prove more helpful in thinking about the performance of the behavioral mechanisms governance systems use to guide behavior in a variety of settings. This perspective focuses on what is typically called procedural fairness or justice; it asks whether there are links between the extent to which subjects regard the operation of a behavioral mechanism as fair in procedural terms on the one hand and the effectiveness of the mechanism in steering behavior in the desired

direction on the other. This line of thinking rests on a sizable body of research demonstrating that actors of various types are willing to accept outcomes they feel have been arrived at through the use of fair procedures that they would be unwilling to accept when they regard them as emanating from processes they see as unfair or unjust (Gupta and Mason 2014). Often, these links are hard to account for in terms of mainstream models that treat actors as self-interested utility maximizers. But to the extent that this is the case, it is testimony to the inadequacy of the models rather than to the irrationality or uninformed behavior of the relevant actors.

These observations suggest the value of conducting systematic research on the links between the performance of behavioral mechanisms and the role of procedural justice. We might begin by asking whether a sense of procedural justice is either necessary or sufficient for the behavioral mechanisms used in governance systems to achieve success in steering or guiding the behavior of relevant subjects. While there is an obvious need for systematic analysis regarding this question, it seems unlikely that such research will yield an affirmative response to the question. There is little doubt that some behavioral mechanisms will fail to produce the desired results, even when subjects generally regard them as fair or just in procedural terms. Conversely, it would be difficult to make a persuasive case for the proposition that behavioral mechanisms can never achieve success in steering or guiding behavior in the absence of feelings on the part of subjects that they meet relevant standards of procedural fairness or justice.

Still, this leaves ample room for additional analysis regarding links that make a difference, though they do not qualify as necessary or sufficient conditions. What seems important in behavioral terms is the extent to which subjects themselves regard mechanisms as fair or just in procedural terms, rather than the extent to which the mechanisms conform to standards lodged in the minds of outside observers. This suggests the importance of asking about conditions that are likely to determine whether subjects feel behavioral mechanisms are fair or just in procedural terms. Can we develop broad generalizations in response to this question? Are feelings of procedural fairness or justice likely to be situation-specific? Are the same mechanisms that some see as operating in a fair or just manner likely to be dismissed as unfair or unjust by others? In principle, at least, these questions fall within the scope of topics suitable for systematic research. The development of well-grounded answers, even if they confirm the supposition that feelings of fairness or justice are situation-specific, would be of great interest to those who are concerned with the challenge of meeting needs for governance arising in the Anthropocene.

5 THE GAP BETWEEN THE IDEAL AND THE ACTUAL

What is commonly described as the gap between the ideal and the actual arises with regard to all social institutions, including governance systems. The way a governance system works in practice will diverge to a greater or lesser degree from the way it works in principle or on paper. We are used to considering this phenomenon in the case of rules-based governance where it is normal to contrast the rules in use with the rules on paper (Ostrom 1990). But similar observations are in order regarding all the behavioral mechanisms considered in this chapter. It is seldom, if ever, possible to close the gap between the ideal and the actual completely. But in most cases, there are opportunities to narrow the gap. A first step in dealing with this concern is to understand both the sources of the gap and the likely effects of the gap on the operation of specific governance systems. This can provide a point of departure for thinking about strategies for closing the gap. Here, I illustrate these observations with reference to the cases of rules-based and goals-based governance.

What are the sources of governance failure in the case of rules-based governance? Efforts to enact rules in legislative settings or to reach agreement on the provisions of international agreements may fail, ending in gridlock or stalemate. Even when they do succeed, the compromises needed to reach agreement may make the results incoherent or give rise to formulations that are framed in such vague or ambiguous terms that it is difficult to make sense of them when it comes to making the transition from paper to practice. There is as well a range of concerns relating to the implementation of rules-based governance systems and the occurrence of unintended consequences arising from the application of such systems to specific cases. These concerns range from the deadening effects of bureaucratic red tape to the occurrence of endless legal battles and on to the problems associated with economic and political corruption. There are many cases in which compliance procedures and enforcement mechanisms fail to develop or remain underdeveloped so that actual behavior bears little resemblance to expectations associated with the rules in use, much less the rules on paper. There is nothing inevitable about the occurrence of any of these problems. Taken together, however, they present serious challenges that those seeking to create effective rules-based governance systems neglect at their peril. This means efforts to reduce the gap between the ideal and the actual must constitute a constant concern for those committed to using the promulgation and application of rules as a means of steering behavior in a wide range of settings.

Similar remarks are relevant in the case of goals-based governance. Efforts to set priorities often bog down or produce ambiguous results, especially in set-

tings where numerous influential stakeholders pursue disparate goals (Kanie and Biermann 2017). As the case of the UN's Sustainable Development Goals makes clear, a common outcome of efforts to set priorities is the inclusion of so many distinct elements that the results are hard to differentiate from situations in which there are no clear priorities. Goals-based governance also may suffer from the provision of inadequate resources, the absence of effective leadership, and the lack of well-defined and easily understood indicators to assess progress toward the fulfillment of the goals along the way. Nor is goals-based governance immune from conventional forms of corruption featuring favoritism in the assignment of tasks or the siphoning off of public resources to promote private purposes. Here, too, the opening up of these gaps between the ideal and the actual is not inevitable. But falling prey to one or more of these perils is always a possibility, and those desiring to govern through goals effectively must be alert to these concerns during all phases of the governance process.

Any effort to evaluate the effectiveness of a behavioral mechanism or the performance of the governance system of which it is a part must take the actual rather than the ideal as a point of departure. Still, this does not rule out initiatives aimed at reducing the gap between the ideal and the actual in specific situations. There are no simple recipes for closing this gap. But there are strategies for minimizing the gap that may prove (more or less) effective in specific situations. It is important to pay close attention to creating governance systems that are well suited to addressing specific needs for governance. A good match between the problem at hand and the governance system created to address it provides no guarantee regarding efforts to minimize the gap between the ideal and the actual. But a bad match increases substantially the probability of a sizable gap arising. It is important as well to maintain vigilance in this realm, tracking progress closely and building in procedures for making mid-course corrections to minimize the gap between the ideal and the actual while governance systems are in operation. While there is no simple formula for dealing with this challenge, a variety of procedures are worth considering, including the launching of pilot projects, legislative oversight, government accounting procedures, and the use of the courts both to bring pressure to bear on administrators to implement the provisions of governance systems faithfully and to sanction those who abuse their authority in such settings or engage in corrupt practices.

An important concern in thinking about strategies for reducing this gap centers on the danger of generating unintended and often unforeseen side effects in the course of endeavoring to minimize the gap between the ideal and the actual. Perhaps the most obvious danger arises from the impacts of authoritarian procedures designed to force agreement on priorities, to cut through red tape, to galvanize campaigns to fulfill goals, to deter various forms of corruption, and so forth (Zhao et al. 2020). The problem here is that proce-

dures introduced in the interests of maximizing the effectiveness of behavioral mechanisms may produce side effects in terms of the loss of capacity to innovate or the infringement of civil liberties that are just as costly to society as a failure to deal effectively with some specific needs for governance. Efforts to close the gap between the ideal and the actual with regard to specific needs for governance may trigger the development of a higher-order gap between the ideal and the actual regarding overarching societal values. There is no simple recipe for avoiding this danger. But fostering awareness of the problem is certainly a necessary step for those seeking to avoid falling into this trap.

6 A CONCLUDING OBSERVATION

Readers may interpret the argument of this chapter either in positive terms or in normative terms. In positive terms, the central objective is to clarify differences among types of governance systems, to identify conditions under which governance systems are likely to rely on one behavioral mechanism or another, and to offer some insights regarding the effectiveness of governance systems operating in real-world settings. From a normative perspective, on the other hand, the principal objective is to provide insights that may prove helpful to those responsible for devising governance systems to meet specific needs for governance and for operating these systems under real-world conditions. In both cases, the analysis raises more questions for further consideration than it is able to answer in a compelling fashion. We know some things that are relevant to meeting the challenge of steering toward sustainability. But we need to know much more about this subject, especially as we endeavor to put in place behavioral mechanisms and, more broadly, governance systems capable of addressing urgent needs for governance arising in the Anthropocene.

4. What do we mean when we speak about the effectiveness of governance systems?

1 THE PROBLEM OF EFFECTIVENESS

A prominent strand of thinking about international or global governance systems and about environmental governance systems in particular asserts that these systems typically perform poorly and sometimes fail altogether. Gus Speth, a former administrator of the UN Development Programme, says that “efforts to protect the global environment have largely failed” and that “more of the same will not get us where we want to be in time to head off an era of unprecedented environmental decline” (Speth 2004, xi). Jacob Park and his colleagues argue that “there has been an enormous vesting of intellectual energy and political capital in efforts to build issue-specific interstate agreements – despite precious little evidence of their effectiveness” (Park et al. 2008, 8). Ken Conca, who directs attention specifically to the role of the United Nations in addressing largescale needs for governance, says that “we also find a UN record of failure, inaction, and disappointment. The fabric of international environmental law, though not entirely threadbare, contains many tears and missing strands” (Conca 2015, 3). And Thomas Hale, David Held, and Kevin Young, focusing on international governance more generally, describe what they call “a ‘governance gap’ in which crucial needs go unmet” (Hale et al. 2013, 3).

Skepticism of this sort is certainly understandable. The regimes created in the 1990s to address the issues of climate change and the loss of biological diversity have failed to prevent the onset of climate change or to stem mounting losses of biodiversity. The governance system for trade that crosses national boundaries, which seemed robust as recently as the 1990s, is now in tatters. The nuclear nonproliferation regime has not stopped additional states from obtaining nuclear weapons or initiated a phaseout of such weapons on the part of existing nuclear powers. Although international wars of the traditional sort are now uncommon, largescale domestic violence occurs frequently, and outsiders intervene regularly in such situations in a forceful manner without

seeking authorization from the United Nations. Armed interventions in the former Yugoslavia and in Syria are particularly prominent cases in point. Nor are great powers shy about deploying military force to bring about desired changes in the domestic systems of smaller countries. The American intervention in Iraq and the Russian intervention in Ukraine in the absence of authorization from the United Nations illustrate this class of cases. No wonder, then, that the skeptics ask whether institutions really matter at the international or global level and whether, in the final analysis, we are operating in a world in which outcomes are determined largely by the ability of individual actors to exercise power in one form or another.

Still, it is by no means clear that this is the whole story regarding the effectiveness of governance of world affairs (Young 1999). In this chapter, I take a step back to ask what we mean when we speak about the effectiveness of social institutions operating beyond the level of individual states. In responding to this question, I distinguish among what I will call constitutive, issue-specific, and positional effectiveness. This move makes it clear right away that success in solving specific problems like the looming threat of climate change constitutes only one dimension of what is at stake when we speak about the effectiveness of international or global institutions. Institutions may produce significant consequences in terms of one dimension of effectiveness, even while they perform poorly or fail outright with respect to other dimensions. Particularly important in this connection is the distinction between effectiveness understood as solving problems and effectiveness construed as making a difference in the realm of world affairs.

Adopting this broader perspective, I argue that international or global institutions are often quite effective. In efforts to deal with specific concerns like the impacts of climate change, existing institutions may emerge as part of the problem rather than serving as a basis for crafting solutions. But this is surely not the same thing as asserting that institutions are ineffective or do not matter. We may not like the results that institutions produce, especially when they lock us into arrangements that impede our efforts to address increasingly urgent problems. This phenomenon is by no means peculiar to the realm of world affairs. Those concerned with domestic problems like the impacts of systemic racism or extreme inequality are just as frustrated by the difficulty in overcoming institutionalized biases as those seeking to address global problems like the onset of climate change. The challenge in such cases is to break the grip of entrenched institutions, without at the same time triggering a broader or more general breakdown of social order.

2 TYPES OF EFFECTIVENESS

The literature on international regimes that took root during the 1970s and has become an influential stream of work in the field of international relations is largely issue-specific in the sense that it directs attention to efforts to come to terms with more or less well-defined problems like avoiding severe depletions of fish stocks, combatting transboundary air pollution, halting the spread of nuclear weapons, or preventing battles over jurisdictional claims in Antarctica (Krasner 1983). Those who have produced this literature have taken the question of effectiveness seriously. For example, they have introduced an important distinction among outputs, outcomes, and impacts, where outputs involve creating the arrangements needed to administer regimes, outcomes have to do with the extent to which regimes influence the behavior of subjects, and impacts then become a matter of the extent to which regimes solve or alleviate the problems that led to their creation (Miles et al. 2002; Underdal and Young 2004). They have also exhibited a healthy regard for the difficulties involved in establishing causal connections between the creation of regimes and the occurrence of outcomes and impacts (Young 2011). It is one thing to say that there is a causal connection between the negotiation of an agreement and the establishment of the administrative apparatus required to move its provisions from paper to practice. It is far more complicated to show that the operation of a regime caused changes in the behavior of subjects or produced a solution to the problem. We are increasingly conscious of the role of complex causality in which institutions constitute one of a number of driving forces; we know that sorting out the relative importance of individual drivers is a challenging task.

These are significant achievements in our efforts to understand the effectiveness of institutions. But they do not exhaust the conceptual issues associated with the question of whether, how and to what extent institutions make a difference. Another important dimension of effectiveness encompasses what I call constitutive effectiveness. A helpful, though not entirely precise, way to think about this form of effectiveness is to say that constitutive institutions identify the players, assign roles to them, and lay down the general rules of the game governing the social practices in which they engage. But they do not determine the content of the specific issues addressed by the participants in these practices or the character of the regimes that participants create to deal with these issues. The Charter of the United Nations, for example, is constitutive in this sense. It starts with a general statement of purposes and principles and then proceeds to spell out criteria regarding membership in the United Nations, to establish the principal organs of the body, to clarify the respective roles of these organs, to specify decision rules for each of the organs, and to spell out procedures for amending the Charter. But the Charter does not

say anything regarding the treatment of substantive issues like the spread of nuclear weapons, the regulation of international trade, or the prevention of climate change. When we describe the UN Framework Convention on Climate Change and the Convention on Biological Diversity as UN conventions, what we mean is that they conform to the constitutive provisions set forth in the Charter. Thus, the members of these conventions are states; interactions among them reflect procedures developed by the UN and disputes regarding provisions of these conventions may be referred to the International Court of Justice if the parties are unable to settle them by other means.

Effectiveness, on this account, is a matter of the extent to which a constitutive arrangement is successful in structuring interactions among its members as they engage in efforts to address specific issues or problems. An arrangement like the Charter of the United Nations may be highly effective in constitutive terms, whether or not regimes established to address specific problems are successful in solving those problems. In some cases, constitutive effectiveness may emerge as part of the problem rather than part of the solution in efforts to address specific problems. Constitutive arrangements are often sticky in the sense that they are resistant to change in the face of all but the most extreme pressures. To the extent that emerging conditions differ more or less drastically from conditions prevailing at the time a constitutive arrangement was created, features of the arrangement may become impediments to problem-solving. The guarantee regarding domestic jurisdiction articulated in Article 2(7) of the Charter, for example, is regarded by many as a barrier to the development of innovative measures to address a range of issues pertaining to human rights and environmental protection. The language of the article makes it clear that the guarantee cannot block or stymie actions under the provisions of Chapter VII dealing with threats to the peace, breaches of the peace, and acts of aggression. This reflects the principal concerns of those drafting the language of the Charter at the close of World War II. But the provisions of Article 2(7) do constitute a significant impediment to efforts to address problems like climate change that have risen to the top of the planetary agenda today. Nevertheless, it is hard to envision practical ways to adjust the language of the Charter at this stage in response to this limitation.

There is a third conception of effectiveness that deserves separate treatment in this discussion. It encompasses what I call positional effectiveness and centers on the determination of who gets what at the international or global level. Just as domestic institutions (e.g., systems of property rights) are compatible with conditions featuring more or less extreme inequality among individual citizens and may even serve to entrench such conditions, international institutions (e.g., systems of sovereign rights) are compatible with extreme inequality among the members of international society and constitute a barrier to some approaches to dealing with this matter. For example, there is no pro-

vision under existing international institutions dealing with fairness or justice in the distribution of wealth or with the responsibility of wealthy members of international society to make a good faith effort to assist with the development of poorer members. In this sense, institutions matter whether or not we like the consequences they produce. Somewhat similar comments are in order regarding more specific issues that are positional in nature. Under the law of the sea as it stands today, for example, coastal states have rights to exploit the resources of sizable chunks of the world ocean, while non-coastal states have no rights to these marine resources. Outer space, by contrast, is open to use by all members of international society. But it is important to note that only those who have access to advanced technologies are in a position to take advantage of this right. The point is that institutions can and do make a difference in positional terms, whether or not they are a help or a hindrance when it comes to addressing specific problems like the spread of nuclear weapons, the protection of human rights, or the avoidance of severe depletions of stocks of renewable resources.

Two additional conceptual issues deserve consideration before we move on to more substantive matters. The first concerns what a number of authors have taken to calling architectures of global governance (Biermann and Kim 2020). Analysts interested in regimes realized some time ago that there are many cases in which two or more distinct institutional arrangements have grown up to deal with interrelated issues, like plant genetic resources, endangered species, transboundary air pollution, or climate change (Raustiala and Victor 2004; Keohane and Victor 2009). In cases where individual elements interact more or less significantly but are not related to one another in hierarchical terms, researchers have taken to describing the resultant situations as regime complexes or governance complexes (Gomez-Mera et al. 2020). There is now a lively discussion among those who work in this field about mechanisms for the management of regime complexes and the prospects that intergovernmental organizations of one sort or another can play constructive roles in orchestrating situations of this kind to alleviate tensions or encourage the growth of synergy among the elements of regime complexes (Abbott et al. 2020; Stokke 2020).

Proceeding to the next level, some analysts have noted that there are sometimes interactions among regime complexes or what they treat as international networks. Thus, Biermann and Kim define a governance architecture “as the overarching system of public and private institutions, principles, norms, regulations, decision-making procedures and organizations that are valid or active in a given area of global governance” (Biermann and Kim 2020: 4) As they put it, architecture refers to the macro level of governance. Whether the concept of architecture defined in this way proves to be an important contribution to the literature on global or Earth system governance remains to be seen. But what I want to emphasize here is the distinction between architectures and what

I have described as constitutive institutions. The idea of architecture seeks to draw together regimes, regime complexes, intergovernmental organizations, transnational networks, and various types of nonstate actors in the interests of developing an integrated understanding of how institutions work in broad issue domains. But architectures, on this account, may or may not be constitutive as I have used the term in my description of constitutive institutions. In fact, much of the discussion of architectures appears to assume that constitutive issues are dealt with outside the scope of these institutional structures.

The second conceptual issue has to do with the issue of institutional fragmentation (Biermann et al. 2020). While the term crops up often in recent discussions of international governance, analysts have used the term to refer to a number of phenomena. So, it is important to be careful in commenting on assertions about fragmentation. Still, we can be clear about one major issue. Within a single constitutive system, those dealing with needs for governance can and generally do devise substantive regimes or governance systems to address a variety of specific issues. In domestic systems, for example, legislatures operating within the framework of a single constitutional system create regimes or governance arrangements dealing with health care, education, civil rights, commerce, employment, property, taxation, publicly owned land, environmental protection, and so forth. Of course, tensions at the interfaces between or among these regimes arise from time to time, and governments turn to administrative or legal procedures to address these tensions. It is possible to describe the resultant landscape of governance systems as fragmented in the sense that there is no higher order or synoptic structure available to fit all the pieces of the puzzle together coherently. But it is not clear that this observation adds anything important to our understanding of the nature of governance systems. Much the same can be said of governance systems operating at the international or global level. For example, there are hundreds of multilateral agreements setting up regimes pertaining to environmental matters alone. The same observation can be made about regimes located within other issue domains. All these arrangements operate within the overarching constitutive framework of international society, as articulated in the Charter of the United Nations and other authoritative sources. The result can be described as fragmented in one sense of that term. Certainly, this is not a trivial matter. Nevertheless, situations of this kind constitute a fact of life when it comes to understanding the world of governance systems in all human societies. That is, fragmentation in this sense is a reality that needs to be recognized and dealt with properly rather than a defect that we may be able to eliminate or overcome with sufficient effort.

3 CONSTITUTIVE EFFECTIVENESS

From the perspective of governance, the most significant constitutive arrangements operating at the Earth system level center on the institutions that define the planetary system as a society of states in which membership is reserved exclusively for social entities that qualify as states, and the operation of the principle of sovereignty ensures that states have a right to handle their domestic affairs without interference on the part of outsiders coupled with a right to refuse to acknowledge or accept international obligations in the absence of their explicit consent. Of course, compliance with these provisions is not perfect. Powerful states sometimes intervene directly in the internal affairs of weak states and often exert pressure on them to accept obligations they would otherwise reject. As numerous observers have noted, a variety of nonstate actors have worked hard to acquire significant roles in this social environment and succeeded in acquiring real influence in some realms. Nonetheless, the constitutive effectiveness of the institutions that define international society as a states system is undeniable.

Whether the results are desirable or undesirable is another matter. There is growing evidence that some of the grand challenges of governance in the 21st century identified in Chapter 2 (e.g., preventing the eruption of pandemics or controlling misuses of cyberspace) will prove difficult – perhaps impossible – to deal with effectively in an institutional setting dominated by sovereign states. But this tells us nothing about the constitutive effectiveness of the prevailing system or, in other words, the extent to which it makes a difference with respect to the treatment of needs for governance. For better or worse, we can expect to operate for some time in an institutional setting in which efforts to address needs for governance typically involve the negotiation of international legally binding instruments among groups of sovereign states.

Given the constitutive effectiveness of the states system, it is surprising how recently this institutional arrangement has achieved dominance on a global scale. We are used to dating this development from the 1648 Treaty of Westphalia ending the Thirty Years War. But even in Europe, it makes little sense to speak of a fully fledged society of states prior to the unification of Germany and Italy in the second half of the 19th century and quite possibly prior to the dissolution of the Austro-Hungarian and Russian empires in the aftermath of World War I. As to the rest of the world, the spread of the states system is a product of the 20th century and, in many cases, of the period following the close of World War II. The British and French empires, Japanese control of sizable parts of Asia, and the international concessions in China are all difficult to square with the idea of international society as a society of sovereign states. The spread of the states system to encompass all the terrestrial

portions of the Earth system owes a great deal to the success of the drive to promote decolonization during the course of the decades following World War II. It would be a mistake to exaggerate the role that the United Nations played in this process. Still, it is worth noting that the Charter of the United Nations envisions a global system and that it is based squarely on the idea that international society is and should be organized as a society of states.

All this suggests that international society is not static and that it is not naive to think about alternatives to the states system or at least the development of constitutive arrangements in which nonstate actors achieve recognition as legitimate rights holders in the not-too-distant future. It is not easy to forecast how constitutive changes will occur and exactly where such changes will lead at the global level. For some time, we have looked primarily to processes of economic globalization with its emphasis on the proposition that multinational corporations operating global supply chains that states find difficult or impossible to control will become serious rivals to states in the competition for constitutive legitimacy at the global level. At this stage, doubts about the persuasiveness of this line of thinking are growing. But other developments have emerged to challenge the dominance of the states system going forward. The onset of the cyber age and the growing importance of virtual systems, in particular, are threatening the dominance of states (Young, Yang, and Guttman 2020). A range of nonstate actors (including technologically sophisticated individuals) are able to make use of virtual systems to pursue their objectives in ways that states are unable to control effectively. The rise of technologies that enable various forms of cyber manipulation, cyberterrorism, and cyberwarfare is producing a world in which we can no longer take for granted the dominance of states when it comes to addressing major needs for governance. While this tells us little about what lies ahead, it does raise questions about the effectiveness of the constitutive institutions of the states system.

The constitutive institutions of the states system apply in a straightforward manner only to the terrestrial portions of the Earth system. Since marine systems cover more than two-thirds (70+%) of the surface of the Earth, this is an important limitation. States are major players when it comes to the governance of ocean spaces. But the constitutive provisions of the law of the sea differ in a number of respects from the constitutive provisions applying to terrestrial spaces. What is more, the law of the sea has evolved steadily in the period since the close of World War II; important developments relating to the law of the sea are in progress at this time. The ongoing effort to devise institutional arrangements dealing with biodiversity in areas beyond national jurisdiction is particularly significant. In constitutive terms, it is reasonable to expect that the governance system applicable to marine spaces will look substantially different in 2050 than it looked in 1950.

The cornerstone of the prevailing law of the sea is the 1982 UN Convention on the Law of the Sea (UNCLOS) that entered into force in 1994. Although there is room for debate about some of the provisions of UNCLOS, large parts of the convention are constitutive in nature in the sense that they provide a general framework within which a variety of substantive regimes operate (Oude Elferink 2005). Thus, regimes dealing with marine mammals (e.g., the International Convention for the Regulation of Whaling), commercial shipping (e.g., SOLAS and MARPOL), commercial fishing (e.g., a variety of regional fisheries management organizations), and environmental protection (e.g., OSPAR) are all nested within the constitutive provisions of the law of the sea. In some respects, UNCLOS is properly understood as a part of the general operating system of international society. The convention is a treaty negotiated under the auspices of the United Nations; the members of the convention are sovereign states; the provisions of the convention have the status of international law. Nevertheless, UNCLOS sets forth a constitutive system that differs in important respects from the constitutive system applicable to terrestrial spaces.

To begin with, UNCLOS draws a clear distinction between coastal states and members of international society that have no borders adjacent to marine spaces. Coastal states are accorded jurisdiction with varying degrees of control over what are known as their internal waters, territorial seas, and Exclusive Economic Zones (EEZ). In all cases, this control is more limited than the control states are authorized to exercise over their terrestrial spaces. For example, coastal states must respect the right of vessels registered in other states to engage in innocent passage through their territorial seas and EEZs and transit passage through international straits under their jurisdiction. Coastal states are accorded sovereign rights to explore, exploit, and manage natural resources located in the water column and on the seabed within their EEZs. But their control of straddling stocks and highly migratory species while in their EEZs is subject to the provisions of the 1995 Fish Stocks Agreement, an arrangement treated as a legally binding implementing agreement under UNCLOS. Coastal states can designate portions of their EEZs as marine protected areas. Yet they have no authority to transfer portions of their EEZs into private hands, in contrast to the recognized authority of states to dispose of state-owned lands.

With regard to marine spaces located beyond the outer limits of EEZs, an area that still encompasses some 40–45% of the surface of the planet, a different set of constitutive provisions applies. In general terms, this area is not subject to ownership or control on the part of individual states. Unless otherwise determined, the high seas are not subject to claims of sovereignty and are open to use by all members of international society for peaceful purposes. These purposes include commercial navigation, fishing, overflight, and laying

of subsea cables. The seabed beneath the high seas, known as the Area, is treated as having the status of the “common heritage of mankind.” UNCLOS creates a body known as the International Seabed Authority to govern uses of the Area; Part XI of the convention establishes a fairly detailed governance system to guide the work of the authority. Beyond this, UNCLOS contains a variety of constitutive provisions that provide a basis for the development of specific regimes dealing with the protection of the marine environment.

The law of the sea is dynamic. The constitutive provisions set forth in UNCLOS differ in important respects from provisions relating to marine spaces prevailing as recently as the middle of the 20th century. And the system has continued to evolve since the completion of UNCLOS in 1982. Several implementing agreements negotiated during the 1990s are significant in constitutive terms. The current negotiations aimed at producing an implementing agreement dealing with issues of biodiversity beyond national jurisdiction may yield significant adjustments in constitutive provisions relating to marine genetic resources and obligations of states to produce environmental impact assessments. Nevertheless, UNCLOS continues to provide a constitutive arrangement governing human activities relating to marine spaces and resources. The collection of issue-specific regimes nested into this constitutive framework and dealing with a wide range of substantive issues has grown steadily.

What can we infer about effectiveness from this account of the constitutive arrangements that define international society? Many regard the institutions of the states system as ineffective because they impede or even block efforts to solve a variety of problems ranging from the proliferation of nuclear weapons to the eruption of pandemics and the onset of climate change. In effect, they see these arrangements as part of the problem rather than as a point of departure for creating effective governance systems. There is some justification for this argument. But it is important to recognize that this does not mean that these institutions are ineffective in constitutive terms. The constitutive features of international society clearly make a difference. Many believe that the single most important thing we need to do to address the challenges of planetary governance arising today is to alter these constitutive arrangements in fundamental ways. The result is a dramatic illustration of the difference between constitutive effectiveness and the issue-specific effectiveness we often have in mind when we speak of the effectiveness of international governance systems.

4 ISSUE-SPECIFIC EFFECTIVENESS

Although international society is hardly unique in these terms, the skeptics are right to emphasize the inability of states to create regimes to address a variety of specific needs for governance arising at the international level and the inad-

equate performance of many issue-specific regimes that have been established to address particular problems. What is more, we are facing new challenges regarding matters like the eruption of pandemics and misuses of cyberspace that we are only beginning to recognize as prominent issues in world affairs. Nevertheless, some international regimes are effective in issue-specific terms, and there is much to be said for a careful assessment of success stories in the interests of thinking systematically about what works and why in the realm of Earth system governance. In this section, I consider in some detail the governance systems for Antarctica, the ozone layer, and the internet in order to clarify the idea of issue-specific effectiveness and to demonstrate that there are success stories in this realm.

The Antarctic Treaty of 1959, negotiated by 12 states during the midst of the Cold War, grew out of a desire to avoid serious disputes regarding jurisdictional claims in Antarctica and, more generally, a common interest in avoiding conflict regarding this uninhabited continent (Berkman et al. 2011). As the preambular language of the treaty puts it, “it is in the interest of all mankind that Antarctica shall continue forever to be used exclusively for peaceful purposes and shall not become the scene or object of international discord” (Antarctic Treaty 1959). In this connection, the treaty recognizes the “substantial contributions to scientific knowledge resulting from international cooperation in scientific investigation in Antarctica” and emphasizes the role of cooperation on “the basis of freedom of scientific investigation” as the cornerstone of a set of practices that will ensure that the continent is used exclusively for peaceful purposes.

The treaty then proceeds to set forth a set of prohibitions and requirements that form the core of this issue-specific international regime. Activities carried out under the provisions of the treaty can neither strengthen nor weaken preexisting jurisdictional claims relating to Antarctica. All military activities, including the establishment of military bases, the conduct of military maneuvers, and the testing of weapons, are prohibited. Nuclear explosions and the disposal of radioactive waste are prohibited. Contracting parties may designate observers, and all areas of Antarctica including all stations “shall be open at all times to inspection” on the part of these observers. The parties are required to transmit the reports of these observers to each other in conjunction with meetings of the Antarctic Treaty Consultative Parties. The contracting parties are required as well to provide each other with notice in advance regarding “all expeditions to and within Antarctica.” If disputes arise, the parties are required to “consult among themselves with a view to having the dispute resolved” by peaceful means.

During the 60 years since the treaty entered into force in 1961, this regime has proven remarkably effective. The preexisting jurisdictional claims have largely withered away; the continent remains demilitarized, and scientific

research in Antarctica continues to be robust. Additional contracting parties have joined the regime, and the parties have negotiated supplemental agreements, so that we now speak of the Antarctic Treaty System. Notable in this regard are the 1980 Convention on the Conservation of Antarctic Marine Living Resources, which sets up an innovative management system covering fishing and ecosystem management in the waters surrounding the continent, and the 1991 Protocol on Environmental Protection to the Antarctic Treaty, which contains a range of provisions designed to ensure environmental protection and prohibits “[a]ny activity relating to mineral resources, other than scientific research.” No doubt, this regime may face significant challenges in the future, and it is plausible to argue that this is an easy case given the peripheral status of the continent and the low level of human activity occurring in the extreme conditions prevailing in Antarctica. Nevertheless, there is no denying that this regime, established to address an important need for governance under difficult conditions, has fulfilled its goals over time and proven sufficiently adaptable to remain resilient in the face of a range of significant changes in prevailing conditions over time.

The 1987 Montreal Protocol on Substances that Deplete the Ozone Layer, negotiated under the auspices of the United Nations, now has 197 members and is widely regarded as the most effective issue-specific environmental regime in existence (Andersen and Sarma 2002; Parson 2003). Nested within the framework provided by the 1985 Vienna Convention for the Protection of the Ozone Layer, the protocol provides an operational procedure for regulating and ultimately phasing out the production and consumption of chlorofluorocarbons, halons, and other substances that deplete the ozone layer. As scientific knowledge in this realm has advanced, the parties have adopted a series of amendments to the protocol accelerating phaseout schedules, adding more chemicals to the list of substances regulated under the terms of the protocol, and creating the Montreal Protocol Multilateral Fund to provide financial assistance to developing countries that need help in order to pursue development plans that avoid the use of ozone-depleting substances.

How should we evaluate the performance of this issue-specific regime? As a result of the phasing out of ozone-depleting substances, the health of the stratospheric ozone layer is improving, though there is some distance to go in restoring the ozone layer to its original condition. The interaction between scientists and policymakers in administering the regime and strengthening it in response to the growth of knowledge has worked well. As observers have noted, moreover, the Montreal Protocol has played a more important role in reducing emissions of greenhouse gases than the various components of the climate regime, including the 2015 Paris Climate Agreement (Velders et al. 2007). This is a consequence of the fact that many ozone-depleting substances are also greenhouse gases. Phasing out the production and consumption of these

substances reduces emissions of greenhouse gases as a byproduct of restoring the ozone layer. A notable recent development is the Kigali Amendment, adopted at the 2016 Meeting of the Parties to the Montreal Protocol, which calls for phasing out the production and consumption of hydrofluorocarbons (HFCs), even though they are not ozone-depleting substances. At this writing, the ozone regime seems robust, and there is no reason to expect that its effectiveness will decline during the foreseeable future.

The issue-specific regime that has grown up to govern the internet differs fundamentally from the regimes for Antarctica and the ozone layer (DeNardis 2014). This regime is not based on an international legally binding instrument; its major provisions have arisen spontaneously and often through the initiatives of a range of nonstate actors. The regime features critical internet resources, including internet addresses, domain names, and transmission control protocols and internet protocols, which are drafted by the Internet Engineering Task Force and formalized by the Internet Architecture Board. These arrangements allow users to transmit data of various sorts from one device (e.g., a computer or a smart phone) to another virtually through the use of cyberspace. The regime does have some links to government agencies. For example, the Internet Corporation for Assigned Names and Numbers (ICANN) has a contractual link to the United States Department of Commerce, a situation that has given rise to some controversy and that is changing as a matter of fact if not in principle. But overall, the internet regime constitutes a prominent example of what some analysts have described as governance without government (Rosenau and Czempiel 1992).

The internet regime has performed well in the face of an explosion in the number of uses and users of cyberspace. Nevertheless, there are growing questions concerning the effectiveness of this regime going forward. Fundamentally, these questions arise from the rise of a variety of misuses of digital technologies, ranging from the harassment and bullying of individuals to invasions of privacy, identity theft, censorship using firewalls, interventions in electoral processes, and acts of espionage and terrorism. Taken together, these concerns pose profound challenges to the effectiveness of the governance system for the internet that has evolved more or less spontaneously over the last three decades. It is difficult to predict how the community will respond to these challenges in the coming years and whether the effectiveness of internet governance will suffer as a result. The internet has become far too integral to day-to-day life on a global basis to allow for any return to the status quo ante. Yet misuses of cyberspace have reached a point where it has become essential to take action to curb the worst offenses. There is little reason to expect that we can deal with this problem through the negotiation of one or more international legally binding instruments. States are among the worst offenders with regard to some of the most disruptive misuses of cyberspace (Perloth

2020). In any case, it is doubtful whether they have the resources to control a range of misuses in a politically acceptable manner. As a result, this problem now looms as a critical concern for all those interested in the effectiveness of issue-specific governance systems.

Can we draw any useful conclusions about issue-specific effectiveness from these success stories? One thing is clear: we cannot approach needs for governance in international society in a formulaic fashion, hoping that a more or less standard approach will suffice to deal with a variety of problems. The ozone regime features a multilateral environmental agreement, negotiated under the auspices of the United Nations, including virtually all members of international society as signatories, and administered as an activity of the UN Environment Programme. The Antarctic Treaty System encompasses a set of linked legally binding agreements not negotiated under the auspices of the United Nations and overseen by an independent secretariat supported informally by the Scientific Committee on Antarctic Research, which is formally a body of the International Science Council. The internet regime, by contrast, involves a set of practices that have evolved on an ad hoc basis, have no formal legal status, and provide opportunities for active engagement on the part of a variety of nonstate actors. All these arrangements work or have worked under specific conditions. Perhaps the principal lesson to be drawn from a consideration of these cases has to do with the issue of fit or, in other words, the importance of paying attention to compatibility between the major characteristics of a problem to be solved and the key features of the governance system developed to address it (Young 2002).

It seems fair to conclude from this account that the prospects for success are greatest when the problem is not regarded as critical to the core interests of the major players in the system. Unlike greenhouse gases like carbon dioxide, the production and consumption of ozone-depleting substances was not critical to the economic or political fortunes of any major actors. In 1987, the DuPont Corporation produced ~25% of these substances. But the sale of the substances accounted for only ~3% of DuPont's sales. The Antarctic Treaty was signed at the end of 1959 during an active phase of the Cold War. But the Soviet Union and the United States, neither of which had asserted jurisdictional claims relating to the continent, found themselves on the same side of the issue, wanting to neutralize the claims of the seven claimant states. The success of the 1957–1958 International Geophysical Year, which had included extensive scientific research in and on Antarctica, provided a convenient springboard for promoting the idea that the pursuit of knowledge could become the exemplary peaceful use of the continent. The one issue on the horizon today that could erode the resilience of the Antarctic Treaty System centers on the possibility that some members of the regime may become fixated on the search for and potential exploitation of minerals in Antarctica as an economic proposition.

The informality and adaptability of the internet regime was an asset so long as the use of cyberspace was a relatively exotic activity of interest to a small number of people mostly engaged in science and the development of advanced technologies. What has transformed this regime into a matter of extreme economic and political sensitivity is the growth of the user community to include billions of people who rely on the internet to pursue their core interests or, in some cases, exploit it to harm the welfare of others. It is difficult to imagine, under the circumstances, a scenario under which the difficulties now plaguing this regime can be resolved through a series of adjustments in which the character of the regime remains unchanged.

All successful regimes must find ways to translate their principal provisions from paper to practice in a more or less systematic and sustained fashion. In analyses of the policy process, this is known as the issue of implementation. In the case of the ozone regime, implementation has not been particularly demanding. The UN Environment Programme has been able to monitor progress toward phasing out the production and consumption of a growing collection of chemicals. The multilateral fund has been able to achieve a lot with funding that is relatively modest by comparison with the funds needed to tackle other problems. For the most part, voluntary compliance has made it unnecessary to exercise the enforcement mechanism established under the terms of the Montreal Protocol. The key to the operationalization of the regime for Antarctica lies in the role of scientific organizations in the day-to-day administration of the regime's major provisions. Research is the principal human activity in Antarctica; science ministries or related bodies are responsible for funding and managing this activity, and interactions among the members of the science community interested in Antarctica are vigorous and generally cooperative. So far, the development of the internet regime has been a case of what we can think of as learning by doing. That is, there is no general blueprint for the regime (e.g., a treaty) requiring a specified set of activities to operationalize it. Various bodies, such as ICANN, the Internet Engineering Task Force, and the Internet Architecture Board, have been formed one by one as needs have arisen.

Another requirement for issue-specific effectiveness is the ability to adjust or adapt the provisions of a regime to changing circumstances in such a way as to strengthen rather than weaken its performance. A remarkable aspect of the performance of the ozone regime has been the ability of the Meeting of the Parties to make use of the amendment procedure provided for in the provisions of the protocol, not only to add the multilateral fund but also to expand the coverage of the regime from a few CFCs and halons to over 100 hazardous chemicals worldwide. There have been cases of noncompliance regarding the requirements of the regime. But they have not prevented steady progress toward fulfilling the goal of restoring the stratospheric ozone layer to its earlier

condition. In the case of Antarctica, the key issue has been the balance of interests between those desiring to explore for valuable deposits of minerals on the continent and those dedicated to environmental protection. During the 1980s, the contracting parties devoted a great deal of time and energy to the negotiation of the 1988 Convention on the Regulation of Antarctic Mineral Resource Activities. When several key parties refused to ratify this convention, however, attention shifted sharply toward issues of environmental protection, resulting in the negotiation and entry into force of the environmental protocol to the Antarctic Treaty. While the protocol explicitly prohibits mineral exploration, this provides no guarantee that the issue will not surface again in the future. Much will depend on the course of the larger global debate regarding the future of industrialized societies and what we have come to think of as the green economy. When it comes to matters of adaptation, the situation of the internet regime is considerably more tumultuous. Many misuses of cyberspace involve efforts on the part of actors to exploit the capacity of the internet to pursue what are widely regarded as illegitimate purposes. There is every reason to expect that the resultant challenge will become more severe during the foreseeable future. Any effective response will undoubtedly require some combination of technological advances and the development of substantive norms. But the details of what such a response might look like are far from clear at this stage.

5 POSITIONAL EFFECTIVENESS

The phrase positional effectiveness may seem awkward to some. Many regard the fundamental concern in this realm as distributive in nature. To them, the issue is whether and how governance systems play a role in determining who gets what in interactions with one another. Clearly, this is a key issue. But the positional effects of institutions are not limited to their distributive consequences. Governance systems assign subjects to specific roles or to identifiable groups, shaping their identity and creating expectations about what constitutes appropriate behavior for occupants of these roles and members of these groups. Whether or not they make a difference in ordinary distributive terms, roles assign rights and duties to participants in social practices and shape norms governing the behavior of the occupants of various roles. In thinking about the positional effectiveness of governance systems, it seems desirable to cast a wide net to capture the full range of these effects.

At the constitutive level, prevailing international institutions divide the universe of actors cleanly into two non-overlapping categories: states and nonstate actors. From an institutional perspective, all states are the same, though in reality they differ drastically in terms of every other biophysical or socioeconomic criterion. All states enjoy sovereignty; all are eligible for membership in the United Nations; all may become signatories to international

legally binding instruments; all are entitled to appear as parties to cases dealt with by the International Court of Justice. This institutional equality may prove beneficial to some actors in specific situations. For example, coalitions of small states can and often do join forces to pass resolutions in the UN General Assembly, even when a number of major powers are unwilling to join them or even oppose such initiatives openly. Similarly, requirements for entry into force incorporated in the texts of international conventions may make the willingness of small states to ratify more important than their activities regarding the issues at stake would suggest.

The phrase nonstate actors, by contrast, is a catchall encompassing everything from multinational corporations to nongovernmental organizations and intergovernmental organizations. What they have in common is simply that they are not states and are expected to abide by the rules prevailing in the states in which they are based. Powerful nonstate actors are not without influence in these terms. Corporations may have considerable bargaining strength in their dealings with governments, and they often demonstrate remarkable sophistication in their ability to take advantage of the provisions of differences among states with regard to tax systems and other financial arrangements. Intergovernmental bodies, like the United Nations bodies located in New York and Geneva, may operate under the terms of specialized agreements with host countries, including provisions regarding what is often described as extraterritoriality. But none of this alters the facts that nonstate actors do not enjoy the benefits associated with sovereignty and that they are expected to comply with the legal rules and regulations in force in the jurisdictions within which they operate.

International institutions produce distributive consequences in two distinct ways. For one thing, states vary dramatically in terms of the nature and extent of their natural capital and various types of social and human capital. The per capita income of advanced industrialized states is many times that of poor developing states; hundreds of millions of people in poor countries suffer from poverty, insecure food supplies, and a lack of health care. In other words, international society is characterized by extreme inequality, despite the fact that all its members are equal with regard to the rights, rules, and norms associated with statehood. And this inequality is baked into the system. That is, the prevailing institutional arrangements do not include any clear provisions obligating wealthy states to come to the assistance of poor states. Issues relating to foreign aid have been debated at length within international bodies like the organs of the United Nations, and some normative principles have emerged from these debates. Nevertheless, the contributions of individual states are voluntary, and some of the most wealthy and powerful states (e.g., the United States) have ignored international norms in this realm or imposed politically inspired restrictions on their willingness to help.

Notable efforts to address this feature of the states system have emerged in the form of the Millennium Development Goals (MDGs) (2000–2015) and the Sustainable Development Goals (SDGs) (2016–2030). An interesting feature of these initiatives is that they highlight the idea of governing through goals in contrast to the more familiar rules-based governance (Kanie and Biermann 2017). The key idea here is that the members of international society working through the United Nations should reach agreement on the formulation of priority goals (e.g., ending poverty defined as living on less than \$1.50 a day) to be fulfilled within a specified period of time (e.g., 2000–2015) and then proceed to engage in a campaign to mobilize the effort needed to fulfill these goals (Sachs 2015). There is considerable debate regarding the results arising from this way of dealing with needs for governance. But the key point for purposes of this analysis is that experience with the MDGs and the SDGs does not reflect any important change in the inequality baked into the states system. While social pressure may play a role, states are not obligated to contribute in any specified way to the pursuit of these goals, and there is no prospect that these efforts will produce anything approaching equality at the level of international society, even if they do alleviate the suffering of some of the world's poorest people.

On the other hand, some institutional arrangements in international society produce distributive consequences precisely because they draw distinctions among the occupants of different roles or introduce provisions relating to benefit-sharing. Under the law of the sea, as it stands today, coastal states are entitled to enjoy the benefits they are able to derive from sizable marine areas known as EEZs, an entitlement that did not exist prior to the negotiation of the 1982 UN Convention on the Law of the Sea. The Area, by contrast, is characterized in the convention as the common heritage of mankind. The inclusion of provisions relating to benefit-sharing in conjunction with deep seabed mining in Part XI of UNCLOS dealing with the governance of the Area constitutes a major factor in the unwillingness of the United States to ratify the treaty. The UN Framework Convention on Climate Change, to take another example, introduces a distinction between Annex 1 and non-Annex 1 countries. Annex 1 countries are expected to take the lead in addressing the problem of climate change and to provide assistance to non-Annex 1 countries in devising development strategies that minimize emissions of greenhouse gases. This arrangement together with similar arrangements in other issue-specific regimes has given rise to the principle known as common but differentiated obligations. The basic idea is that it is appropriate to divide states into distinct categories in addressing needs for governance at the international level and to adopt different expectations regarding the contributions of those included in each category. Relative to the inequality baked into the states system, the significance of this principle is limited. Yet it does amount to a recognition that

it is appropriate to divide the universe of states into subgroups for purposes of assigning responsibility for dealing with some specific needs for governance.

There is no doubt that international institutions produce positional effects. These effects may or may not correlate with issue-specific effectiveness and they may or may not produce results that are compatible with various normative principles regarding justice or fairness. Positional effectiveness in international society is particularly difficult to justify in terms of most approaches to what is generally known as distributive justice in contrast to procedural justice. This is an issue of obvious importance in today's world. But it does not detract from our understanding of the positional effectiveness of the institutional arrangements in place in international society. On the contrary, a major impediment to the achievement of outcomes that are more just or fair at the international level lies precisely in the positional effectiveness of the prevailing institutional arrangements.

6 INTERACTION EFFECTS

I have discussed the constitutive, issue-specific, and positional effectiveness of social institutions as though they were separate phenomena. Up to a point, this makes sense. Institutions may be highly effective in constitutive terms, whether or not they provide a favorable point of departure for those seeking to address a specific need for governance, such as coming to terms with the emission of greenhouse gases. Similarly, institutions may be effective in positional terms, whether or not the results are compatible with addressing issue-specific concerns like the protection of biological diversity. For purposes of analysis, therefore, it seems reasonable to consider each dimension of effectiveness on its own terms.

Nevertheless, it is apparent that there are interaction effects between and among the individual dimensions of institutional effectiveness. Perhaps the most significant issue of this sort, mentioned at several points in the preceding sections, is that the defining institutional features of the states system may impede efforts to respond to issue-specific needs for governance like controlling the spread of nuclear weapons, addressing major humanitarian concerns, limiting emissions of greenhouse gases, or curbing misuses of cyberspace. This is a legitimate concern. The fundamental issue here centers on the institution of sovereignty, which immunizes states from outside interference in their internal affairs and allows states to refuse to abide by obligations they have not accepted freely. As the case of climate change makes clear, many actors are seeking to devise innovative ways to circumvent this problem. Thus, the pledge-and-review mechanism embedded in the 2015 Paris Climate Agreement allows states considerable leeway in formulating the terms of what are known as their Nationally Determined Contributions but also includes

a procedure described as a “global stocktake” designed to exert pressure on member states to strengthen their commitments over time. In some ways, this is an ingenious effort to circumvent the limitations imposed by the constitutive arrangements of the states system. It is reasonable to suppose that ingenuity of this sort may work to produce solutions to some problems. But as numerous analysts have noted, the arrangements established under the terms of the Paris Climate Agreement seem inadequate to solve wicked problems like climate change.

This makes it relevant to ask whether mounting pressure to come to terms with such wicked problems will lead to significant changes in the constitutive provisions of the states system. It seems clear that the critical provisions are highly sticky, especially in a society that lacks well-developed mechanisms authorized to address issues of this sort. Still, it is worth reemphasizing the point made in an earlier section of this chapter regarding the fact that the states system as we know it today is an arrangement arising only in the period following the close of World War II. In other words, this system emerged as a result of the impact of forces operating within the lifetimes of people like myself. Given the intensity of the major biophysical and socioeconomic forces at work today, there is no reason to assume that the constitutive provisions of the system will remain unchanged during the course of the coming decades. This suggests that there is every reason to invest substantial time and energy in analyses of institutional dynamics regarding the constitutive provisions of the states system, including efforts to evaluate the relative merits of significant institutional options that may become feasible during the foreseeable future. I take up this topic more systematically in Chapter 8.

Another interaction effect centers on disconnects between issue-specific effectiveness and positional effectiveness. Existing international institutions are highly effective in assigning roles to states and nonstate actors, without reference to the consequences of doing so for efforts to address issue-specific problems. All states are regarded as equal in institutional terms, with limited exceptions like the designation of some states to play the role of permanent members of the UN Security Council in dealing with issues identified in Chapter VII of the Charter. Of course, we think a lot about power differentials among states, debating what we mean in using a term like hegemon, what it takes to be accepted as a great power, and what consequences the onset of the cyber age will have for the exercise of power at the international level. But all these are political calculations; they are not institutionalized in the constitutive provisions of the states systems.

One of the more interesting developments in the realm of planetary governance involves efforts to overcome such disconnects in the context of developing regimes to address specific problems. The creation of the multilateral fund as a component of the ozone regime, for example, reflects an explicit

recognition of the need to provide assistance to developing states and is widely regarded as a key factor in accounting for the success of this regime. On the other hand, the case of climate change seems far less promising in these terms. The United States, for example, refused to ratify the Kyoto Protocol on emissions of greenhouse gas, arguing that its modest obligations were unfair despite the fact that the United States has one of the highest levels of per capita emissions in the world and is responsible for a large portion of historic emissions of the relevant gases. Similarly, some rich and powerful countries have encouraged polluting industries to move offshore, so that they can claim that they are taking steps to control emissions of greenhouse gases within their own jurisdictions. In such cases, effectiveness in dealing with issue-specific problems will certainly require a more substantial effort to come to terms with some of the positional consequences arising from the institutional provisions of the states system.

7 A CONCLUDING THOUGHT

Mainstream discussions of the effectiveness of governance systems are limited by a common failure to draw clear distinctions among what I have called constitutive, issue-specific, and positional effectiveness. In some respects, the institutional arrangements of international society are highly effective. They privilege the efforts of those seeking to maximize relative gains, impose constraints on efforts to solve collective-action problems, and entrench inequalities that limit the achievement of many elements of what we think of as sustainable development. This emphasizes the need to draw a clear distinction between the effectiveness of institutions in the general sense of making a difference and the ability of governance systems to solve specific problems like limiting the spread of nuclear weapons, controlling emissions of greenhouse gases, or curbing misuses of the internet. In fact, constitutive effectiveness can impede or even block the creation and implementation of regimes needed to solve issue-specific problems. This suggests that it will be essential going forward to find ways to modify the institutional arrangements of the states system. It would be naive to underestimate the magnitude of this challenge. Yet the states system as we know it today is a product of remarkably recent developments; there is no reason why we need to regard it as a monolithic institutional system whose continuation into the indefinite future must be accepted as a fact of life.

5. Does formalization enhance institutional effectiveness?

1 THE ISSUE OF FORMALIZATION

Mainstream thinking about governance generally takes it for granted that it is desirable to formalize governance systems by grounding them in the provisions of legally binding instruments. Especially pronounced in the analyses of those whose thinking reflects Western conceptions of the rule of law, this premise underlies much of the work of social scientists as well as legal scholars who have contributed to the remarkable growth of knowledge regarding the creation and performance of the regimes or, more broadly, institutions that have developed in recent decades to address needs for governance in a range of areas, including environmental protection, trade, arms control, and even human rights (Chayes and Chayes 1995; Mitchell 2003; Biermann 2014). On this account, informal arrangements are often lumped together in a somewhat ill-defined category labeled soft law (Abbott and Snidal 2000; Chinkin 2008). The standard view regarding such arrangements is that they are somehow underdeveloped. They may constitute a good beginning in specific cases, but we should make every effort to nurture them so that they can evolve into formalized or hard-law arrangements at the earliest opportunity.

What is the basis for this clear preference for formalized governance systems? Few analysts offer explicit or easily comprehensible answers to this question; the preference for formalized arrangements may be simply a form of received wisdom or owe as much to cultural predispositions as it does to any solid evidence regarding the superior performance of hard-law systems. In the final analysis, however, the preference for formalized arrangements must rest on the presumption – whether clearly articulated or convincingly argued – that arrangements grounded in legally binding instruments will prove more effective or more successful than informal arrangements in addressing needs for governance arising in human societies. Subjects of governance systems are simply more inclined to take seriously prescriptions that have the force of law behind them or develop a habit of obedience in response to hard laws, adapting or adjusting their behavior accordingly (Hart 1961).

Is the preference for formalized arrangements persuasive? Or are there conditions under which informal arrangements are preferable, though formalized arrangements may make more sense under other circumstances (Lipson 1991)? In this chapter, I address these questions, drawing on recent experience with governance systems in the Arctic as a source of empirical evidence. Over the last 30 years, the Arctic has become a lively arena for the development of innovative arrangements dealing with needs for governance at the international or transnational level. Some of these governance systems have been set up at the outset as legally binding arrangements. Others have begun life as informal arrangements and developed over time into formalized arrangements. Still others take the form of informal arrangements that have shown little sign of developing into anything more formalized. The Arctic thus provides a rich vein of material to mine as a basis for thinking about the relationship between (in)formality and the capacity of the resultant arrangements to deal effectively with particular needs for governance.

I tackle this subject in several steps. The next section deals with matters of terminology, clarifying the distinction between formal and informal arrangements in the interests of avoiding confusion arising from terminological misunderstandings. I then provide a brief introduction to recent institutional innovations in Arctic affairs, highlighting the development of the Arctic Council but making it clear that a range of other innovations have arisen in the Arctic during the same era. This provides a point of departure for an analysis of the central question: does formalization yield better results than those arising from the operation of informal institutions? I address this question through an assessment of the performance of the Arctic cases. My conclusion is that we need to think carefully about conditions under which formal arrangements and informal arrangements are likely to thrive rather than adhering to the conventional preference for formalized governance systems without regard to relevant conditions.

2 CLARIFYING KEY CONCEPTS

Formalized governance systems are arrangements that are rooted in the provisions of legally binding instruments. Although this may seem straightforward, several complications are worth noting explicitly. The procedures that individual members of international society use to ratify or otherwise accede to legally binding instruments vary considerably. Consider the case of the United States for purposes of illustration. The gold standard occurs when the US Senate ratifies an agreement and Congress passes implementing legislation to ensure that the agreement's provisions make the transition from paper to practice. The Montreal Protocol on Substances that Deplete the Ozone Layer is a prominent example (Bryner 1995). Short of this, the US Senate may ratify

an agreement, but ratification is not followed by the passage of implementing legislation. Responsible agencies are left to pursue implementation on the basis of preexisting authority allowing them to engage in the required activities. The Agreement on the Conservation of Polar Bears is a case in point (Fikkan et al. 1993). In still other cases, the United States accepts an agreement as legally binding through executive action without submitting the agreement to the Senate for ratification. The 2015 Paris Climate Agreement is a prominent example (Wirth 2016). Beyond this, there are cases in which the United States and other members of international society treat certain arrangements as having the status of customary international law, even though they have not ratified agreements establishing such arrangements or otherwise taken formal steps to accept these arrangements as legally binding. For example, the United States takes the view that many (but not all) of the provisions of the 1982 UN Convention on the Law of the Sea have acquired the force of law, despite the fact that the US Senate has rebuffed presidential requests to ratify the convention on several occasions.

These differences are clearly significant. There is good reason to expect governance systems that meet the gold standard to carry more weight when it comes to guiding the behavior of both subjects and administrators than arrangements that feature lesser commitments. The ease with which the Trump Administration was able to abandon US participation in the Paris Climate Agreement is a clear example of the weakness of commitments that do not involve formal ratification. For purposes of this analysis, nevertheless, I will treat those arrangements that fit into one or another of the categories described in the preceding paragraph as formalized governance systems.

This makes it tempting simply to treat informal arrangements as a residual category including all those governance systems that do not belong to one or another of these categories of formalized systems. But this would be a mistake for several reasons. Social scientists have long recognized that some institutions arise spontaneously or in the absence of intentional initiatives on the part of individuals or groups. They take the form of spontaneous or self-generating social practices that are acknowledged at the level of behavior and that serve important steering functions in a variety of settings (Hayek 1973). Such arrangements are the norm in many smallscale traditional societies that lack a government in the modern sense of the term (Ostrom 1990). But they are not limited to such settings. Although they may be subject to a growing collection of regulatory arrangements over the course of time, markets are social institutions that emerge spontaneously in a variety of settings. Nor are such self-generating arrangements absent at the international level. Influential codes of conduct, for example, thrive in this setting, even when they are not products of intentional initiatives, much less articulated in the form of formal agreements. There is much to be said about the roles that spontaneous insti-

tutions play in a variety of settings; a serious body of knowledge about such matters has arisen within several of the social sciences. Nevertheless, these spontaneous arrangements are not the subject of this analysis. Rather, I treat informal governance systems as arrangements that are the results of intentional initiatives, but that are not grounded in legally binding instruments.

The resultant universe of informal governance systems encompasses a number of differentiable types of arrangements. In the Arctic, recent practice has emphasized arrangements established under the terms of non-legally binding ministerial declarations. The 1996 Ottawa Declaration on the Establishment of the Arctic Council is a prominent example (Smieszek 2019). But this is by no means the only sort of arrangement to be considered under the rubric of informal systems. Other informal arrangements involve important roles for simple agreements not articulated in high-profile much less legally binding documents, guidelines that are not legally binding, informal codes of conduct, and strategic plans providing guidance regarding well-defined issues, though they are not governance systems in their own right. There is experience with all these mechanisms in the recent history of the Arctic. In this chapter, I use the phrase informal governance systems to encompass the set of arrangements that share the property of being intentional without being formalized in legally binding instruments. My central concern is to compare and contrast formalized arrangements and informal arrangements in terms of their performance in addressing a variety of needs for governance.

3 AN INTRODUCTION TO ARCTIC GOVERNANCE

Located on the front line of the confrontation between the Soviet Union and the United States during the Cold War, the Arctic offered few opportunities to put in place international regimes designed to produce cooperative responses to needs for governance (Osherenko and Young 1989). But the close of the Cold War and the subsequent collapse of the Soviet Union at the end of 1991 released energy to tackle a variety of transboundary issues of interest to varying combinations of states. Perhaps the most important observation about the resultant pattern of international cooperation is that it does not rest on a comprehensive constitutive foundation. In the Arctic, there is no analogue to the 1959 Antarctic Treaty to provide a constitutive framework within which to develop a variety of operational regimes allowing different combinations of actors to address a variety of specific issues. Despite recurrent calls emanating from a number of quarters for the development of an Arctic Treaty, there is no prospect that such an agreement will emerge during the foreseeable future. What we have in the Arctic, then, is a governance or regime complex composed of a number of discrete elements that focus individually on matters of interest to specific sets of actors and that, taken together, reflect a range of

perspectives on the types of arrangements most appropriate to address specific needs for governance arising in this region (Alter and Raustiala 2018). Table 5.1 provides a comprehensive listing of the resultant universe of Arctic cases. There is no shortage of arrangements dealing with Arctic issues grounded in legally binding instruments. Surprisingly, several of these arrangements emerged during the course of the Cold War. In 1973, for example, the five range states (Canada, Denmark, Norway, the Soviet Union, and the United States) negotiated the legally binding Agreement on the Conservation of Polar Bears. And in 1976, the Soviet Union and the United States agreed on the terms of a bilateral convention on the conservation of migratory birds and their environment. The pace regarding the creation of legally binding Arctic regimes has accelerated during the ensuing years (Byers 2013). In 1994, China, Japan, Korea, Poland, Russia, and the United States agreed on the terms of the Convention on the Conservation and Management of the Pollock Resources of the Central Bering Sea. More recently, the eight Arctic states have entered into a series of legally binding arrangements whose terms have been negotiated under the auspices of the Arctic Council. These include the 2011 agreement on search and rescue in the Arctic, the 2013 agreement on marine oil spill preparedness and response, and the 2017 agreement on the enhancement of cooperation in scientific research. Notably, the resultant collection of agreements includes cases exemplifying the principal subsets of formalized governance systems I identified in the preceding section.

Recent experience in the Arctic also encompasses cases in which arrangements launched initially either as informal regimes or as a mix of formal and informal arrangements have developed into broader formalized governance systems over the course of time. Starting in the 1970s, Norway and the Soviet Union (now the Russian Federation) developed step-by-step a bilateral regime to facilitate cooperation regarding their mutual interests in the resources of the Barents Sea. In 1975 and 1976, the two countries entered into a pair of legally binding agreements dealing with Barents Sea fisheries. In 1978, they supplemented these agreements with a much less formal practical arrangement covering fishing in a segment of the Barents Sea known as the Grey Zone due to unresolved jurisdictional claims in the area. The legally binding 2010 treaty between the two countries on boundary delimitation and cooperation in the Barents Sea resolved longstanding disagreements regarding matters of maritime jurisdiction and formalized a complex of preexisting arrangements for cooperation regarding fisheries, oil and gas development, and environmental protection. The International Maritime Organization adopted voluntary guidelines for ships operating in polar waters in 2002 and upgraded them in 2009. These informal guidelines initiated a process of institutional development that led over time to agreement on the terms of a legally binding Polar Code that entered into force at the beginning of 2017 in the form of a series of amend-

Table 5.1 *Arctic governance agreements*

Formal agreements	
1957	Interim Convention on the Conservation of North Pacific Fur Seals
1973	International Agreement on the Conservation of Polar Bears
1975	Agreement between the Government of the Kingdom of Norway and the Government of the USSR on Co-operation in the Fishing Industry
1976	Agreement between the Government of the USSR and the Government of the Kingdom of Norway concerning Mutual Relations in the Field of Fisheries
1976	Convention between the USA and the USSR concerning the Conservation of Migratory Birds and Their Environment
1980	Convention on Future Multilateral Cooperation in Northeast Atlantic Fisheries
1981	Agreement on the Continental Shelf between Iceland and Jan Mayen
1987	Agreement between the Government of Canada and the Government of the United States on the Conservation of the Porcupine Caribou Herd
1990	Agreement between the USA and the USSR on the Maritime Boundary (not in force)
1992	Convention for the Protection of the Marine Environment of the North-east Atlantic
1992	North Atlantic Marine Mammal Agreement
1994	Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea
2010	Treaty between the Kingdom of Norway and the Russian Federation concerning Maritime Delimitation and Cooperation in the Barents Sea and the Arctic Ocean
2011	Agreement of Aeronautical and Maritime Search and Rescue in the Arctic
2013	Agreement on Marine Oil Pollution Preparedness and Response
2014/2015	The International Code for Ships Operating in Polar Waters
2017	Agreement on Enhancing International Arctic Science Cooperation
2018	Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean (not in force)
Informal agreements	
1978	Agreement on an Interim Practical Arrangement for Fishing in an Adjoining Area in the Barents Sea
1988	Agreement between the Government of Canada and the Government of the USA on Arctic Cooperation
1989	Agreement between the Government of the USA and the Government of the USSR concerning Cooperation in Combatting Pollution in the Bering and Chukchi Seas in Emergency Situations
1989	Agreement between the Government of the USA and the Government of the USSR concerning mutual visits by inhabitants of the Bering Strait Region
1991	Shared Beringian Heritage Agreement
1991	Rovaniemi Declaration on the Protection of the Arctic Environment

1993	Kirkenes Declaration on Cooperation in the Barents Euro-Arctic Region
1996	Ottawa Declaration on the Establishment of the Arctic Council
1998 onward	Biennial Arctic Council Ministerial Declarations
2002/2009	Guidelines for Ships Operating in Polar Waters
2008	Ilulissat Declaration on the Arctic Ocean
2011	US-Russia Statement on Cooperation in the Bering Strait Region
2013	Russia/US Joint Statement on enhancing bilateral cooperation on fisheries
2013	Memorandum of understanding between the Government of the USA and the Government of the Russian Federation symbolically linking national parks in the Bering Strait Region
2015	Declaration to Prevent Unregulated Fishing in the Arctic Ocean
2018	Joint Russia-USA Proposal on Bering Strait Routing Measures

ments to the multilateral SOLAS and MARPOL Conventions. A somewhat different story arises in the case of potential fisheries in the Central Arctic Ocean. In 2015, the five Arctic coastal states issued a declaration on the prevention of unregulated fishing in the Central Arctic Ocean. Given the acknowledged status of this area as high seas, however, the Arctic states recognized the need to extend their effort to address this issue by engaging other interested states, including China, Iceland, Japan, and Korea as well as the European Union. This produced a 5+5 or 10-party legally binding Central Arctic Ocean Fisheries Agreement in 2018.

More familiar, perhaps, are the numerous informal arrangements that have arisen to address Arctic issues over the last 30 years. Particularly prominent are the Arctic Environmental Protection Strategy created under the terms of the 1991 Rovaniemi Declaration on the Protection of the Arctic Environment, the Barents Euro-Arctic Region established under the terms of the 1993 Kirkenes Declaration, and the Arctic Council launched under the provisions of the 1996 Ottawa Declaration on the Establishment of the Arctic Council (Young 1998; English 2013). Both the Barents Euro-Arctic Council and the Arctic Council hold periodic ministerial meetings that have produced additional ministerial declarations dealing with issues of common concern. But these multilateral ministerial declarations do not constitute the only type of informal mechanism states have employed to initiate and nurture international cooperation in the Arctic. A number of significant arrangements are rooted in bilateral agreements between Arctic states. Russia and the United States, for example, have institutionalized cooperative arrangements dealing with matters of common concern in Beringia, including wildlife conservation, coordinated management of protected areas, contact among Indigenous peoples living in the region, and commercial shipping (Berkman et al. 2016; Young, Berkman, and Vylegzhanin 2020). In 1988, Canada and the United States reached agree-

ment on an informal arrangement regarding transits of the Northwest Passage by American icebreakers, without prejudicing the legal position of either party regarding larger questions concerning the status of the passage (Kirkey 1995). Norway and Russia, too, have worked out the terms of a number of agreements covering informal cooperation regarding matters of common interest in the Barents Sea that are not covered by the more formal provisions of the 2010 boundary delimitation treaty.

4 ASSESSING THE PERFORMANCE OF ARCTIC GOVERNANCE SYSTEMS

Assessing the performance of governance systems is a tricky business (Young 2011; Ch. 4 *infra*). There are few opportunities to engage in useful counterfactual analyses in this realm. It is hard to construct informed analyses regarding how things would have developed in the absence of a particular regime, such as the polar bear agreement, the Norway-Russia boundary treaty, or the Arctic Council. As the common distinction among outputs, outcomes, and impacts makes clear, moreover, there are significant differences regarding what we have in mind in asking questions about performance (Miles et al. 2002; Underdal and Young 2004). It is one thing to enquire whether the parties have succeeded in moving an agreement from paper to practice. It is another matter to ask whether the resultant regime has made a real difference in solving the problem(s) that led to its creation. Nevertheless, this does not mean we are unable to reach any significant conclusions regarding the performance of Arctic governance systems and, more specifically, gather observations that shed light on the central question regarding the validity of the common preference for formalized arrangements.

Formalized Arrangements

It is apparent, to begin with, that formalization provides no guarantee of success in efforts to create cooperative arrangements to solve problems of common concern. The polar bear agreement was a remarkable achievement, bringing together government officials and members of the science community around a shared interest in the conservation of an iconic species during Cold War times (Fikkan et al. 1993). It is reasonable to argue that the agreement legitimized the efforts of officials working in the US Fish and Wildlife Service, the Canadian Wildlife Service, and their counterparts in other signatories and provided needed support for the work of the Polar Bear Specialists Group operating under the auspices of the International Union for the Conservation of Nature (IUCN). But we can turn this argument around. It may make better sense to think of the informal cooperation among these actors as drivers of the

process that produced the 1973 agreement than as an outcome of the regime established under the terms of the agreement. Even more important is the observation that today polar bears are increasingly threatened by the impacts of climate change on the Arctic's marine systems. The destruction of habitat resulting from the recession and thinning of sea ice attributable to climate change may turn out to be a critical determinant of the fate of this species. But there is little to be done within the context of the 1973 agreement to alleviate the effects of this growing threat.

In 1987, Canada and the United States entered into a binding agreement establishing the International Porcupine Caribou Board, a mechanism that has played a constructive role in introducing a co-management system in which representatives of user groups are accorded a significant voice in decision-making about the management of renewable resources (Kofinas 2005). Nevertheless, the size of the Porcupine caribou herd, which migrates annually across the international boundary between Alaska and Yukon, has fluctuated dramatically over the years; there is little evidence to suggest that efforts to implement the terms of the bilateral agreement have played an important role in stabilizing the population dynamics of this herd.

The central Bering Sea pollock agreement was negotiated and entered into force only in the aftermath of the crash of pollock stocks in the regime's catchment area due to intensive fishing (Dunlap 1995). There has been little evidence of a revival of pollock stocks in this area since then, despite the prohibition on harvesting imposed under the terms of the 1994 convention. There is some controversy among fisheries biologists regarding the biophysical conditions governing the status of pollock stocks in the central Bering Sea. But there is no basis for concluding this regime has solved or even alleviated the problem that led to its creation.

In the case of migratory birds, the critical problem arises from the fact that key species migrate annually over long distances and pass through multiple jurisdictions. No international agreement focused mainly on the Arctic can ensure the conservation of these species. In recent years, the Arctic Migratory Bird Initiative (AMBI), launched through the efforts of the Arctic Council's Working Group on the Conservation of Arctic Flora and Fauna, seems to be making a difference in promoting international cooperation among states located along major flyways used by migratory birds that spend the summer in the Arctic and the winter in southern latitudes. Interestingly, AMBI is a voluntary initiative operating under the auspices of an informal governance system (Barry et al. 2020). While many forces play a role in this context and future developments are difficult to forecast, there is a case to be made for the proposition that AMBI will prove more effective than efforts to implement the terms of legally binding arrangements like the 1976 agreement between the Soviet Union and the United States.

Somewhat similar observations are relevant in thinking about the performance of the 2011, 2013, and 2017 agreements negotiated under the auspices of the Arctic Council. The 2011 agreement deals with search and rescue in the Arctic; it is a regional version of the more encompassing international Safety of Life at Sea Convention (SOLAS). While the agreement has provided some incentives for authorities in the Arctic states to upgrade their operational capabilities to address search and rescue needs, the 2011 Arctic agreement adds little of substance to the overarching SOLAS regime. Much the same is true of the 2013 marine oil spill preparedness and response agreement, which sets forth a regional version of the overarching regime established under the International Convention on Oil Pollution Preparedness, Response and Cooperation (OPRC) (Johnstone 2018). A notable feature of the 2013 Arctic agreement is that it contains no provisions dealing with oil spill prevention. Today, offshore hydrocarbon development in the Arctic is limited to a few small installations. Whether or not the 2013 agreement makes a difference in the future remains to be seen. But its achievements to date are limited. As for the 2017 agreement on the enhancement of cooperation in scientific research, these are early days. Some of its provisions may prove significant over time (Berkman et al. 2017). But it is notable that the agreement lacks substance regarding specific steps the eight Arctic states are obligated to take to promote international cooperation regarding research activities carried out within their jurisdictions or beyond the boundaries of their jurisdiction in the Central Arctic Ocean. The growth of great-power tension in the Arctic in recent years does not bode well for the operation of this agreement.

Informal to Formal Arrangements

The story regarding governance systems that begin (at least in part) as informal arrangements but evolve into formalized arrangements is different in some respects but similar in others. It seems fair to say that the 2010 Norway-Russia boundary delimitation treaty resolved once and for all a lingering dispute over jurisdiction in the Barents Sea (Henriksen and Ulfstein 2011). This is no small accomplishment. Still, it is important to note that the two countries had set up cooperative arrangements dealing with common concerns relating to the Barents Sea involving a mix of formal and informal agreements dating back to the 1970s (Stokke 2012). The relatively informal 1978 agreement, in particular, served to defuse tension in a portion of the central Barents Sea subject to overlapping jurisdictional claims. Knowledgeable analysts have generally praised the accomplishments of these bilateral arrangements, now formalized in the 2010 treaty. Most believe that this cooperation has played a significant role in the success of efforts to manage the commercial fish stocks of the Barents Sea. But it is relevant to note that the arrangements formalized

in the 2010 treaty have important limitations when it comes to meeting challenges arising today and likely to become more serious in the future (Young, Berkman, and Vylegzhanin 2020). Cooperation between the two states has not succeeded in avoiding major challenges arising from the introduction of invasive species, such as snow crabs (Østhagen and Raspotnik 2019). Even more to the point, this bilateral agreement lacks the authority to address issues that arise when shifts in the distribution of fish stocks (e.g., cod) open up opportunities for fishers from other countries (e.g., the Faroe Islands) to harvest fish that move beyond the boundaries of Norwegian and Russian jurisdiction.

The story of efforts to govern commercial shipping in Arctic waters is, in some ways, more encouraging. Treated as a minor concern in the past due to harsh biophysical conditions, interest in the governance of Arctic shipping has risen in recent times as the volume of commercial shipping within the Arctic or passing through the Arctic has grown (Hildebrand et al. 2018). Though projections regarding such matters are hazardous, it is not unreasonable to expect commercial shipping in the region to continue to grow during the foreseeable future. Interest in this issue became manifest during the 1990s, and the 2002/2009 voluntary guidelines served to put the issue on the map as a suitable topic for the development of a governance system. The 2009 report (including specific recommendations) of the Arctic Marine Shipping Assessment, an informal activity carried out under the auspices of the Arctic Council, served to heighten interest in this issue among members of the policy community substantially. This set the stage for the negotiation of the principal elements of the Polar Code under the auspices of the International Maritime Organization, including an assemblage of Arctic-specific provisions relating to safety of life at sea and environmental protection. Though some have criticized the Polar Code for its failure to include provisions dealing with matters like heavy fuel oils, black carbon, injury to marine mammals, noise pollution, and the control of invasive species, the code has teeth regarding the matters it does cover. It mobilizes actors like the International Association of Classification Societies and marine insurers to demand compliance with requirements regarding matters such as the possession of an up-to-date Polar Certificate. And the entry into force of the Polar Code has energized those demanding even stronger provisions governing commercial shipping in the Arctic. The odds are good at this stage, for example, that restrictions regarding the combustion and carriage of heavy fuel oils will be added to the Polar Code in the coming years. Although the results fall well short of perfection in the eyes of those seeking to impose stricter regulation on Arctic shipping, they are far from trivial.

The case of commercial fishing in the Central Arctic Ocean presents a very different picture (Vylegzhanin et al. 2020). There are no commercially significant fish stocks located in the area covered by the agreement today. In fact, the reigning view among fisheries biologists is one of skepticism regarding

the likelihood that significant fish stocks will emerge in this area any time soon. It is likely, therefore, that the provisions of the agreement will not be tested severely during the foreseeable future. Proponents of the arrangement take the view that the negotiation of the agreement nevertheless constitutes a significant achievement. It is precedent-setting in the sense that it is one of the first arrangements relating to marine resources in which the relevant parties have put in place a regime before the commencement of commercial exploitation of natural resources rather than struggling to impose some sort of order once exploitation is under way. And the regime created under the terms of the agreement establishes the precautionary principle as one of its central elements. It is possible that we may look back at some future time and see these as important achievements. At the moment, however, all we can do is to note these elements of the regime and treat them as features to keep in mind when it comes to assessing the performance of the regime over time.

Informal Arrangements

As noted, a prominent feature of recent practice regarding the creation and operation of Arctic governance systems is the prominent role accorded to arrangements that are informal in the sense that they are not grounded in legally binding instruments. A number of informal bilateral agreements dealing with concrete issues of concern to a pair of Arctic states have produced positive results. The 1988 agreement on transits of the Northwest Passage has served to avoid friction between Canada and the United States regarding the use of the passage, though it is fundamentally an agreement to disagree on the legal status of the passage (Kirkey 1995). Interestingly, Russia and the United States have entered into a number of bilateral agreements dealing with Arctic issues of interest to the two countries, even as tensions of a more geopolitical nature have risen (Berkman et al. 2016). The authorities in each country responsible for managing protected lands have taken a number of informal steps to twin national parks on the two sides of the Bering Strait Region. There is a bilateral agreement to join forces to protect polar bears using the waters of Beringia. Russia and the United States worked out a vessel routing scheme for the Bering Strait, which they then proceeded to take to the International Maritime Organization for endorsement as an element in the broader regime for Arctic shipping (Young, Berkman, and Vylegzhanin 2020).

The central focus of attention in the realm of informal agreements, however, is the creation and operation of multilateral arrangements established under the provisions of ministerial declarations. Among these, it is worth devoting particular attention to the Barents Euro-Arctic Region (BEAR), an arrangement designed to promote regional cooperation on a range of functional concerns among the northern counties of Fennoscandia and their counterparts in north-

western Russia, and the Arctic Council (AC), a high-level forum created and operated by the eight Arctic states to address issues of environmental protection and sustainable development on a circumpolar basis.

Perhaps the most striking feature of the BEAR is that it allows the parties to cooperate simultaneously on two levels through the activities of the inter-governmental Barents Euro-Arctic Council and the Regional Council in which the principal participants are representatives of subnational governments (Dellenbrant and Olsson 1994). The importance accorded to this dual structure may well explain why the parties to the 1993 Kirkenes Declaration chose to avoid the use of an international legally binding instrument in establishing the BEAR (Young 1998). In practice, the BEAR has spawned a sizable collection of pragmatic efforts at the regional level to encourage cooperation dealing with a range of issues relating to health, education and welfare, environmental protection, the concerns of Indigenous peoples, and cultural traditions. It is not feasible to construct a box score summarizing the performance of the BEAR over several decades regarding each of these functional areas. Nevertheless, it is reasonable to say that this arrangement has fostered a variety of programmatic initiatives producing results that are generally beneficial, though they are not showy.

It is a stretch to assert, as the foreign ministers of the eight Arctic states did in 2013, that “the Arctic Council has become the pre-eminent high-level forum of the Arctic region and we have made this region into an area of unique international cooperation” (Kiruna Declaration 2013). Still, there is a sense that the council has accomplished a good deal over the years since its establishment in 1996 under the terms of the Ottawa Declaration (Smieszek 2019). How can we explain this record, given the facts that the council lacks the authority to make binding decisions and that the material resources under its control are negligible? The answer to this question lies in the efforts of the AC’s Working Groups, Task Forces, and Expert Groups to exercise influence through processes involving agenda-setting, information dissemination, and the coordination of informal programs. The Arctic Monitoring and Assessment Programme, one of the council’s working groups, has assembled the data needed to put a number of environmental concerns (e.g., persistent organic pollutants, heavy metals, radioactive contamination) on the policy agenda and helped to energize efforts leading to international agreement on measures like the 2001 Stockholm Convention on Persistent Organic Pollutants (Downie and Fenge 2003; Stone 2015). The Working Group on the Conservation of Arctic Flora and Fauna has documented areas of high-level concern, produced an influential Arctic Biodiversity Assessment, and helped to coordinate the work of coalitions of the willing to make progress in areas like the protection of migratory birds (Barry et al. 2020). The terms of the 2011, 2013, and 2017 legally binding agreements have all been hammered out through the

efforts of issue-specific Task Forces of the Arctic Council, though the council itself lacks the authority to adopt such agreements. The 2004 Arctic Climate Impact Assessment documented the extraordinary effects of climate change in the Arctic, energizing enhanced global efforts to deal with climate change through mechanisms like the UN Framework Convention on Climate Change (Arctic Climate Impact Assessment 2005). The 2009 Arctic Marine Shipping Assessment, which was conducted by the Working Group on the Protection of the Arctic Marine Environment and included a set of actionable recommendations, clearly played a role in propelling the process within the International Maritime Organization resulting in agreement on the provisions of the Polar Code in 2014/2015 (Hildebrand et al. 2018). Critics tend to downplay or even dismiss these forms of influence, noting that the Arctic Council lacks the authority and the resources to undertake forceful initiatives to solve problems on its own. Taken together, however, these modest forms of influence add up to an overall record of performance on the part of the council that compares favorably with the achievements of the more formalized governance systems created to address various problems over the last several decades.

5 ARCTIC GOVERNANCE IN A BROADER CONTEXT

What can we conclude from this overview of the performance of Arctic governance systems? Needless to say, it is important to proceed with caution in responding to this question. There are few opportunities to engage in natural experiments, comparing the performance of formalized arrangements and informal arrangements dealing with the same problem or even distinct problems that resemble each other in relevant ways. Still, the available evidence suggests, at least in the case of the Arctic, that formalized arrangements are not generally preferable in terms of effectiveness and that informal arrangements are not simply underdeveloped governance systems that should be nurtured to become more formalized arrangements at the first opportunity. All three types of arrangements reviewed in the preceding section have yielded positive results under some conditions but led to modest accomplishments or even failure under others. What this suggests is that it is a mistake to focus too much attention on the issue of formalization in thinking about the design of governance systems. This does not mean that the question of whether or not to ground an agreement in a legally binding instrument is irrelevant. But it does mean that we should be paying equal attention to a variety of other diagnostic conditions in crafting the terms of governance systems and taking the necessary steps to move them from paper to practice once we reach agreement on their substantive provisions.

The preceding discussion addresses the performance of Arctic governance systems treated largely as self-contained arrangements. But it is important to recognize that we are witnessing the evolution of an Arctic governance complex in the sense of an expanding collection of distinct elements that interact in a variety of ways but do not stand in any hierarchical relationship to one another (Young 2012). As recent research on international governance suggests, combinations of this sort are common; any effort to evaluate the performance of specific governance systems must take into account the links between individual arrangements and the larger complexes to which they belong. An initial, perhaps surprising, observation about this phenomenon is that there are cases in which interactions of this sort produce synergy rather than leading to crippling interference on the part of overlapping or intersecting arrangements. But there is nothing automatic about the occurrence of positive interactions (Oberthür and Gehring 2006).

A natural question, then, is whether the performance of specific regimes can be enhanced by taking steps to improve coordination among the elements of the institutional complexes within which they operate (Oberthür and Stokke 2011)? The expanding Arctic governance complex encompasses elements that differ in a number of important respects: some are bilateral, others are multilateral; some are formal, others are informal; some are restricted to Arctic states, others include non-Arctic states; some address a single issue, others have a broader mandate. What mechanisms are available to address the issue of coordination in such a setting? In the case of the Arctic, two plausible answers have emerged, one calling for the negotiation of a constitutive Arctic Treaty; the other suggesting that an informal mechanism like the Arctic Council can play this role. Is either of these answers satisfactory? In my judgment, while the need for coordination among the elements of the Arctic governance complex is rising, neither of these options provides the basis for a workable solution. An important challenge going forward, therefore, will center on the effort to devise an innovative response to the challenge of improving coordination among the elements of the Arctic governance complex.

Constitutive arrangements provide broad frameworks that can serve as foundations on which to build operational regimes dealing with more specific needs for governance. A prominent case in point is the 1982 UN Convention on the Law of the Sea, which not only provides a basis for the development of a series of implementing agreements but also offers general principles regarding matters like jurisdiction and the roles of coastal, flag, and port states that guide the development of separate regimes dealing with fishing, shipping, protected areas, and so forth. Closer to home for those interested in the Arctic is the 1959 Antarctic Treaty (Dodds et al. 2017). This constitutive agreement calls for freezing the jurisdictional claims of individual states, demilitarizing and denuclearizing the continent, ensuring that Antarctica is used exclusively

for peaceful purposes, and guaranteeing open access for representatives of the parties to all parts of the treaty area. Over the years, a number of operational arrangements dealing with matters like the conservation of seals, fishing, and environmental protection on and around the continent have developed within this constitutive framework.

Is a parallel Arctic Treaty a realistic option? The answer to this question is no, at least during the foreseeable future (Young 2011). The terrestrial portions of the Arctic lie firmly within the jurisdiction of the Arctic states. The Arctic coastal states have asserted their competence to take the lead in addressing issues relating to the Arctic Ocean; they argue that no new framework agreement is needed to deal with marine issues in the Arctic. At the same time, non-Arctic states have legitimate interests in the Arctic, and they are taking steps to ramp up activities, including both economic initiatives and scientific programs, that are making it impossible to ignore their role as significant stakeholders in Arctic affairs. The Arctic is and will continue to be a theater of operations for advanced military systems, including nuclear-powered submarines carrying state-of-the-art strategic weapons. The Antarctic Treaty was the product of a unique combination of circumstances in which the superpowers of the time (the Soviet Union and the United States) joined forces to strike a bargain with the so-called claimant states to exempt the continent and its surrounding waters from the impacts of political competition by agreeing to treat the area as an international space dedicated to peaceful uses (Berkman et al. 2011). While it is always hazardous to make firm predictions regarding the future in an area like this, no such opportunity to strike a bargain on the terms of a constitutive treaty for the Arctic is on the horizon at this time.

Under the circumstances, numerous commentators have advanced proposals for reforming the Arctic Council to provide it with the capacity to play a coordinating role in the context of the expanding Arctic governance complex (Smieszek 2019). Is such a role for the council a realistic prospect? Three factors seem critical in this context. To perform this role effectively, the council would have to find ways to (i) allow non-Arctic states to engage more fully in its work, (ii) acquire the authority needed to underpin coherent coordinating efforts, and (iii) gain access to more substantial material resources. The fact that the council's constitutive features are articulated in the provisions of a ministerial declaration means that it would not be hard to introduce changes regarding such matters in the event that the relevant actors were able to agree on the nature of the required adjustments. But this is where the problem arises. It is apparent that there is little prospect of agreement concerning such matters during the foreseeable future. There is nothing approaching consensus regarding the proper way to delineate the roles of Arctic and non-Arctic states when it comes to addressing Arctic issues going forward. In any case, providing the Arctic Council with actual authority regarding specific matters would be

difficult to accomplish using the mechanism of a ministerial declaration; such an effort might well trigger a need to reach agreement on the terms of a legally binding instrument, raising once again the issues identified before. No realistic source of material resources that the council could use to perform an expanded coordinating role is in sight. This does not mean that there is no role for the Arctic Council as a coordinator of the Arctic governance complex. But it is important to bear in mind the limits of the capacity of the council to play such a role.

The need for a coordinator of the Arctic governance complex is growing, but neither of the standard responses seems likely to offer an effective way forward regarding this concern during the foreseeable future. So, what is to be done? There is no straightforward, much less simple, answer to this question. But one avenue that may be worth exploring in some detail centers on the articulation of a set of principles that provide the basis for social practices among those interested in the Arctic, even though they are not embedded in any formalized arrangement. The precautionary principle, which suggests proceeding with care when it comes to potentially disruptive activities, might offer a place to start (Vylegzhanin et al. 2020). The idea of stewardship, which calls for systemic thinking not limited to considerations easily expressed through calculations of costs and benefits, is appealing in this context (Chapin et al. 2015). The value of making use of different types of knowledge, including Indigenous knowledge, is another important consideration. Obviously, these are early days regarding such matters; other elements would need to be added in an effort to assemble a normatively grounded, coherent, and widely shared package of operating principles that could develop into a constitutive foundation for the growing collection of operational arrangements included in the Arctic governance complex. The outcome of this process might well become an important determinant of the performance of the individual elements of the Arctic governance complex. Interestingly, there is no reason to assume that formalization would constitute a necessary condition for such a package of operating principles to make a difference in coordinating the Arctic governance complex going forward.

6. Escaping social and socioecological traps in complex systems

1 RESILIENCE: THE BRIGHT SIDE AND THE DARK SIDE

Building on Holling’s pioneering work of the 1970s, a dedicated research community has acted vigorously to develop a rich understanding of the concept of resilience and deploy it as the cornerstone of an influential stream of thinking regarding the dynamics of ecological, social, and socioecological systems (Gunderson and Holling 2002). Resilience, in the resultant analytic framework, is a property of systems. Specifically, it is a matter of the “capacity of a social-ecological system to absorb or withstand perturbations and other stressors such that the system remains within the same regime, essentially maintaining its structure and functions” (Resilience Alliance 2020). What distinguishes resilience from older and related concepts such as equilibrium or stability is the idea that a resilient system is able to adapt to changing circumstances without losing its basic character and its capacity to operate successfully. Thus, we can say that a resilient system “learns” by making adjustments needed to allow it to continue to function effectively in the face of pressures that are both internal and external in origin. To elucidate the processes giving rise to resilience, the research community concerned with such matters has devoted considerable energy to developing a dynamic model commonly referred to as the adaptive cycle, a construct originating among ecologists that shows how systems can experience collapse but rebound through processes of reorganization and regrowth needed to adjust to changing circumstances (Holling and Gunderson 2002). Systems that behave in this manner are regarded as adaptive systems.

As applied to socioecological in contrast to purely ecological systems, the idea of resilience has provided not only an analytic framework to be used in enhancing our understanding of the behavior of systems of interest to humans, but also a normative perspective that many find helpful in creating and administering management systems to address a range of policy issues (Walker and Salt 2006). Put simply, resilience is a good thing. Because resilient systems are able “to absorb or withstand perturbations and other stressors,” they have

greater staying power than systems that lack resilience, especially in a world in which biophysical and socioeconomic changes constitute a prominent feature of reality. It follows that we should devote time and energy to thinking about ways to enhance the resilience of major socioecological systems. While key actors may disagree on the pros and cons of specific strategies for pursuing this goal, there is widespread agreement regarding the desirability of taking steps to buttress resilience.

This analytic framework has produced insights of considerable value, especially as we endeavor to maintain the resilience of socioecological systems in the face of major challenges arising today (Folke 2006). That is a substantial achievement. But in this chapter, I endeavor to temper the air of enthusiasm that surrounds the concept of resilience, drawing attention to two complications that deserve serious consideration as we seek to respond to the 21st century's grand challenges of planetary governance. One complication centers on what I call the dark side of resilience. My purpose in using this phrase is to draw attention to the observation that there are systems that are resilient but generate results that seem undesirable from a variety of normative perspectives; they may even yield outcomes that are worse for all parties concerned than other outcomes that could be achieved if it were possible to break the power of resilience to impede the occurrence of regime shifts or critical transitions. These situations are often characterized as social or socioecological traps (Cross and Guyer 1980; Costanza 1987). As cases like the poverty trap and many traps associated with the tragedy of the commons make clear, systems of this kind may prove highly resilient, resisting even the most determined efforts to escape the force of the relevant traps by instituting reforms designed to alter the dynamics of the systems. In situations of this sort, resilience is a feature of the problem to be solved, rather than a valued property of the system to be enhanced through a variety of supportive measures.

The second complication, cutting across these observations about resilience, arises from the fact that we live in a world of systems that are increasingly complex in the sense that they are characterized by hyperconnectivity, non-linearity, directional change, and recurrent surprises (Johnson 2009; Levin 1999). As the debate about planetary boundaries has taught us, we need to pay close attention to tipping elements in complex systems and the prospect that seemingly small perturbations can trigger profound changes or bifurcations in apparently resilient systems (Lenton et al. 2008; Rockström et al. 2009). This has produced a lively discussion of thresholds, safe operating spaces, and the need to exercise extreme care regarding human actions that could trigger changes that take us by surprise, producing results frequently thought to be catastrophic. The growing interest in the idea of precaution or, in other words, the virtues of playing it safe is a response to this concern.

But here, too, we need to think about the flip side of this phenomenon. What I mean by this is that some complex systems feature positive tipping elements giving rise to opportunities to break out of social or socioecological traps (Lenton 2019). In situations of this kind, seemingly modest initiatives can trigger regime shifts, allowing actors to escape the treadmill of grinding poverty or communities to avoid disruption arising from repeated collapses of valuable living resources. In the case of climate change, the danger of passing a tipping point and moving into a more chaotic climate system is a source of extreme concern. But for those struggling to escape from socioecological traps, there is hope in the prospect of locating tipping elements and finding ways to push complex systems toward thresholds where modest additional interventions can trigger processes that weaken the forces of resilience locking actors into dysfunctional situations. Whereas bifurcations in complex systems may loom as dangerous occurrences to be avoided at all costs in the management of functional systems, they can appear as beacons of hope for those caught in dysfunctional traps. Precaution may well be the order of the day in cases where the goal is to preserve a safe operating space for humanity. But bold initiatives offer a better recipe for the pursuit of sustainability in situations where the challenge is to break out of social or socioecological traps.

2 CRITICAL CLARIFICATIONS

Before embarking on an effort to unpack these observations, let me comment on several critical issues associated with key features of the concept of resilience. Resilience, in this line of analysis, is a variable. Systems may be more or less resilient, and we want to identify those factors that can be expected to enhance or diminish resilience under specified conditions. But here, too, two complications arise. One has to do with the fact that we lack a precise, much less an operational, metric for measuring resilience or assessing trends in resilience under real-world conditions. This does not mean we are at a complete loss regarding levels or degrees of resilience. For instance, it seems reasonable to say that systems featuring negative feedback mechanisms that kick in when perturbations occur will be more resilient than systems lacking such mechanisms. Research featuring arguments pertaining to levels of resilience have also generated productive debates among members of the research community. A good example is the effort to evaluate the relationship between species diversity and resilience in ecosystems. Nevertheless, the lack of a well-defined metric and a widely accepted set of procedures for measuring trends in levels of resilience is a serious problem for those seeking to develop a body of empirically grounded knowledge about the behavior of socioecological systems, much less a capacity to bring this knowledge to bear as a source of prescriptive advice regarding the management of specific systems. Among other things,

this limitation encourages us to think in dichotomous rather than continuous terms. A system is resilient until it passes a tipping point, after which it shifts more or less abruptly from one basin of attraction to another (Rockström et al. 2009).

Then, there is the problem of coming to terms with complex causality, a condition that becomes more and more central as we move into a world of complex systems. What this means is that a multiplicity of factors, often interacting with one another, act as determinants of levels of resilience in specific situations. In those rare situations where we have sizable universes of cases to work with, this means that we need to think in terms of the application of procedures like multiple regression, assigning weights to the role of different factors as determinants of variance on the dependent variable. In the more usual situation where we are limited to analyzing a few cases and focusing on regime shifts, it may make more sense to think about conjunctural causation, as articulated by Ragin and others, who have developed the analytic technique known as qualitative comparative analysis (Ragin 1987). The central idea here is that we should search for clusters of forces that, taken together, can explain whether and when dramatic changes occur, including the dichotomy between the occurrence or nonoccurrence of a regime shift or critical transition in a socioecological system.

3 SOCIAL AND SOCIOECOLOGICAL TRAPS

A trap is a situation harmful to its victims in which a set of interlocking conditions make it difficult or even impossible for those ensnared in the trap to escape through their own efforts. Of course, we are all familiar with situations in which humans are the trappers and members of other species are the victims. Humans seek to eliminate unwanted rodents through the use of mousetraps; trappers make their livings by establishing and running traplines designed to catch animals like beavers and foxes. In such situations, those who set the traps endeavor to make them as resilient as possible. But the focus of interest in this analysis is on situations in which humans, either as individuals or as members of collectivities, fall into social or sociological traps that they find costly to escape from or that they are unable to extricate themselves from at all, at least in the absence of some effective external intervention. In some cases, the struggle to escape actually increases the resilience of the trap, making escape increasingly difficult. In other cases, the effort to escape one trap triggers the onset of conditions that make victims vulnerable to a related trap.

Resilience in such situations is a matter of the persistence of a trap in the face of changing biophysical or socioeconomic conditions. A resilient trap on this account is one that persists or reasserts itself both in the face of substantial changes in the broader setting and especially in the face of focused efforts

aimed at eliminating or dismantling the trap itself. In such cases, resilience emerges as a feature of the problem rather than as a feature of systems that enhance their capacity to perform a variety of social functions effectively. We want to devise strategies that lead to the erosion of resilience and improve prospects for exiting social and socioecological traps in contrast to strategies that can enhance the resilience of adaptive systems. To explore the conditions that give rise to traps of this sort and to begin the process of identifying escape mechanisms or measures that mitigate their harmful effects, I draw a distinction between structural traps and collective-action traps.

Structural Traps

In some societies or social strata within them, a set of interlocking structural conditions serve to impede the efforts of individuals or groups of individuals to enhance their welfare or to improve their circumstances more generally. Consider as an initial example what many think of as the poverty trap. We all know about “rags-to-riches” narratives or Horatio Alger stories in which impoverished individuals “rise from humble backgrounds to lives of middle-class security and comfort through hard work, determination, courage, and honesty” (Wikipedia 2020). But such cases constitute the exception rather than the rule. The fact is that there is a strong correlation between impoverished beginnings and subsequent failure to make good, whether we are looking at the fate of individuals in more or less advanced societies or at the fate of impoverished societies treated as social units. There are several identifiable factors underlying this correlation, including undernourishment, developmental deficiencies, limited access to education, the absence of adequate health care, a scarcity of resources to upgrade infrastructure or invest in new ventures, the degradation of relevant biophysical systems, temptations to engage in illegal activities to alleviate these problems, and so forth. In many cases, the poverty trap is highly resilient. Efforts to intervene to give people a better start in life may benefit some individuals. But they do little to alleviate the poverty trap itself. They may even make things worse for those still caught in the trap by providing an escape route for a few of the best and brightest members of the community, leaving the rest to suffer from the knock-on effects of severe poverty.

Turn next to the case of a socioecological trap arising from the influence of path dependence. During the second half of the 20th century, many Americans fled from harsh conditions prevailing in major cities to seek a better life in newly developing suburbs. Rising incomes during the postwar period made it possible for families to aspire to own their own homes in the suburbs. Developers were happy to oblige by acquiring tracts of land and building new homes to meet the rising demand. Urban and suburban planners were able and

willing to design infrastructure to accommodate the dispersed and relatively low-density residential pattern associated with suburbanization. The rise of automobile ownership led to the development of transportation systems featuring highways suitable for automobile traffic and the relative neglect of various forms of public transportation. Efforts to assess the benefits and costs of suburbanization are highly controversial. But one thing is clear. From the perspective of major environmental concerns and especially the problem of climate change, suburbanization is a significant part of the problem. It is a major source of the fact that greenhouse gas emissions per capita in the United States are among the highest in the world (Global Carbon Project 2020). What makes this situation a socioecological trap is that suburbanization is in many ways a one-way street. That is, it is hard to envision a strategy that would allow us to reverse the course of this pattern of development. At a minimum, the costs of reversing course, at least on a large scale, are widely regarded as prohibitive. Of course, modest adjustments (installing solar collectors on suburban rooftops) are possible. But such measures do not offer an effective escape route from the trap itself.

Yet another example centers on what I call the authoritarian trap. The key observation in this case is that societies in which authoritarian regimes break down or are forcibly overthrown frequently experience the emergence of new authoritarian regimes following a period of more or less unsuccessful experiments with democratic institutions. Prominent recent examples include the reemergence of authoritarian rule in Russia following the collapse of the Soviet Union and the unfulfilled promise of the Arab Spring in countries like Egypt. In effect, the authoritarian trap is resilient under a variety of conditions as efforts to break out of the trap set in motion processes that lead to a reversion to authoritarian control, albeit with new leadership and perhaps with new mechanisms for asserting control. Why is this the case? It turns out that there are close connections between the ability to resist authoritarian rule and the development of a political culture emphasizing active participation on the part of individual citizens and the creation of political institutions that serve as barriers to the ambitions of powerful leaders. The absence of such conditions in Russia stretching back into czarist times is undoubtedly an important determinant of the lack of effective barriers to authoritarian rule in the 21st century. Authoritarian rule is typically harmful to the bulk of the population and may prove harmful to the long-term prospects of society as a whole. Nevertheless, there is no shortage of cases in which the authoritarian trap has proven highly resilient.

A final structural case that also offers some insights regarding the prospects for escaping social and socioecological traps involves what many think of as the demographic trap, or the Malthusian trap. The essential idea, as formulated initially by Thomas Malthus at the end of the 18th century, is that any increases

in food production will stimulate a growth in population, so that society as a whole will revert to a subsistence level over time. This line of thinking has remained influential, especially in times like the post-World War II period during which the Earth's human population has expanded at an extraordinary rate. Yet, on a global scale at least, the trap has not closed (Fogel 2010). A combination of factors, including the clearing of virgin land for farming, the development of improved varieties of plants, the use of chemical fertilizers, and the introduction of pesticides, has allowed food production to increase at a dramatic rate. Although severe famines have occurred in some societies and there are obvious problems regarding the distribution of food within most societies, the rate of growth in global food production is commensurate with the rate of growth in human population. Even so, the concern about the demographic trap has not disappeared. Some ask whether our ingenuity relating to food production has simply delayed the inevitable. Will the cornucopia associated with advances in agricultural technology eventually be depleted as we run into the limits to food production? Equally important are the ecological consequences of the explosion in the population of humans, ranging from rapid increases in greenhouse gas emissions to dramatic losses of biological diversity. This raises a question about whether our efforts to escape the demographic trap have given rise to an even more profound trap involving the long-term sustainability of the human enterprise on a finite planet.

Collective-Action Traps

Another type of social or socioecological trap arises in situations where actors (ranging from individuals to nation states) pursuing their own interests in interactions with others behave in such a way that the outcomes are harmful or even disastrous for all parties concerned. Traps of this sort involve what Olson describes as the logic of collective action (Olson 1965) and Schelling treats as the interplay between micromotives and macrobehavior (Schelling 1978). Of course, outside intervention may alter the incentives of the relevant actors in such a way as to allow them to escape from collective-action traps. Left to their own devices, however, the actors may find it difficult to devise escape routes; their efforts may even serve to tighten the traps. In other words, some collective-action traps often are characterized by a high level of resilience.

Consider as an initial example a situation involving a common pool resource like an exploitable fish stock that is open to entry on the part of those desiring to engage in harvesting. In the absence of effective restrictions, the harvesters are likely to fall prey to what we have come to know as the tragedy of the commons (Hardin 1968). That is, each harvester will have an incentive to continue fishing knowing that any fish remaining in the stock will be taken by other members of the group. The outcome will be a severe depletion or even

destruction of the stock that is harmful to the well-being of all those interested in catching and consuming the fish. There is a long history of efforts to introduce restrictions that make it possible to avoid falling into this trap (Webster 2015). Some of these efforts have proven successful, allowing for the achievement of sustainable harvests over indefinite periods of time. What is striking, however, is the resilience of the common pool trap or, in other words, the frequency with which the trap reemerges in one form or another in the wake of various efforts to break out of it. For example, the introduction of open and closed seasons may result in the occurrence of fishing derbies during shorter and shorter openings. The imposition of gear restrictions is often met with increased investments in the types of gear that are permitted in a given fishery. What is more, measures designed to protect fish stocks from severe depletion often result in outcomes that are unappealing in normative terms. There are many instances in which the introduction of individual transferable quotas (ITQs), for example, leads to outcomes in which smallscale coastal fishers are driven out of the industry and levels of economic inequality rise.

Another case centers on the purchase of guns on the part of those who fear for their own safety. In many cases, the result is a spiral in which more and more people acquire weapons and those who have them already upgrade to increasingly powerful weapons, such as assault rifles. Defenders of such behavior argue that people rather than guns kill other people and that self-defense is a reasonable response to such situations. Nevertheless, it is clear that the spread of weapons in a society leads to a rise in the incidence of homicides. Ironically, the evidence suggests that an individual who possesses a gun is more likely to be killed or injured by gunfire than an individual who does not possess a weapon. It turns out that it is difficult – sometimes impossible – to find a way to escape this trap. In the United States today, for example, those who defend the right to bear arms are so influential politically that there is little prospect of imposing serious limitations on the possession and use of firearms through the operation of the political system. And the resultant trap is highly resilient. In fact, there is a tendency for the trap to become increasingly severe as the actions of individual members of society escalate in response to the real or perceived threats arising from the actions of others. In the absence of effective restrictions, the result can be a dynamic in which more and more powerful weapons proliferate within the relevant society over the course of time.

In recent years, students of international relations have devoted considerable attention to what has become known as the Thucydides trap (Allison 2018). The trap refers to a destructive episode in the history of ancient Greece in which the rivalry between Sparta as an aging hegemon and Athens as a rising great power provoked a protracted war during the 5th century bc in which both sides suffered severe losses. Reflecting on this case, analysts have asked whether the mechanism underlying this trap is generic, so that we can expect

a high probability of destructive warfare breaking out in situations featuring challenges to prevailing political orders in cases where rising powers are perceived to threaten the position of existing hegemon. Some see a dynamic of this sort arising in conjunction with the naval arms race between Great Britain and Germany in the run-up to the outbreak of World War I in 1914. There is a lively discussion today regarding the question of whether a similar dynamic is driving interactions between the United States as an aging hegemon and China as a rising superpower. As critics have observed, it is dangerous to impose simple explanatory models on highly complex historical episodes like the rivalry between Sparta and Athens in ancient Greece, much less to generalize to a range of cases that differ from one another in a number of significant ways. Still, we can see elements of this type of dynamic in the competition between or among leading actors in a variety of social settings ranging from smallscale societies to the global system. The interesting challenge is to identify the conditions leading to the onset of such traps and to determine the extent to which they are resilient in the face of various efforts to escape from them.

A final example, related in some ways to the proliferation of firearms and to the competition among those seeking to achieve dominance within a social system, centers on arms races in which two or more actors compete with one another in an effort to achieve military dominance. As many commentators have noted, arms races often seem to have a life of their own driven by a kind of “mad momentum,” consuming extraordinary amounts of resources diverted from other uses and leading to a condition of mutual exhaustion rather than a victory for one or another of the participants (Fairbanks 1985). Most arms races are properly viewed as social traps. But arms races featuring weapons of mass destruction seem particularly pernicious in these terms. Because each participant is apt to have a pronounced fear that falling behind will lead to a situation in which the other side achieves political control, the resultant competition is likely to become particularly intense. Those who study arms races often pose questions about the resilience of these traps, seeking to identify conditions governing the trajectory and intensity of arms races over time. The result is the development of models that allow us to identify in abstract terms conditions under which these action–reaction processes escalate toward some sort of explosion or, conversely, die down toward some sort of stasis (Rapoport 1960; Boulding 1962). It is not easy to map such models onto real-world situations, making it possible to explain or predict the trajectories of actual arms races. But this observation does suggest that it is time to turn to a consideration of the relevance of various features of the overarching systems in which social and socioecological traps emerge and play out.

4 ESCAPING TRAPS IN COMPLEX SYSTEMS

Those who focus on resilience and spend time thinking about ways to maintain and even enhance resilience tend to regard the growth of complexity in socioecological systems as a source of challenges. Telecoupling may make a community vulnerable to events occurring far away over which members of the community have little or no control. Consider the case of small coastal communities in remote areas forced to relocate due to the impact of coastal erosion attributable to the global forces of climate change. The prospect that crossing ill-defined thresholds will trigger critical transitions that are difficult to cope with leads to an increasing emphasis on the importance of precaution. The implicit message here is that the dangers of action are greater than the dangers of inaction, though it is apparent that inaction can become a source of problems in some situations. Above all, the frequency of surprises occurring in complex systems can give rise to a pervasive sense of unease or anxiety. Because we are aware that surprises will occur but have little ability to forecast when they will occur or anticipate their consequences, we find it difficult to deploy resources effectively to secure the resilience of social or socioecological systems that we value highly.

Certainly, these are understandable concerns. But I want to argue that the role of complexity emerges in a different light when we focus on the phenomenon of social and socioecological traps and think about what is required to escape or break out of traps that are harmful to all those affected by structural traps or to the specific parties ensnared in collective-action traps. Many (though not all) traps are resilient. The poverty trap, for example, often reasserts itself, even in cases where victims struggle to escape and seem to be making some initial progress in their efforts to climb out of the trap. The confusion or chaos following the collapse of an authoritarian regime can create conditions that are favorable to the rise of some new form of authoritarianism. The tragedy of the commons may reemerge in marine fisheries in some new form, even after the introduction of measures intended to break the power of the interactive decision-making that produces outcomes that are harmful to all. Some technological advance or political spark may reignite an arms race that has been slowed or even stopped by the negotiation of an agreement regarding arms control measures.

An observation that applies to most situations of this sort is that strategies featuring incremental or step-by-step measures to escape social and socioecological traps seldom suffice to break the grip of resilient traps. The poverty trap constitutes a classic example. Interventions may help individual members of a group to escape, gaining an education and rising to a higher stratum in the social order. But the grip of grinding poverty for the bulk of the affected pop-

ulation typically proves resistant to the influence of a wide range of measures designed to alleviate the impact of poverty at the margin. Similarly, the creation of democratic institutions that look good on paper often fails to suppress the political dynamics leading to the reemergence of authoritarianism. Much the same is true regarding collective-action traps. Specific measures like gear restrictions in marine fisheries or caps on permissible levels of particular types of weapons may weaken the grip of traps in specific instances. But these traps often prove resilient in the sense that they adapt to the influence of the specific measures and reassert their grip over the outcomes arising from the relevant forms of interactive behavior.

What this suggests is a need to consider critical transitions or what are known as bifurcations in thinking about the prospects for escaping from resilient traps (Lenton et al. 2008; Scheffer 2009). Or, to employ the language of researchers who study resilience, there is a need to identify conditions that can trigger a regime shift or cause a jump from one basin of attraction to another. Whereas most students of resilience fear bifurcations and devote substantial time and energy to maintaining a “safe operating space for humanity,” those concerned with breaking the grip of social and socioecological traps are likely to treat the possibility of critical transitions and bifurcations as a source of hope. If we can find a way to push a dysfunctional system past a critical threshold or tipping point, modest additional efforts may cause a new dynamic to take hold that leads to fundamental changes in the behavior of the system (Lenton 2019). Of course, it is important to avoid falling prey to naive hopes regarding the nature of such processes. Some traps (e.g., suburbanization) may prove extremely difficult to escape; others (e.g., arms races) can end in explosions that impose high costs on all parties concerned. Still, the role of critical transitions and bifurcations will look very different to those concerned with escaping traps than they do to those concerned with maintaining the capacity of the adaptive cycle to avoid regime shifts.

As a general proposition, it seems accurate to say that the probability of critical transitions and bifurcations occurring rises as systems become more complex. That is why the rise of complex systems may seem promising to those seeking to escape traps, even though they do not deny the difficulty of governing such systems effectively. In this connection, the idea of positive tipping elements comes into focus (Lenton 2019). Most discussions of tipping elements point to forces that can drive systems past thresholds leading to explosions or cascades of change that produce destructive results (at least from a human perspective) and that are difficult or impossible to control. This accounts for the fear that seemingly small occurrences can trigger massive consequences that are harmful to all. But this is not the case with regard to positive tipping elements. The idea here is to locate critical threads that can make all the difference for those struggling to escape from a social or socio-

ecological trap. Pulling on the right thread may make it possible to release the jaws of the trap in situations where massive campaigns to break out of a trap that fail to focus on the critical issues prove ineffective.

We can identify (at least) three types of (by no means mutually exclusive) tipping elements that are worthy of consideration on the part of those seeking to escape resilient traps. For shorthand purposes, I will describe them as technological, institutional, and behavioral tipping elements. There is a lively debate about the relative merits of strategies featuring reliance on one or another of these elements. It is apparent that there are no magic bullets available to those seeking to escape social and socioecological traps. The success of specific strategies will be affected by a variety of features of specific situations. Nevertheless, a few examples will serve to clarify the differences among approaches associated with each type of tipping element.

The spread of cell phones and the resultant ability to conduct business over the internet has made a striking difference in the efforts of some communities to escape the poverty trap. Half to two-thirds of the residents of some poor African communities, for example, are now able to make a variety of transactions via the internet. This has opened up significant opportunities for those with entrepreneurial skills to launch new businesses that have produced benefits not only for themselves but also for the communities to which they belong. Turning to a very different example, the development of high-resolution satellite observations has made it possible to document compliance with certain types of arms control agreements, without any need to organize intrusive and politically sensitive onsite inspections. Of course, the evidence regarding compliance is not always conclusive, and this can become a problem in situations where only a few violations can make all the difference. Similar observations are in order regarding the development of satellite observations systems that make it possible to determine whether individual ships are in compliance with fisheries regulations. What this means is that technology may reduce but not eliminate the dynamics generating traps or leading to their reemergence following initial efforts to escape.

In some respects, the classic response to social and socioecological traps is to introduce new institutions or governance systems designed to deactivate some key element(s) of the traps (Young 2017). This response is particularly relevant to collective-action traps. Regulatory arrangements seek to alleviate the tragedy of the commons; arms control agreements seek to defuse the momentum of arms races. But institutional adjustments can help to alleviate structural traps as well. Zoning systems can steer patterns of urban and suburban development and channel choices regarding infrastructure needed to accommodate these patterns. Institutional arrangements aimed at improving the education of girls in poor communities can alter demographic and economic forces in ways that can help to alleviate poverty. Nevertheless, institutional interventions are

hardly a panacea when it comes to escaping from resilient traps. Institutional arrangements that look promising on paper often prove insufficient to control the forces leading to the reemergence of authoritarianism. As those who have struggled to control the spread of firearms through regulatory measures know well, it is not only difficult to get policymakers to agree to meaningful regulations at the outset; it is also extremely difficult in many cases to implement them effectively. On a grander scale, the creation of the United Nations to take action against “threats to the peace, breaches of the peace, and acts of aggression” has not provided any guarantee that we are no longer vulnerable to the Thucydides trap (United Nations 1945). Institutions do play a significant role in efforts to escape social and socioecological traps under some conditions. But they certainly do not provide an all-purpose solution.

This brings us to the role of behavioral tipping elements. Human behavior lies at the heart of social and socioecological traps. Sometimes, the behavior in question involves conscious calculations on the part of those seeking to promote their own interests. Many collective-action traps, for example, arise from the calculations of those engaged in interactive decision-making who seek to maximize relative gains or to protect themselves from the actions of others expected to exhibit such behavior. For their part, structural traps often reflect less conscious efforts of individuals to get ahead or protect themselves in situations over which they have little control. Sometimes, the results are counterproductive, as in many cases featuring the spread of firearms. Often, the results are ineffective, as in many cases involving flight from the perceived ills of urban living. The question that arises in all these cases concerns the extent to which human behavior is malleable. Are we stuck with certain basic features of human behavior baked into our DNA? Or is it possible to influence patterns of behavior associated with the operation of traps through various forms of socialization or the development of cultural constraints? Obviously, it is important to tread carefully in responding to such questions. But there is some basis for optimism in thinking about tipping elements featuring behavioral adjustments. For example, there are human groups in which the dynamic we associate with the tragedy of the commons is a rare occurrence. There are also societies in which levels of trust are high enough to eliminate incentives to purchase firearms based on calculations relating to self-defense.

Finally, it is helpful to introduce a distinction between short-term and long-term solutions to social and socioecological traps. Technological innovations, in particular, often yield solutions that seem remarkable in the short run but that may not prevent the eventual reemergence of resilient traps or the rise of new traps. The development of hatchery fish can prevent stock depletions in the short run. But this intervention alone cannot solve the underlying problem arising from dilemmas of collective action and may lead to negative consequences for affected species. The Green Revolution featuring the use of

improved crop varieties coupled with the introduction of chemical fertilizers and various forms of pesticides has made possible immense growth in global food production. But it does not provide any guarantee against the eventual return of the Malthusian dilemma (Mann 2019). Today, we are debating the merits of turning to geoengineering as a response to what is increasingly regarded as a climate emergency (National Research Council 2015). But it is already clear that geoengineering is at best a palliative measure. What is more, these technological innovations have a tendency to produce more or less severe side effects. The influx of hatchery fish tends to degrade the vigor of natural stocks. The ecological disruption arising from a reliance on monocrops and liberal uses of chemical fertilizers and pesticides is notorious. Geoengineering provides no solution to the problem of acidification and may prove costly in breeding what is known as moral hazard. None of this is to argue that we should avoid all such interventions, letting nature (including human nature) take its course. But it is clear that we need to bear in mind at all times the problematic consequences that may arise from efforts to take advantage of positive tipping elements that seem to offer hope for breaking out of social and socioecological traps.

5 TOWARD A BALANCED VIEW OF COMPLEX ADAPTIVE SYSTEMS

Nothing I have said in this chapter is meant to detract from the significant contributions of mainstream researchers who study resilience. To develop a comprehensive understanding of resilience, however, we need to consider the dark side as well as the bright side of resilience. Social and socioecological traps are common in most societies. In many cases, it is extraordinarily difficult to devise effective escape routes for those ensnared in these traps. And such traps are often highly resilient in the sense that they reemerge in recognizable forms in the wake of disturbances in the form of concerted efforts to break out of them. Cases involving the return of authoritarianism following revolutions and the rise of new threats to the sustainability of living resources following the development of regulatory restrictions provide prominent examples. This does not mean that there are no cases of success in efforts to escape from social and socioecological traps. But it does mean that we must take this problem seriously, seeking to pinpoint the mechanisms involved and devising solutions on a case-by-case basis that are crafted carefully to counteract these mechanisms under real-world conditions.

Finding ways to address two key analytic concerns will be critical to efforts to make progress in developing an empirically grounded and robust theory encompassing both the bright side and the dark side of resilience. One of these concerns has to do with developing operational indicators to distinguish

between a reorganization within the same system and a critical transition from one system to another distinct system (Scheffer 2009). So long as we are dealing with reorganization within the same system, it makes sense to apply the idea of the adaptive cycle and to argue that the system is resilient. We know what a transition from one system to another or from one basin of attraction to another looks like conceptually (Scheffer et al. 2012). But we lack a straightforward method for applying this concept empirically to identify actual bifurcations. The result in many cases is ambiguity regarding the limits to resilience.

The other concern has to do with treating resilience as a variable. If we could measure variations in levels of resilience with some precision, it would be possible to develop and (at least in principle) test hypotheses about factors or combinations of factors that determine levels of resilience. In the absence of such measures, we often are reduced to treating resilience in dichotomous terms. That is, we are inclined to say that a system is either resilient or it is not resilient. The resultant focus on critical transitions has certainly led to important insights regarding the dynamics of ecological, social, and socioecological systems. But it cuts off a large range of topics that a comprehensive account of resilience should be able to address.

We live in a world of increasingly complex systems marked by hyperconnectivity, nonlinear dynamics, and frequent surprises. Mainstream work on resilience tends to regard this development as worrisome. The focus is on thresholds and tipping points, the maintenance of safe operating spaces, and the importance of applying the precautionary principle to avoid skating on thin ice. While this focus is understandable for those who think about the bright side of resilience, a different reaction to complexity comes into focus when we investigate the prospects for escaping social and socioecological traps. Many traps are hard to escape. That is, they are often resilient in the sense that they show a tendency to reemerge following disturbances or perturbations. In such cases, the operation of teleconnections and the occurrence of bifurcations may present opportunities for breaking out of traps rather than appearing as dangers to be avoided at all costs. Because such developments are apt to take the form of surprises under conditions of complexity, those seeking to escape from traps may be unprepared to recognize these opportunities and to seize them in launching prompt efforts to spring free of the traps. This suggests that there is much to be said for taking steps to sharpen our ability to recognize the onset of bifurcations and to build a capacity to move quickly to take advantage of the opportunities they present. The familiar adage that a severe crisis is too good to waste applies to situations of this sort. But for those seeking to escape traps in complex systems, a necessary condition for success in reacting promptly and effectively to the onset of a crisis will be the development of a capacity

to recognize the start of critical transitions quickly and to launch vigorous responses without delay.

7. The technological dimensions of governance

1 TECHNOLOGICAL DRIVERS; TECHNOLOGICAL RESPONSES

Again and again, technological innovations have driven the rise of new issue domains and, in the process, generated new needs for governance. Think of the machinery of industrial production, modern transportation systems, and advanced means of communication as sources of numerous examples. Prior to the machine age, the need to regulate industrial emissions of pollutants such as sulfur dioxide, nitrogen oxides, and greenhouse gases did not arise. The invention of trains, automobiles, and airplanes brought with it a host of governance questions pertaining to licensing, rules of the road, safety, and environmental impacts. Addressing needs for governance relating to telephones, radios, and television has produced a complex network of regulations dealing with matters like licensing and the allocation of broadcast frequencies along with the administrative apparatus needed to implement these regulations. There is nothing surprising or controversial about these observations. To be sure, efforts to develop and implement institutions to address these needs for governance have met with varying degrees of success. But there is no doubt about the existence of an intimate relationship between technological innovations and social institutions across a broad range of issue domains.

In this chapter, I take up several distinct aspects of the relationship between technology and governance. To begin with, there is the question of whether the processes involved in the development and application of new technologies are themselves governable. Is technological innovation a juggernaut that is unstoppable, without regard to the impacts of new technologies on human well-being (Smith and Marx 1994)? Or can we steer the course of technological innovation, encouraging the development of new technologies that seem likely to produce results that are beneficial in societal terms, while discouraging or even prohibiting work on technologies that seem likely to prove harmful to society? Conversely, there is the question of whether we can or should rely on the development of new technologies in our efforts to address various needs for governance. At the end of the day, can we count on techno-

logical innovation to come to our aid as we endeavor to come to grips with complex problems like anthropogenic climate change? Or, as many believe, is the presumption that we can rely on what some commentators criticize as technological fixes to address such problems a dangerous habit that is likely to breed complacency in the face of novel needs for governance and to produce knock-on effects that generate new and sometimes more challenging needs for governance in the course of endeavoring to address existing needs (Commoner 1972)? More modestly, are there technological tools (e.g., advanced monitoring systems) that do not amount to technological fixes but that can play useful roles in conjunction with responses to needs for governance? Looming over all these concerns is the advent of the cyber age. Is the growing role of virtual reality, a phenomenon brought about by the development of a cascade of new information and communications technologies, a game changer generating novel needs for governance that existing institutions are not well positioned to address (Young, Yang, and Guttman 2020)? Will this result in growing challenges to the conventional assumption that we operate on a global scale within a political order in which membership is restricted to actors that are able to meet the requirements for recognition as sovereign states, and states are regarded as the principal actors when it comes to creating and implementing governance systems to address most needs for governance?

2 CAN GOVERNANCE SYSTEMS STEER THE COURSE OF TECHNOLOGICAL INNOVATIONS?

Much thinking about technological innovation reflects a sense of determinism (Heilbroner 1967). On this account, the processes involved in the development and application of new technologies exhibit a dynamic of their own that is largely beyond the control of governance treated as a social function involving efforts to steer human activities toward the production of outcomes that are desirable from a societal perspective. We regularly find ourselves seeking to address needs for governance in issue domains that arise as a result of the advent of new technologies. But the question I address in this section is whether the processes energizing the development of technological innovations are themselves ungovernable. Several distinct strands of thinking are embedded in this enquiry.

Whether their behavior is driven by the pursuit of material gain, the prospect of becoming famous, the desire to solve social problems, or just plain intellectual curiosity, individual inventors are motivated by a drive to figure out how things work and to explore opportunities to create new devices that can be put to practical uses. Thomas Edison, for example, turned technological innovation into a successful business, creating a large, well-staffed laboratory and coming up with numerous innovations that provided the basis

for profit-making enterprises (Simmons 2016; Stross 2008). It seems likely, on the other hand, that the Wright brothers were seized with the challenge of building a machine capable of sustaining manned flight without regard to the commercial potential of their invention (McCullough 2016). The disconnect between innovation and eventual applications may be particularly pronounced in cases where scientific advances are critical to the achievement of success. Many of the atomic scientists, for instance, were drawn to participation in the Manhattan Project by the appeal of working on the cutting-edge scientific challenges involved in understanding nuclear fission in contrast to a practical desire to produce an atomic bomb. Leading scientists like Robert Oppenheimer became acutely aware of the moral and ethical issues associated with the development of nuclear weapons, largely in retrospect once the genie was out of the bottle and the nuclear age was under way. Similar observations may apply to the work of some scientists engaged in the production of knowledge underlying the development of the capacity to engage in heritable human genome editing today (Doudna and Sternberg 2017; Isaacson 2021). In all these cases, the implication is the same: it is difficult, if not impossible, to steer the behavior of those whose efforts give rise to technological innovations.

Beyond this, the imperatives of competition often drive the development of technological innovations. Companies invest substantial resources in research and development (R&D) to generate ideas for new products that will give them a competitive edge in their interactions with rivals. States engage in arms races in order to prevent opponents from gaining the upper hand due to technological innovations and subsidize industries to help them produce technological breakthroughs expected to promote the national interest as well as corporate interests. As the example of arms races makes clear, there are instances in which the resultant competition erodes the security of all the participants and destabilizes the larger system of which they are a part. But that does not alter the fact that what some have characterized as the “mad momentum” arising from competition can become a powerful driver of technological innovation in a variety of settings. The result is a sense that while we may be able to address needs for governance generated by the advent of new technologies, we have little capacity to steer the processes that produce technological innovations.

Nevertheless, it is easy to exaggerate the force of these arguments regarding technological determinism. To begin with, many of the devices inventors create are of little or no interest to others or fail for one reason or another to gain traction within society at large. In Los Angeles, there is a Museum of Jurassic Technology that displays a wide variety of innovative devices that have fallen by the wayside for the most part, never to be heard from again. The point is that a large proportion of the results of technological innovation turn out to be more or less irrelevant from the perspective of governance. What is more, while inventors may be more imaginative than others, they are not

immune to the influence of material incentives or to broader social and cultural currents. Much of the work of inventors is made possible by the provision of material resources on the part of companies or government agencies interested in the development of technologies designed to solve specific problems or to achieve particular goals. While it may not be easy to govern the actions of those in a position to make decisions about the allocation of such resources, there is certainly no basis for arriving at a general conclusion that decisions of this sort are ungovernable. No doubt, the effectiveness of governance in this realm is a variable affected by a variety of factors. But this does not support any general conclusion about technological determinism.

An interesting issue in this realm relates to deliberate efforts to prohibit or limit the development of new technologies as a matter of public policy. The horrors associated with the use of poison gas as a weapon on the battlefields of World War I, for example, stimulated a concentrated effort to ban work on technological innovations that could lead to the development of various types of chemical and biological weapons. Although the resultant 1925 Geneva Protocol banning the use of poison gas has not been completely effective, there is little doubt that this initiative and several others that followed have made a significant difference. More recently, there has been a focused effort to place sharp restrictions on efforts to develop effective anti-ballistic missile systems that many regard as having the potential to disrupt the strategic balance among the nuclear powers, giving rise to extremely unstable and dangerous developments in great-power politics. It would be a mistake to conclude that these efforts to control technological innovation regarding weapons systems have been entirely effective or to assume that ongoing efforts of this kind will prove highly effective in the future. As in other domains, efforts to create and implement governance systems to steer the trajectory of technological innovation often run into problems; they may fail altogether in some instances. But this is not the same as arguing in more general terms that there is something in the nature of technological innovation that makes it ungovernable.

A more fruitful topic for consideration may be experience gained from the development of mechanisms designed to steer the activities of those engaged in processes of technological innovation. To begin with, it is apparent that governments play prominent roles in steering the trajectory of technological innovations in a variety of issue domains. There is a long history of such interventions. A famous case features the British Parliament's action in 1714 to establish a prize of £20,000 to be awarded to anyone able to create a device capable of measuring longitude at sea accurate within half a degree, an initiative that led eventually to the development of the chronometer (Sobel 1995). Not surprisingly, many of the initiatives of governments are driven by concerns about national security. Governments regularly allocate large sums to support R&D intended to produce more advanced weapons systems,

such as sophisticated aircraft, advanced ballistic missiles, and more powerful communications systems. Whatever their usefulness with regard to military security, the resultant technologies produce applications that have far-reaching consequences for civil society. Many of the technologies embedded in sophisticated civilian aircraft today originated in efforts to develop advanced military aircraft. The rockets we use to launch civilian payloads into space owe their existence to the development of technologies for military purposes. A particularly prominent illustration involves the origin of the internet, which grew out of work conducted under the auspices of the US Department of Defense's Advanced Research Projects Agency (DARPA). Of course, this development has triggered an extraordinary flow of additional innovations that go far beyond the intent of the original DARPA initiative (DeNardis 2014). But it remains the case that all these developments stem from a conscious effort to steer the course of technological innovation.

Nor are such efforts limited to interventions inspired by the pursuit of national security. Governments regularly act to promote technological innovation in a variety of areas, using policy instruments ranging from tax breaks to measures designed to protect companies from foreign competitors to outright subsidies. An interesting contemporary example involves the provision of incentives for those engaging in R&D in the realm of technologies relevant to renewable energy. These incentives range from support for producers interested in pursuing technological advances in the fields of solar and wind power to support for consumers (e.g., rebates on electric cars, financial incentives for installing solar collectors) that translates into support for those engaged in the development of new technologies. Of course, it is important to recognize that these forms of support for technological innovation are sometimes offset by a variety of subsidies that support continued reliance on fossil fuels in the energy-intensive sectors of modern societies. Nevertheless, this does not change the observation that the actions of governments play a significant role in determining the trajectory of technological innovation in many issue domains.

Beyond this, governments develop and administer a wide range of regulations that have far-reaching impacts on the trajectory of technological innovation on the part of private or nongovernmental actors working in many areas. While they differ from place to place, almost all societies have developed systems of patents, licensing arrangements, health and environmental standards, and liability rules designed to steer processes of technological innovation. The availability of patents, for example, encourages inventors by offering them rights that can and often do result in streams of income accruing to those who hold them. There is great variation among societies in the character of their systems of patent law. Some influential individuals even argue that inventions should be shared freely with all members of society (Hyde 2010).

But, for the most part, recent trends in patent law have tended to strengthen the rights of those who hold patents. Licensing, by contrast, may operate as a restraint on the activities of inventors. In cases where inventors are required to obtain licenses in order to market their innovative technologies, for instance, society is able to impose a variety of restrictions relating to health and safety, employment, and more general ethical concerns.

Because new technologies often generate unintended side effects, governance systems frequently include regulations intended to suppress negative externalities or to ensure that developers and users of technological innovations have incentives to minimize their unwanted side effects. Much the same is true of liability rules that require users of new technologies to compensate those harmed by the development and application of innovative technologies. The stringency of such rules varies greatly across societies and even across issue domains within the same society. What is more, numerous analysts have shown that the difficulty of pinning down causal connections frequently makes it difficult for victims to obtain adequate redress for harms generated at least in part by the introduction of new technologies (Fagin 2015). Nevertheless, it is fair to conclude that societies use a variety of institutional arrangements to guide the behavior of inventors and that these arrangements do make a difference under a variety of circumstances, even though their effectiveness in any given setting is far from assured.

A particularly challenging situation with regard to governance arises in cases involving what are commonly referred to as dual-use technologies. These are technologies that have multiple uses, some of which are deemed socially beneficial while others are widely regarded as harmful. Perhaps the classic example is nuclear energy, where peaceful uses are generally treated as desirable but military uses in such forms as the development of weapons of mass destruction are seen as harmful. But there are other prominent cases, including biotechnologies that can enhance public health but also have the potential to be used for harmful purposes by antisocial actors, and information technologies that allow actors to engage in all sorts of productive activities but that also open up possibilities for cyberterrorism and cyberwarfare. From the perspective of governance, the challenge is to find ways to permit or even encourage socially beneficial uses of such technologies, while at the same time suppressing or sharply limiting harmful uses. The track record resulting from efforts to solve this puzzle is not encouraging. The rapid growth of misuses of cyber age technologies ranging from identity theft to illegal interventions in electoral processes and various forms of cyberwarfare is a daunting case in point (Perlroth 2020). Today, we are facing a variety of severe challenges relating to the regulation of uses of biotechnology in the absence of any well-conceived governance strategies likely to prove effective (Evans 2020). But this is no reason to throw up our hands in the face of the forces of techno-

logical determinism. As I argued in Chapter 2, these developments are among the grand challenges of global governance in the 21st century; efforts to devise new strategies for steering behavior in these areas will constitute cutting-edge concerns for those who work on the creation and implementation of governance systems for some time to come.

The argument of this section supports the conclusion that governance systems are often significant and sometimes decisive determinants of the trajectory of technological innovation. But it also suggests three broader observations that are important in providing context for this conclusion. As is the case in all other domains, the impact of governance systems is only one of a number of factors that together determine the trajectory of technological innovations. There is ample scope for asking questions about what works and does not work in this realm and thinking about opportunities for enhancing the effectiveness of governance systems in specific settings. It is worth noting that there are significant normative issues in this realm. For example, there are those who argue that technological dynamism is generally good for society and that we should not encumber inventors with restrictions or limitations likely to hinder the course of technological innovation. Without going into detail here, it seems reasonable to suggest that the trick is to strike a balance between the imposition of appropriate restrictions (e.g., limitations designed to protect public health) and the avoidance of restrictions (e.g., oppressive licensing requirements) likely to stifle the development of socially beneficial inventions. But applying this general standard to specific situations will give rise to intense controversy in many cases.

A second observation is that effective efforts to steer the course of technological innovation can lead to outcomes that many will find objectionable on ethical or moral grounds. Perhaps the most prominent cases center on the role of the state in allocating public revenues to support technological innovations justified in the name of national security. Major powers provide massive support for R&D relating to the invention of ever more sophisticated weapons systems that are said to be needed to defend society against the actions of hostile outsiders. But in most cases, the effect is to stimulate arms races that leave no one more secure and everyone with fewer resources to invest in the promotion of human well-being. But national security is not the only realm in which this concern arises. In modern times, for example, societies have supported the development of a variety of technologies that are major contributors to the onset of anthropogenic climate change, thereby accelerating the emergence of one of the grand challenges of global governance in the 21st century. Of course, there is room for disagreement about such matters. What some see as negative results of the efforts of governments to steer the course of technological innovation, others will treat as socially desirable. But for now, the point is that there is a critical difference between effectiveness and

social desirability when it comes to evaluating the results of efforts to steer the trajectory of technological innovation.

Finally, it is useful to draw a distinction between the results of efforts to steer the trajectory of technological innovation in specific instances and the broader forces of technological dynamism. It may be that while governance works in specific instances (e.g., prohibiting the development of certain types of biological weapons), the forces of technological determinism are difficult to control on an aggregate or systemic level. This is the concern of those who argue that at the macro level the technological juggernaut is uncontrollable and that the best we can hope for is to find effective ways to adjust to a continuing wave of technological innovations. This is an important line of thinking (Winner 2020). But it is difficult to analyze such arguments on a systematic basis. It is probably fair to say that some societies (e.g., America in the 20th century) are more in thrall to the forces of technological determinism than others. And it is certainly true that there are waves of technological innovation in the sense that the pace of innovation varies greatly across issue domains, social contexts, and time periods. But none of this reduces the importance of asking questions about the effectiveness of various strategies for governing the course of technological innovation in specific times and places.

3 CAN TECHNOLOGICAL INNOVATIONS HELP IN MEETING NEEDS FOR GOVERNANCE?

A wide chasm separates the views of those who believe technological innovations can produce solutions to problems giving rise to needs for governance from the views of those who regard technological innovations as sources of problems and technological solutions as unsatisfactory at best and likely to generate serious knock-on problems under the most favorable circumstances. On one side are those who regard necessity as the mother of invention. They argue that acute needs for governance will incentivize inventors and that human ingenuity is sufficient to come up with solutions to most – possibly all – problems when the incentives are right. Their opponents are likely to deride such thinking as constituting a form of technological salvationism apt to eventuate in ill-considered technological fixes that offer no more than partial solutions to current problems and that are unlikely to contribute to human well-being in the long run. Stated in their strongest terms, these opposing perspectives often stimulate acrimonious debates among proponents that fail to contribute to a more nuanced assessment of the contributions of technological innovations to meeting needs for governance in modern societies.

It is not difficult to find concrete examples that illustrate the arguments of the two camps. A well-known example centers on the looming crisis of increased horse manure in urban streets toward the end of the 19th century. The introduc-

tion and rapid growth in the use of motorized vehicles led to the evaporation of this crisis over the span of a few years. But counter examples are equally easy to find. The development of tall smokestacks as a response to the effects of local air pollution generated by power plants and factories, for instance, produced the phenomenon of long-range air pollution, introducing the problem of acid precipitation and eventually leading to the negotiation of international agreements intended to curb the impacts of long-range transboundary air pollution. Problems with chemicals (e.g., ammonia) used in refrigeration provided the impetus for the development of chlorofluorocarbons (CFCs) during the 1930s. But the new chemicals turned out to be ozone-depleting substances that caused a serious thinning of the Earth's stratospheric ozone layer. The result was an acute need for governance leading in due course to the negotiation of the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer followed by a series of substantive amendments strengthening the provisions of this agreement in the following years (Parson 2003). An interesting feature of this example is that the success of the Montreal Protocol, widely regarded as one of the most effective international regimes of modern times, is linked closely to the ability of major corporate players like DuPont to come up with alternative technologies when confronted with powerful incentives to phase out the production and consumption of ozone-depleting substances, including CFCs, halons, and several other families of chemicals.

What these observations suggest is a need to think systematically about the relationship between technological innovation and the creation and implementation of social institutions, including a consideration of the conditions that determine whether technological innovation becomes part of the problem, part of the solution, or both in situations featuring needs for governance. Setting aside the extreme views – technological innovations can solve all problems versus “tech fixes” are part of the problem – questions about the interactions between technological innovations and the creation and administration of governance systems come into focus. Can technological innovations contribute to the development of steering mechanisms that make it possible to alleviate or even solve problems giving rise to needs for governance? Can governance systems channel efforts to develop technological innovations, promote the development of some innovations in contrast to others, or impose regulations channeling the application of innovations to specific issues? In short, the interesting questions have to do with the interactions between technology and social institutions rather than whether we should treat the promotion of technological innovations or the creation of new institutions as alternative ways to respond to needs for governance. One way to explore this theme systematically is to examine conditions that are likely to determine whether technological innovations constitute a help or a hindrance when it comes to addressing various needs for governance.

One important condition involves what many analysts call moral hazard (Arrow 1971). The issue here is easy to identify but difficult to evaluate with reference to specific situations. If actors ranging from private individuals to prominent political leaders believe that technological innovations will come to the rescue once a problem becomes sufficiently severe, will this generate complacency regarding the creation and implementation of governance systems designed to steer behavior toward the avoidance of largescale problems or toward the development of solutions that do not rely on technological fixes? In the case of climate change, for example, does the idea that we can resort to various forms of geoengineering undermine or erode incentives to strengthen the provisions of the 2015 Paris Climate Agreement? Or can we move vigorously to build an effective climate regime, holding in reserve the option of turning to various forms of geoengineering if and when we reach a point where the case for adopting technologies of this sort becomes compelling? There are no simple answers to these questions. No doubt, complacency is a serious concern. It will affect the thinking of some actors more than others. A key question in this regard concerns the prospect of taking steps to explore the pros and cons of technological options (e.g., various forms of solar radiation management), while at the same time making it clear this is not an alternative to proceeding energetically to improve institutional arrangements like the Paris Climate Agreement. At the end of the day, this is a challenge of creating an appropriate mindset regarding the contributions of technological innovations rather than a technical challenge (e.g., creating effective vaccines for Covid-19) to which there is a well-defined solution. But that does not mean we cannot make progress toward meeting this challenge.

Another condition regarding the role of technological innovations has to do with the occurrence of harmful side effects arising from the development and application of technologies designed to deal with societal problems. All major technological innovations produce both direct and indirect effects. The development of solar panels to increase the use of renewable energy or electric vehicles to reduce the use of gasoline, for example, has triggered the creation of new companies, introduced new types of jobs, and changed the behavior of investors regarding the allocation of available capital. A variety of indirect effects are likely to follow, including the loss of jobs for workers in old industries and the decline of communities that are unable to adjust easily to the shifting landscape of industrial activities (e.g., cities in the American Rust Belt). Some of these consequences may prove costly to those whose livelihoods are tied to old technologies superseded by the development and application of technological innovations. There is nothing surprising about occurrences of this sort; they are classic consequences of technological innovation at all times and in all places. Societies may want to assist those displaced by such changes to improve their chances of finding new roles or even compensate victims.

But there is no reason to adopt measures to block or slow down the course of technological innovation for this reason alone.

The concern about relying on technological solutions to address problems producing needs for governance centers on two more specific issues. One of these issues concerns unforeseen harms or costs that are not taken into account in decisions regarding the introduction of technological innovations in efforts to meet needs for governance. For example, no one foresaw or fully understood the array of environmental impacts associated with the operation of nuclear power plants or the costs of decommissioning such plants at the end of their productive lives in early discussions regarding the role that nuclear energy could play as an alternative to systems relying on fossil fuels to generate electricity. We have been slow to recognize, much less to address adequately, the harms that increased reliance on hydroelectric power impose on those displaced as a result of the construction of large dams and on the surrounding ecosystems. These are specific externalities resulting from efforts to reduce emissions of greenhouse gases rather than normal effects associated with technological innovations under any circumstances. They deserve to be taken seriously in any assessment of the pros and cons of adopting technological responses to societal problems.

Then there are issues regarding the extent to which technological responses constitute full-fledged solutions to the problems at hand. Consider again the case of geoengineering as a response to climate change (National Research Council 2015). Making use of technological innovations to manage solar radiation might suffice to control the increase of temperatures at the Earth's surface by blocking some incoming solar radiation. But so long as such measures are not accompanied by a substantial reduction in the use of fossil fuels, they would provide no solution to the disruptions caused by the acidification of marine and terrestrial ecosystems. What is more, relying on solar radiation management to address the problem of climate change would require what amounts to a permanent commitment. Any interruption in the application of the relevant technologies would be followed by a rapid rise in temperatures at the Earth's surface with consequences that might well be catastrophic. While turning to geoengineering as an emergency response to a problem that we have allowed to get out of control may seem unavoidable, therefore, no one should be under the illusion that this technological fix constitutes a fully satisfactory response to the problem of climate change. Certainly, it offers no basis for relaxing our efforts to introduce institutional arrangements that will lead to reductions in emissions of greenhouse gases.

Sometimes technological solutions generate new and potentially more serious problems as an unintended and typically unforeseen consequence of efforts to come to terms with the initial problem. I have referred already to the examples of acid rain and the thinning of the stratospheric ozone layer.

But it turns out that these cases are not unusual. Other examples are easy to identify. The development and application of chemicals such as DDT have proven highly effective in combatting diseases like malaria. But these persistent organic pollutants are highly destructive in ecological terms (Carson 1962). They have contributed to the profound problem we now understand as the loss of biological diversity, and efforts to control uses of this large family of chemicals have given rise to international agreements like the Stockholm Convention on Persistent Organic Pollutants. Similar remarks are in order regarding what is known as the Green Revolution, a development that undoubtedly has played a role in reducing hunger on a global scale but that has also contributed to the loss of biological diversity due to increased reliance on a small number of cultivars and to growing reliance on chemical fertilizers and pesticides (Mann 2019). The fact that the application of technological innovations to meet needs for governance can and often does generate knock-on problems does not constitute a reason for avoiding all technological responses to the world's problems. But it does provide a compelling reason to proceed with an abundance of caution in turning to technological innovations to meet a wide range of needs for governance.

In the final decades of the 20th century, the idea of technology assessment became popular as an approach to thinking systematically about the benefits and costs of turning to technological responses in making informed decisions about matters of public interest, including responses to needs for governance. In 1972, for example, the US Congress created an Office of Technology Assessment to “provide Congressional members and committees with objective and authoritative analysis of the complex scientific and technical issues of the late 20th century.” The assumption embedded in such measures is that we can make intentional choices regarding the role of technology in dealing with matters of public policy and that it is possible to represent all the consequences associated with available options in terms of a utilitarian and preferably quantitative calculus of benefits and costs. This should make it a relatively easy matter to select that option in any given situation with the highest benefit/cost ratio. Whatever its appeal in conceptual terms, the effort to apply technology assessment to issues regarding the role of technological innovations in meeting needs for governance has produced disappointing results. In many cases, the consequences of technological solutions to societal problems include major unknowns and even unknown unknowns. The idea that it is feasible to represent the consequences of technological solutions in terms of some common metric of benefits and costs has proven deeply controversial at best. What is more, the application of benefit/cost analysis has failed to suppress continuing efforts on the part of interest groups to promote the selection of options favorable to themselves, regardless of the consequences for society as a whole. As a result, what began as a promising new approach to policy analysis has

fallen by the wayside. In the United States, Congress dismantled the Office of Technology Assessment in 1995, following the 1994 election, which brought to power Republican legislators who regarded the office “as wasteful and hostile to GOP interests.” With regard to the specific issue of evaluating the contributions of technological innovations to meeting needs for governance, it is clear that we cannot count on technology assessment as a rigorous procedure for examining the conditions under which technological solutions are feasible, much less desirable.

Much of the debate about technological solutions has turned on questions of effectiveness. Can geoengineering solve the climate problem at an affordable cost? Would relying on geoengineering to solve the climate problem produce knock-on problems, so that the cure might turn out to be at least as bad as the ailment over time? But it is increasingly clear that there are important normative issues associated with a turn to technological innovations to meet needs for governance. In some cases, these issues feature matters of justice or fairness. Do technological solutions in specific cases allow the rich and powerful to protect themselves from the negative impacts of environmental problems, while leaving the masses to suffer the consequences? Are technological solutions that offer protection to those living today likely to impose severe costs on members of future generations? At the same time, there are larger normative questions that come into focus in thinking about the role of technological innovations in meeting needs for governance. Does the idea that we can count on technology to come to our rescue in addressing issues like anthropogenic climate change reflect a kind of technological salvationism that encourages us to avoid the hard work of thinking carefully about the consequences of relying on energy produced through the combustion of fossil fuels? More broadly, does technological salvationism breed an attitude of indifference or complacency regarding the disruptive consequences of human activities that seem appealing in terms of personal gratification?

If these concerns are taken seriously with regard to the contributions of technological innovations to solving specific problems, the issues are magnified greatly when technological salvationism becomes a pervasive feature of the prevailing culture in major societies like the United States or China or in international society more generally. What is at stake here is a clash between the values and practices of technological cultures, which set store by a continuous flow of technological innovations to provide new experiences and solve old problems, and more humanistic cultures, which emphasize the distinction between humans and machines and seek to promote practices (e.g., interest in the arts, mindfulness) that do not rely on technological innovations to generate new experiences. Of course, it is easy to exaggerate this cultural divide, and there is no way to reach conclusions regarding the relative merits of one cultural orientation or the other in any case. Nevertheless, it is worth noting

that any comprehensive assessment of the role of technological innovations in meeting needs for governance must take into account the links between this specific concern and a range of issues regarding the links between technology and culture.

This broader concern will resurface in the concluding section of this chapter on consequences arising from the onset of the cyber age. But one observation that seems relevant at this stage is that there may be a growing need for governance regarding efforts to make use of technology in meeting needs for governance (Royal Society 2009). Once again, the case of geoengineering offers a clear example. Who should decide when to resort to geoengineering to alleviate the impacts of anthropogenic climate change and whether some forms of geoengineering are more acceptable than others? Should we devise different rules to deal with those measures commonly referred to as carbon dioxide removal in contrast to solar radiation management? Should we allow research regarding various types of solar radiation management to go forward with few restrictions, but then shift gears when it comes to the deployment of the relevant technologies on a sizable scale? Would it be helpful to articulate the provisions of a regime for geoengineering in the form of an international legally binding instrument? How might we address the challenges of moving such a regime from paper to practice? While geoengineering constitutes a prominent case of great interest to analysts and practitioners today given our inability to come to grips with the problem of reducing emissions of greenhouse gases sufficiently to address the problem of climate change, it is by no means unique. It is not difficult to think of other examples relating to the 21st century's grand challenges of planetary governance, such as the possibility of making use of technological innovations in the effort to come to terms with the dramatic growth in disruptive misuses of cyberspace.

4 CAN TECHNOLOGICAL INNOVATIONS IMPROVE THE PERFORMANCE OF GOVERNANCE SYSTEMS?

Setting aside for the moment the debate about the virtues of technological solutions and the dangers of technological fixes, we can turn to a series of more concrete issues regarding roles that technology can play in the development and administration of institutional arrangements dealing with a variety of needs for governance. Here, it is helpful to make use of the idea of the policy cycle as a means of organizing the discussion. Technology may prove useful across the various stages in the cycle, ranging from the identification of emerging needs for governance through the creation of governance systems and their movement from paper to practice and on to the evaluation of performance

and the consideration of adjustments to existing systems needed to improve performance in subsequent time periods.

Advanced observing systems can provide early warning regarding the emergence of needs for governance and the assessment of competing arguments regarding the sources and seriousness of the relevant problems. Airborne and satellite-based observations have played key roles in the identification of the problems of acid rain, the thinning of the stratospheric ozone layer, and climate change. Similar observations are in order regarding the pollution of rivers and lakes, the destruction of coral reefs as a consequence of the acidification of sea water, and the spread of radioactive fallout from accidents involving nuclear power plants at Chernobyl, Three Mile Island, and Fukushima. Growing awareness of the problem of plastic debris today is made possible through the application of technological innovations allowing us to track the debris over long distances and in remote places. There is every reason to expect that technological innovations will become more and more prominent, both in detecting and in analyzing the nature of emerging needs for governance during the foreseeable future.

Technology can also provide assistance in designing the provisions of governance systems to address what we commonly refer to as the problem of fit (Young 2002). Computer programs can provide assistance in making decisions regarding the location of the boundaries of marine protected areas in such a way to achieve common goals while minimizing harm to the interests of individual stakeholders. Integrated assessment models can help to set targets for reductions in emissions of greenhouse gases by making projections regarding the relationship between emissions and the concentration of greenhouse gases in the Earth's atmosphere. Remote sensing can help to identify what areas need to be included within the scope of systems designed to protect marine mammals from harmful ship strikes. None of these applications of technology eliminates the need for policymakers to make hard choices. But they can contribute to the pursuit of informed decision-making on the part of those charged with the management of complex systems.

Likewise, technology can play a number of important roles when it comes to moving the provisions of governance systems from paper to practice. Some of these roles center on issues of monitoring, reporting, and verification. In cases where onsite monitoring would be difficult due to remoteness in spatial terms or sensitivity in political terms, satellite-based monitoring systems often are able to generate the information needed to facilitate the administration of governance systems. Automatic information systems can determine whether ships at sea are located in areas subject to various regulatory measures. Remote sensing can help to determine trends in phosphorus levels in major water bodies. Many assessments of the performance of international governance systems have noted deficiencies in the actions of members when it comes to

fulfilling reporting requirements. This can become a serious problem when it comes to the administration of regimes. But technological innovations involving the growing sophistication of Earth observing systems can help to alleviate this problem, without precipitating political battles or triggering sensitivities arising from efforts to bring pressure to bear on regime members to fulfill reporting requirements.

As this discussion suggests, technological innovations may prove helpful as well in addressing problems of compliance, even in a politically decentralized setting like international society. Consider the case of the Polar Code dealing with commercial shipping in Arctic waters, which entered into force at the beginning of 2017 (Hildebrand et al. 2018). The code requires ships sailing in Arctic waters to be in possession of a valid license to operate in the form of a Polar Certificate and to have an operational transponder on board at all times. Satellite-based automatic information systems can track the movements of specific ships in Arctic waters in real time. Monitors can then match the resultant observations with an electronic database to determine whether individual ships are in possession of a valid license. Those who manage the data can share this information with port authorities, so that these authorities will know whether a ship is in compliance with the rules and can act accordingly when the ship's captain or owners request permission to enter a specific port. This example is specific to a particular case. But it illustrates the proposition that technological innovations can play a role in helping to ensure compliance with the provisions of governance systems, even in settings like international society where there is no government in the ordinary sense of the term to deal with matters of compliance and enforcement.

Technology may also come into play in assessing the performance of governance systems to determine whether there is a need to strengthen the provisions of such systems to meet the relevant needs for governance. The 2015 Paris Climate Agreement, to take a prominent case, calls for actions on the part of members to limit temperature increases at the Earth's surface to 2°C, and if possible to 1.5°C. To this end, the parties to the agreement have pledged to make what are known as Nationally Determined Contributions and to review these contributions at regular intervals to determine whether they need to be strengthened. In this connection, it is easy to see that technologically sophisticated observing systems will be essential in tracking performance, providing the information needed to drive what the agreement calls the Global Stocktake process. While there may be debates about the relationship between rising concentrations of greenhouse gases in the Earth's atmosphere and temperature increases at the surface of the Earth, there can be no doubt about the critical role that sophisticated technology can play in evaluating the performance of this governance system over time.

What emerges from this discussion is a close connection between governance and technology across the full range of phases of the policy cycle from the identification of new needs for governance to the evaluation of the performance of governance systems that have been in place for some time. Importantly, nothing in this discussion raises questions about whether we are in danger of becoming dependent on technological fixes that turn out to do more harm than good in the long run. But it does suffice to demonstrate that there are intimate connections between social institutions and technologies, especially when it comes to crafting governance systems that are well matched to the character of the problems at hand and assessing the performance of the resultant systems once they are up and running.

5 IS THE ONSET OF THE CYBER AGE A GAME CHANGER?

A cascade of technological innovations over the course of the last four to five decades has triggered the onset of the cyber age (Isaacson 2014; Young, Yang, and Guttman 2020). Including developments in software as well as hardware, this cascade has already produced computers, smart phones, the internet, the world wide web, social media, robots, artificial intelligence, machine learning, big data, the internet of everything, and facial recognition. And there is no indication that the flow of new innovations will slow during the foreseeable future. What sets this cascade of developments apart from other technological innovations is that the new technologies highlight the role of virtual reality in contrast to material (biophysical and socioeconomic) reality. Increasingly, human activities feature virtual interactions in the sense that people are able to engage in a growing range of activities making use of digital technologies without engaging in any face-to-face interactions. Many are able to work from home, interact with one another for business or pleasure using virtual platforms, and handle a large proportion of their needs via online transactions. The eruption of the Covid-19 pandemic in 2020 clearly has accelerated and intensified this trend. But there is no doubt that the trend toward reliance on digital technologies using virtual reality to deal with a growing range of tasks will continue even after the pandemic subsides.

Two additional features intensify the distinctiveness of the cyber age. One centers on the pace of innovations in the realm of digital technologies. The flood of technological innovations has reached a point where even the most technologically savvy individuals find it difficult to keep up with new developments arising in a variety of fields. We are all in danger of falling further behind in relation to the cutting edge of technological innovations. In addition, private individuals working in remote locations with relatively few resources are able to generate innovations that mushroom into digital technologies

becoming important features of the cyber age. Think of the origins of Google and Facebook as examples of this phenomenon. Among other things, this feature of the cyber age makes it difficult for public authorities to control the pace and trajectory of technological innovations, no matter how determined they are to do so. Adding these features together suggests that we are now operating in a setting that differs qualitatively from the setting existing prior to the onset of the cyber age. What are the implications of this shift for the generation of needs for governance and the creation of governance systems to meet these needs?

For one thing, there is the issue of developing governance systems to manage human interactions involving the use of the internet, the world wide web, social media, and so forth. As others have shown, early efforts to deal with this issue involved the evolution of social practices through processes that were to a large extent spontaneous. The development of a suite of practices required for the operation of the internet on an orderly basis provides a striking example (Brousseau et al. 2012; DeNardis 2014). But with the passage of time, we are witnessing a rapid growth in misuses of cyberspace to pursue disruptive and largely illegitimate ends. These misuses range from the activities of individuals involving identity theft, bullying, the tarnishing of personal reputations, and the willful disruption of business operations to the activities of organized groups featuring corrupt financial practices, interventions in electoral processes, and cyberterrorism and on to the activities of government agencies bent on weakening opponents and engaging in what is generally regarded as cyberwarfare. The net result is that what began as a remarkable example of the rise of spontaneous order has devolved into a situation featuring a growing range of needs for government that are almost certainly impossible to fulfill spontaneously and that pose fundamental challenges for those seeking to develop intentional governance systems. At this juncture, most of us are still able to use the internet and related digital systems without incident on a day-to-day basis. But the emerging challenges in this realm are daunting (Perloth 2020).

What are the prospects for governing or steering the ongoing flow of innovations in the realm of digital technologies? Given the variety of new developments and the pace at which they arise together with the facts that innovations are often the work of small groups of individuals who work in isolated locations and are able to launch their innovations on virtual platforms, the prospects for efforts to control the continuing cascade of innovations in the realm of digital technology seem dim. Consider the history of developments like YouTube, Twitter, Instagram, and TikTok in this connection. It is true that major players like Alphabet, Facebook, Microsoft, and Alibaba typically buy up innovations once they show clear signs of success, giving these large corporate players some ability to guide the trajectory of developments in the

realm of digital technology. Nevertheless, the major players do not control the initial stage of the innovative process, and in any case there is no reason to assume that these corporate players are motivated by a desire to steer developments toward socially desirable outcomes. Recent controversies regarding the extent to which platforms like Facebook and Twitter should be required to assume some responsibility for the content of material appearing on their platforms (e.g., hate speech, falsehoods intended to sway voting behavior) are particularly interesting in this connection.

On the other hand, public authorities may be able to exercise control over applications of digital technologies, even if they have difficulty controlling innovative processes themselves. Perhaps the most far-reaching example in this regard centers on China's efforts to construct a Great Firewall to limit the access of its citizens to digitally distributed information and to make use of digital technologies allowing for the use of big data and facial recognition software as instruments of social control. China has invested heavily in these efforts, and there is no doubt that these efforts have produced significant results (Klimburg 2017). For example, China blocks the access of ordinary citizens to products distributed by Google, takes down materials considered undesirable (e.g., the report on climate change known as *Under the Dome*) shortly after they are uploaded, and engages in surveillance of the activities of individual citizens.

Nevertheless, it is worth noting how difficult it is to achieve success in such efforts to control applications of digital technologies. Anyone in China who is willing to invest time and energy can overcome the restrictions of the Great Firewall. The installation of a VPN allows access to restricted materials. Users of WeChat, the Chinese equivalent of WhatsApp, can communicate freely with people all over the world. There is no problem including Chinese participants in virtual meetings using platforms like Zoom and Microsoft Teams. Even internally, there is a cat-and-mouse game in which clever users of digital communications systems engage in the invention of new terminology to replace terms that have been censored by the authorities. Clearly, this extraordinary campaign to control the application of digital technologies has achieved results, especially when it comes to the day-to-day interactions of ordinary people. Still, it is remarkable how easy it is for those who are motivated to overcome or circumvent these restrictions on a regular basis.

So, what about the role of digital technologies in solving societal problems or helping to meet needs for governance in various issue domains. I have commented already on the difficulties involved in devising effective governance systems to steer human uses of virtual reality. If anything, these difficulties are becoming more severe as the cascade of technological innovations continues. On the other hand, digital technologies may provide the means to address a variety of needs for governance, either by alleviating the underlying prob-

lems or by devising innovative methods to move the provisions of governance systems from paper to practice. Consider the following examples to provide a preliminary sense of what is feasible in this regard.

By allowing people to work from home, take virtual classes, shop online, and engage in social interactions via Zoom or similar platforms, the use of digital technologies can reduce problems arising from congestion or crowding, thereby cutting down on needs to regulate congestion in public places and reducing emissions of pollutants including greenhouse gases. Similarly, by optimizing uses of heating and cooling systems and controlling uses of water, digital technologies can reduce the demand for energy and alleviate water shortages. Clearly, these developments will lead to major shifts in residential patterns and in urban infrastructure. Already, for example, retail establishments are being turned into warehouses for fulfilling online orders and commercial office spaces are being adjusted in response to the rise in numbers of telecommuters. The reduction in face-to-face interactions will prove harmful to some activities (e.g., live theater and concerts), and there is no doubt that virtual interactions are a poor substitute for face-to-face interactions with regard to some features of human relationships. For example, it is hard to replicate virtually the chemistry of face-to-face interactions that is so central to sparking creativity in the arts and sciences. This means that adapting to the changes brought about by the onset of the cyber age will require not only far-reaching adjustments on an ongoing basis but also sensitivity in providing continuing opportunities for face-to-face interactions. Still, this does not alter the fact that the growing use of virtual reality can play a critical role in addressing some needs for governance.

Similar observations are in order regarding the uses of digital technologies in moving governance systems from paper to practice. While authoritarian leaders desiring to control the behavior of their subjects may misuse these technologies, digital systems employing advanced observation capabilities and making use of big data can help to determine allowable harvest levels for renewable resources, operate emissions trading schemes efficiently, and assess rates of progress toward fulfilling collectively determined goals. Similarly, the use of artificial intelligence to pilot aircraft or robots to clean up after accidents can make it possible to engage in activities that would be too dangerous for real people to undertake. These applications do not constitute a panacea. Quite apart from problems arising from intentional misuses, there is plenty of scope for things to go wrong in the use of digital technologies to deal with matters involving the administration of governance systems. Nevertheless, the technologies of the cyber age open up opportunities to make use of steering mechanisms that were unavailable in earlier times.

6 CONCLUDING OBSERVATIONS

There are multiple links between technological innovation and the creation and administration of governance systems. There is no need to engage in technological determinism to recognize that technological innovation is a major driver of the evolution of human societies. Whether or not the pace and trajectory of technological innovations are themselves subject to effective steering is an open question. Perhaps the most promising initiatives in this realm center on efforts to exercise control over applications of new technologies in contrast to steering the course of technological innovation itself. As the massive Chinese effort to construct the Great Firewall suggests, such efforts may reflect the pursuit of objectives that are antithetical to liberal values. But this case also indicates that achieving effective control in this realm, especially in the cyber age, is easier said than done. More generally, there are serious limitations to efforts to steer when it comes to regulating the influence of a pervasive technological culture in contrast to guiding the use of technological innovations to pursue specific goals.

With regard to the role of technology in efforts to meet various needs for governance, much has been said about the debate between those who believe that technological solutions will be forthcoming when the need arises and those who fear that a faith in technological fixes is part of the problem. There is no simple way to resolve this debate. Technological innovation can play an important role in solving some problems; the dangers of an excessive faith in technological fixes are real. Perhaps more relevant is an analysis of the roles that technological innovations can play in providing early warning of emerging problems, designing regimes that are well matched to the relevant problems, administering the provisions of steering mechanisms effectively and efficiently, and helping to evaluate the performance of governance systems. Here, too, it is important to exercise caution to avoid the temptation to rely too heavily on the contributions of technology. But it seems clear that technological innovations, especially those involving the digital technologies of the cyber age, can help substantially in addressing the challenges arising in the governance of complex systems.

8. The future of the global order

1 THE PROBLEM OF GLOBAL ORDER

Most members of my generation grew up with a simple understanding of the character of the prevailing global order. We assumed, without stopping to examine this assumption critically, that we live in an international society or, in other words, a society in which the members are actors that meet the standards for recognition as states and that states are endowed with sovereignty in the sense that they have full authority over their internal affairs and are not subject to external or superordinate standards to which they have not given their explicit consent. International society is, as Hedley Bull and others have observed, an anarchical society featuring a variety of social institutions but lacking anything resembling a central government capable of exercising authority over the member states (Bull 1977). Of course, we were aware that the provisions of Chapter VII of the United Nations Charter accord formal authority to the UN Security Council to take forceful steps to address “threats to the peace, breaches of the peace, and acts of aggression” (United Nations 1945). But we recognized the difficulties in making a transition from paper to practice regarding the implementation of these provisions, particularly under the conditions prevailing following the onset of the Cold War and the resultant prospect of vetoes stymieing action on the part of the council in specific situations. And we understood the provisions of Article 2(7) of the Charter as constituting a general reaffirmation of the sovereignty of member states in other respects.

For the most part, we also took it for granted that the members of international society are nation states in the sense that they reflect a general congruence between political and cultural boundaries or, in any case, that the ideal of the nation state constitutes a kind of gold standard toward which international society is destined to evolve over the course of time. Under the circumstances, those of us interested in what we now often refer to as global governance studied international economics, international law, international politics, and international political economy. Grouped together under the heading of international relations, we had no trouble accepting the idea that this field of study provided the basis for establishing a distinct program or even a separate department within institutions of higher education and for defining the scope

of leading journals in the field. All in all, we thought we knew what we were talking about in tackling issues pertaining to the future of the global order.

As it turns out, however, this simple understanding provides a remarkably narrow lens on issues relating to global order. There is nothing timeless or unchangeable about the character of the global order enshrined in these assumptions. The idea of a society of sovereign states came into focus initially in Europe during the 17th century in the context of an effort to resolve intractable disagreements about the nature of political authority that had triggered violent clashes culminating in the destructive Thirty Years War and that came to an end with the Treaty of Westphalia in 1648 (Wedgwood 2005). But there has always been a sizable gap between the ideal and the actual with regard to international society, and there is no sign that this gap has narrowed in recent times. Although membership in international society has grown dramatically, the capacity of many states to exercise sovereignty both internally and externally is doubtful at best. In many parts of the world, powerful outsiders regularly intervene in the affairs of nominally sovereign states. Current developments, especially those associated with the onset of the cyber age, are raising persistent questions about the extent to which individual states can control their own affairs, much less engage effectively in interactions with others. What is at stake here is not only our understanding of the character of the global order prevailing today, but also our expectations and preferences regarding the institutional dimensions of the global order of the future.

In this concluding chapter, I address this theme in several stages. The next section goes into some detail regarding the nature and magnitude of the gap between the ideal and the actual with regard to the idea that international society is a society of sovereign states. It demonstrates that reality has never conformed closely to this ideal and that the gap has not narrowed over time. This sets the stage for three parallel sections dealing with what I call change agents in the realm of global order: the spread of globalization, the rise of nonstate actors, and the onset of the cyber age. While this assessment does not lead to the conclusion that the states system is on the verge of collapse, it does provide a strong case for the proposition that fundamental change in the character of the global order is possible during the coming decades. Needless to say, none of us is in a position to make specific predictions regarding the character of the global order of the future. But it is not premature to initiate a focused examination of major pathways in this realm and the destinations toward which these pathways may lead over the course of time. I take up this topic in the final section of the chapter.

Before embarking on this journey, let me emphasize the observation that this analysis deals fundamentally with matters relating to the nature and influence of social institutions. The constitutive foundation of international society is a set of legal and political institutions. While these institutions may be deeply

embedded both in day-to-day practices and in the minds of those who think about world affairs, they are not facts of life we must accept as permanent arrangements. What is at stake, then, is the future of the institutions that serve to define international society as a society of states and perhaps as a society of nation states. Will these institutions endure, more or less, in their current form? Are there forces at work likely to produce fundamental, even transformative, changes in this realm? If so, is there anything useful we can say at this stage about the character of the social institutions that will arise to define the basic character of the global order of the future?

2 THE GAP BETWEEN THE IDEAL AND THE ACTUAL

The vision of a society composed of sovereign states has never provided an accurate description of reality, even in Europe, where much of the thinking underlying this idea originated. The United Kingdom, which brought together England and Wales with Scotland early in the 18th century, expanded at the beginning of the 19th century with the addition of Ireland but contracted in the 20th century with the recognition of Ireland as an independent state. Germany and Italy became unified states only in the second half of the 19th century. In the aftermath of World War II, the Cold War divided Germany into the separate states of East Germany and West Germany. Germany achieved reunification in 1990, but within boundaries that differ significantly from those of pre-war Germany. Norway did not become an independent state until early in the 20th century. The Baltic states – Estonia, Latvia, and Lithuania – emerged as independent states in the aftermath of World War I, disappeared into the Soviet Union in 1939, and reemerged as independent states with the breakup of the Soviet Union at the end of 1991. The Austro-Hungarian Empire, Prussia, and Russia partitioned Poland among themselves on several occasions during the 18th century. The Soviet Union absorbed Poland into the Soviet Bloc following World War II, before the country regained full sovereignty following the breakup of the Soviet Union.

What is more, much of the modern history of Europe has featured interactions among empires rather than states. The Hapsburg Empire, centered on today's Austria, encompassed Hungary, Czechoslovakia, and a sizable swath of the rest of eastern Europe until its collapse at the end of World War I. Southeastern Europe, a longstanding battleground between the Austro-Hungarian Empire and the Ottoman Empire prior to the collapse of both these empires at the end of World War I, became a multinational state with the establishment of Yugoslavia in the aftermath of World War I. But the region split apart into six successor states during the 1990s. The Soviet Union – formally the Union of Soviet Socialist Republics – joined together a multiplicity of distinct republics

encompassing separate nations following World War I and exercised effective control over most of eastern Europe in the period following World War II. When the USSR collapsed at the end of 1991, it resulted in the (re)establishment of 14 sovereign states in addition to Russia itself.

The leading European states – the United Kingdom, France, Spain, and to a lesser extent the Netherlands, Belgium, Portugal, Italy, and Germany – created overseas empires or colonial systems through which they exercised political and economic control over a large proportion of the rest of the world until the final decades of the 20th century. The United Kingdom and France dominated North America; Spain and Portugal dominated South America; the United Kingdom, France, Portugal, and Belgium dominated Africa; and the United Kingdom controlled India, a sizable part of Southeast Asia, Australia, and New Zealand. Australia, Canada, New Zealand, and South Africa achieved political autonomy in the later part of the 19th century and the early part of the 20th century. But they remained members of the British Commonwealth; several of them recognize the British king or queen as their official head of state to this day. France and the Netherlands exercised control over the rest of Southeast Asia and what is now Indonesia. In conjunction with its rapid modernization in the later decades of the 19th century, Japan joined the ranks of colonial powers, controlling Korea and Taiwan during the first half of the 20th century.

The United States became a sovereign state toward the end of the 18th century. But it did not achieve its current form until well into the 19th century through a series of purchases, conquests, and forceful expropriations of territory belonging to various groups of Native Americans. It continued to expand with the addition of Alaska and Hawaii as states during the middle of the 20th century. Canada, the other major state in North America, did not assume its current form until well into the 20th century. The Province of Newfoundland and Labrador did not join the federation until 1949. Most of the states of South America broke away from the Spanish and Portuguese empires to become independent states during the first half of the 19th century.

Even so, the United Nations had only 51 members at the time of its establishment in 1945. It now has 193 members. This explosion in the membership of international society is attributable largely to the process of decolonization starting in the 1940s and picking up steam in the 1960s and 1970s. Iceland achieved independence from Denmark in 1944. The Philippines became an independent state in 1946. Several states in the Middle East, which had been British or French Mandates under the League of Nations, became independent in the aftermath of World War II. Israel achieved statehood in 1948. British rule over the Indian subcontinent came to an end in 1947. But the subcontinent immediately broke into the independent states of India and Pakistan. Pakistan in turn separated into Pakistan (the former West Pakistan) and Bangladesh (the

former East Pakistan) in 1971. The flow of new members into international society picked up speed with the end of colonial rule in Africa during the 1960s and 1970s. Today, Africa has a total of 54 states recognized formally as members of international society. There are as well several dozen small island states, mostly located in the Caribbean and the South Pacific, that achieved independence as a consequence of the process of decolonization during the final decades of the 20th century. The breakup of the Soviet Union and Yugoslavia during the 1990s added more than 20 additional sovereign states to the membership of international society.

During the 1950s, the process Ernst Haas described as “the uniting of Europe” got under way. France, Germany, Italy, and the three Benelux states established the European Coal and Steel Community in the 1951 Treaty of Paris (Haas 1958). Thus began a sequence of events that has led over time to the development of the European Union, expanding to include 28 members (reduced to 27 with the departure of the United Kingdom in 2020) and taking on authority in a variety of functional domains, including banking, agriculture, fisheries, and research. While few regard the European Union as an emergent superstate that will achieve legal and political dominance over its members in due course, the European Union represents an important innovation with regard to global order. Of particular interest is the fact that it has developed a system of law and administrative practices that are not rooted in the legal principles and political practices that form the bedrock of the states system.

Beyond this, it is worth noting that significant chunks of territory along with their human residents have changed hands from time to time between members of international society as a result of annexation, conquest, or purchase. The provinces of Alsace and Lorraine have changed hands between France and Germany on several occasions as a consequence of the outcomes of wars. Britain, France, and Germany established *de facto* control over areas on the Chinese mainland during the early decades of the 20th century through the creation of what became known as concessions. Germany annexed Austria in 1938 and large parts of Czechoslovakia in 1939. Texas declared independence from Mexico in 1835, subsequently becoming a state in the United States in 1846. The United States purchased Alaska from Russia in 1867 and annexed the Hawaiian Islands in 1898. Japan took control of a large swath of northeastern China in the 1930s, only to lose it again at the close of World War II. More recently, China asserted control over Tibet in the 1950s, the United Kingdom relinquished Hong Kong to China in 1997, and Russia annexed Crimea, taking the region forcibly from Ukraine in 2014. Whatever the legitimacy of these territorial realignments, they constitute a significant feature of the shifting character of international society.

Whether or not it is reasonable to describe the members of international society today as nation states is a separate question. We often take it for

granted that established states like France, Germany, and the United Kingdom are nation states. But even here there are major complications. Many German-speaking people, including residents of other German-speaking states like Austria, live outside Germany, and Germany itself now has between 4 and 7 million residents of Turkish origin. The United Kingdom has millions of immigrants coming from various parts of the former British Empire. Today, there are growing questions regarding the extent to which the English and the Scots form separate nations rather than a single homogeneous nation. In many other cases, there is little or no basis for treating states as nation states. In India, there is a deep division between the majority Hindu population and the minority Muslim population. Many African states are multinational due to the vagaries of colonial administration during the era prior to the achievement of independence. In some cases (e.g., Nigeria, Rwanda), this situation has triggered violent civil wars or prolonged civil strife. Many of the states of Southeast Asia, including Indonesia, Malaysia, and Singapore, encompass large numbers of people of Chinese origin who retain their own distinctive culture. Even Israel, which has a constitution containing provisions designating it a Jewish state, has an Arab minority constituting more than 20% of the population.

Then, there are states like the United States that are often regarded as nation states by virtue of the operation of what is commonly described as the melting pot. The basic idea is that millions of people who came to the country as immigrants from places like Ireland, Italy, Scandinavia, and various parts of eastern Europe would and should assimilate as quickly as possible, forming a distinct nation in the process. To a degree, this line of thinking seems reasonable. But it does not fit comfortably in cases like the blacks brought to the United States as slaves, the Chinese who came to the country as a source of cheap or indentured labor, or many Latinx communities that remain quite distinct from the mainstream in America. Similar observations apply to states like Argentina and Australia that are clearly multiethnic even though there may be some basis for debating whether it makes sense to describe them as multinational.

What this brief survey makes clear is both that the gap between the ideal and the actual is wide with regard to the idea of international society as a society of sovereign states and that a large fraction of the current membership are states of recent origin. Although formal membership in this society has grown to almost 200, many member states struggle to live up to the defining features of statehood with regard both to internal sovereignty and to external sovereignty. Various forms of interference in the affairs of member states constitute the norm rather than the exception. Many small island states are micro-states that may literally disappear as a consequence of the impacts of climate change. In any case, it is a stretch to regard many members of international society as nation states. Nevertheless, the idea that international society is fundamentally

a society whose members are sovereign nation states has a powerful and lasting grip on the thinking of many students of international relations as well as most members of the general public. This grip is reinforced in the basic tenets of international law governing the terms of membership in international society, which originated in the work of prominent European thinkers during the 17th and 18th centuries. No doubt, the influence of this paradigm lives on, at least in part, not only because it is inscribed in the administrative practices of existing states but also because the idea of a society of nation states reflects a normative preference that is embedded in the outlook of many who pay attention to international relations. Still, there is no indication that the gap between the ideal and the actual regarding the character of the prevailing global order is narrowing, and there is no basis for limiting our thinking about the future of the global order to a continuing effort to shoehorn reality into the paradigm of an international society (Morris 2011).

Not everyone shares the view that we should treat the paradigm of international society as a fact of life and get on with the business of adapting reality to this vision to the maximum extent possible. Over the last 50 years, several strands of thought have emerged that seek to address what Stanley Hoffmann famously described in the 1960s as the question of whether the state is obstinate or obsolete (Hoffmann 1966). Each of these strands highlights a force or cluster of forces that may be eroding the role of the state as the dominant actor in world affairs. Treating these forces as change agents, I discuss the principal observations regarding the future of the global order that have emerged from these strands of thought in the next three sections under the headings of the spread of globalization, the rise of nonstate actors, and the onset of the cyber age. The result is a roughly chronological profile of the evolution of the debate about the role of the state in the sense that it directs attention to a series of ideas that have emerged and become influential sequentially over the course of a number of decades. Nevertheless, there is no reason to regard these strands of thought as separate or unrelated. It makes more sense to treat the impacts of these change agents as cumulative as we seek to organize our thinking about future directions in the character of the global order.

3 CHANGE AGENTS 1: THE SPREAD OF GLOBALIZATION

A helpful point of departure is a focus on the rise of globalization that became a prominent area of interest to students of international relations during the 1970s and 1980s. The term globalization points to a suite of developments that many see as having important consequences for the future of international society (Friedman 2005). Corporations grew larger, frequently becoming multinational or transnational corporations (MNCs or TNCs) with extensive

networks involving operations in many countries. The largest MNCs or TNCs increased in size until they generated annual streams of revenues larger than the GDPs of the majority of the members of international society. A particularly notable feature of this economic globalization was the development of longer and longer supply chains, featuring the extraction of raw materials in countries located in Africa or South America, the assembly of finished products in China or the countries of Southeast Asia, and the shipment of goods at various stages of the production process from one place to another by sea. This gave rise to the observation that the scale of commercial shipping has grown to the point where it accounts for 90% of everything (George 2013). By the early years of the 21st century, the world's producers and consumers were operating in a tightly coupled global system. Although some are now disillusioned with this system, experience suggests that decoupling is easier said than done.

In addition to the resultant growth in the magnitude of international trade relative to the size of the global economy, comparable developments were under way with regard to investment and financial services. Foreign direct investment (FDI) grew rapidly, fueled by the investment decisions of MNCs and TNCs and amplified by the initiatives of international organizations like the World Bank and state-controlled organizations like the China Development Bank. Associated with this development was the growth of banking services with a global reach. For example, Iceland, with a population of under 350,000, became the base of operations for four banks operating on a global scale. Among other things, this allowed large corporations and wealthy individuals to shift both money and legal residences from place to place to take advantage of favorable tax rates and to minimize their exposure to the financial regulations of individual countries.

While observers have paid particular attention to these economic developments, globalization is prominent also in other domains, including popular culture, tourism, environmental concerns, and public health. Both fueled by and fueling the spread of English as a second language, Western films and popular culture have achieved a global reach. The flow of people moving across national boundaries for recreational as opposed to business purposes has increased steadily. Largescale environmental concerns, like climate change, the loss of biological diversity, long-range transboundary air pollution, and the spread of plastic debris constitute what Kofi Annan, UN Secretary-General from 1997 to 2006, called “problems without passports” (Annan 2009). As a growing incidence of public health concerns culminating in the recent Covid-19 pandemic has made abundantly clear, disease vectors are global; the public authorities of states have only the most rudimentary capacity to prevent infectious diseases from entering their jurisdictions (Snowden 2019).

States have played a prominent role along with private and quasi-private actors in taking steps to promote globalization. States have entered into both

global agreements, like the 1948 General Agreement on Tariffs and Trade and the 1994 Marrakech Agreement creating the World Trade Organization, and regional agreements, like the 1957 Treaty of Rome and the 1992 North American Free Trade Agreement, designed to promote the growth of international trade. They have also negotiated hundreds of bilateral investment treaties to eliminate or alleviate difficulties that otherwise might impede the flow of foreign direct investment. Similar observations are in order regarding other forms of globalization. States have taken a variety of steps to facilitate visa-free travel, to initiate joint responses to largescale environmental issues, and to launch collaborative efforts to reduce poverty and promote public health through initiatives like the UN's Millennium Development Goals (2000–2015) and Sustainable Development Goals (2015–2030).

In some cases, the efforts of states – directly or indirectly – have figured prominently in the rise of globalization. Both Chinese state-owned enterprises (SOEs) and the China Development Bank are prominent players in the realm of foreign direct investment. China's Belt and Road Initiative (BRI), promoted by President Xi Jinping since 2013, is shaping up as the largest programmatic effort to enhance foreign direct investment and overall economic integration in history. Both Korea and Japan, which have played prominent roles in the globalization process, have domestic systems featuring extremely close relations between large corporations and government agencies. It is not surprising, under the circumstances, that the field of international political economy has emerged as a prominent area of specialization among analysts who have produced some of the most rigorous and influential studies in the overarching field of international relations during recent decades (Keohane 1984).

What are the implications of the rise of globalization for the future of the global order? The core argument in this connection focuses on the role of interdependence and especially what Robert Keohane and Joseph Nye have described as complex interdependence (Keohane and Nye 1977). Globalization, on this account, leads to the growth of interdependence among the members of international society. As the process continues, globalization gives rise to an increasingly complex network of relationships that circumscribe the freedom of action of individual states in a variety of ways. The result is a situation in which states find it increasingly difficult to exercise sovereignty effectively, both externally in their dealings with other states and internally in their dealings with their own subjects.

With regard to external sovereignty, the critical argument is that globalization both increases the importance of soft power in contrast to hard power and drives up the costs of engaging in geopolitical initiatives featuring the deployment or use of military force (Nye 2005). Actors preoccupied with the promotion of trade and investment, the flow of people, and the challenges of addressing largescale environmental or public health concerns will have little

interest in the traditional concerns of power politics. From their perspective, conventional efforts to improve the rankings of individual states in the realm of power politics are of little interest. Even more to the point, exercises in power politics seem increasingly costly to the extent that they jeopardize or even undermine the benefits accruing from the growth of international trade, the movement of people across national boundaries, and the mounting of cooperative efforts to address environmental and public health challenges. In effect, the gains from cooperation loom larger and larger relative to any benefits to be derived from exercises in power politics, and the costs of conflict increase to the extent that they undermine cooperative relationships. As a result, national policymakers will discover that globalization has the effect of diminishing their freedom of action.

Globalization, on this account, also imposes limits on internal sovereignty. Under conditions of complex interdependence, MNCs and TNCs have the capacity to engage in autonomous activities that are difficult for governments to control. The growth of debt owed to foreign investors limits the ability of governments to control their own economic systems. The spread of popular culture on a global basis makes it harder and harder for governments to cut off their citizens from foreign influences in order to control their behavior. The spread of infectious diseases like Covid-19 and the intensification of global environmental concerns like climate change give rise to crises within countries that upend the plans of governments and divert their attention from other priorities. Under the circumstances, globalization not only limits the appeal of efforts to exercise hard power at the international level; it also makes it progressively more difficult for governments to pursue coherent political programs within their own jurisdictions.

These developments clearly played an influential role in stimulating the rise of new thinking in the field of international relations. Perhaps the most important development falls under the heading of what is generally called neoliberal institutionalism (Hasenclever et al. 1997). The key observation here, as Robert Keohane put it in his influential study entitled *After Hegemony*, is that states can and do develop a variety of international institutions to pursue common or compatible objectives without the engagement of a dominant power to impose order on the members of international society (Keohane 1984). Unlike traditional studies of international organizations inspired by the perspectives of public administration, the resultant flow of research emphasized the central role of institutions in contrast to organizations and directed attention to the creation of international regimes, initially in the realm of economic relations (e.g., the international trade system) but increasingly in other realms like arrangements created to address a variety of environmental issues. As the institutionalists put it, it became relevant to think about “governance without government”

in international society and in due course to ask a range of questions regarding the evolution of global governance (Rosenau and Czempiel 1992).

There is no question that the developments under consideration here raised important questions about simple conceptions of international society as a society of sovereign states. In a globalized world, states have good reasons to limit their actions, and a variety of other actors, including MNCs, TNCs, and major banks, are able to operate with considerable autonomy. Still, it is important not to exaggerate the importance of these developments. The basic institutions of global order, from the Charter of the United Nations to the Marrakech Agreement and the Framework Convention on Climate Change are all created under the terms of legally binding international treaties or conventions. Membership in major international organizations, like the United Nations, the International Trade Organization, or the World Health Organization, is reserved for actors that are recognized as states. Even major corporations are legally incorporated under the laws of states, though it may be increasingly difficult for individual states to exercise effective control over corporations that are able to shift their legal bases of operations to jurisdictions that offer more favorable regulatory environments. In effect, the basic institutional structure of the states system is deeply embedded in day-to-day practices, despite the fact that the resultant arrangements often prove ineffective in dealing with contemporary needs for governance.

As a number of analysts have noted, globalization as measured by factors like the scale of international trade and the magnitude of foreign direct investment, had reached a remarkably high level in the decades prior to World War I. Many believed that the resultant interdependence would make war, at least on a large scale, obsolete. Yet, escalating tensions, fueled by developments like the naval arms race between Germany and Great Britain, led to the outbreak of a devastating war following what seemed like a relatively minor crisis during the summer of 1914. Similarly, we are witnessing today a movement toward economic decoupling on the part of major actors like the United States and China, despite the power of global supply chains and the influence of an extraordinary array of global communications systems. This is not to deny the impacts of globalization. The effectiveness of both American unilateralism and Chinese efforts to erect the Great Firewall blocking the access of its citizens to outside influences are open to serious question. Nevertheless, it would be a mistake to fall into the trap of thinking that the continuing course of globalization will make the state obsolete, opening the way for the rise of some new form of global order in which states are no longer the principal actors.

4 CHANGE AGENTS 2: THE RISE OF NONSTATE ACTORS

During the 1990s and 2000s, interest turned to the rise of a wide range of nonstate actors as a development with the potential to catalyze the growth of a new form of social order at the global level in which membership is no longer limited to actors that qualify as states and that are recognized as such by other members of international society. Of course, multinational and transnational corporations are nonstate actors. But the rising interest in nonstate actors at the global level followed the practice of those who think about civil society within states as a layer of social organization below the level of the state and above the level of the individual or family, which encompasses a wide range of organizations other than corporations and other familiar economic actors. On this account, the universe of nonstate actors is broad, ranging from artistic and scientific groups to organizations concerned with the promotion of public health and the treatment of environmental problems (Dingwerth 2007; Pattberg 2007).

In thinking about ways in which the activities of nonstate actors may influence the character of the global order, it is helpful to differentiate among types of actors in terms of their contributions to addressing needs for governance. Many nonstate actors (e.g., Greenpeace, the Natural Resources Defense Council, WWF) work primarily within the institutional nexus of international society (Wapner 1996). They seek to influence the actions states take as members of intergovernmental arrangements or the policies individual states adopt that have international consequences. But there are other nonstate actors that are assuming roles in responding to needs for governance in their own right rather than seeking to influence the behavior of states. At least four clusters of cases are worth differentiating in thinking about the resultant contributions of nonstate actors.

First and perhaps foremost, there are nonstate actors that operate as free-standing agents and play regulatory roles not authorized by states. Prominent examples include the Forest Stewardship Council (FSC) and the Marine Stewardship Council (MSC). These bodies have established systems to assess the sustainability of the practices of harvesters of forest and marine products, to certify those that meet the standards they have adopted regarding sustainability, and to monitor the compliance of those they certify with the relevant standards over time. While there are legitimate questions regarding the effectiveness of these efforts, there is no doubt that they reflect an approach to regulation that differs from conventional approaches relying on intergovernmental bodies. Another well-known case is the International Association of Antarctic Tour Operators (IAATO). This nonstate actor regulates the activities of tour

operators in the interests of ensuring safety and minimizing the environmental impacts associated with tourist visits to Antarctica and the islands of the Southern Ocean. It constitutes a form of self-regulation motivated at least in part by a desire on the part of tour operators to avoid the creation of a conventional intergovernmental arrangement to deal with the relevant concerns.

A second cluster of nonstate actors includes those that play distinct roles along with intergovernmental bodies in the development and implementation of regulatory arrangements. Consider, as prominent examples, the roles the International Association of Classification Societies (IACS) and major insurers play in regimes dealing with maritime commerce. The regulations are set, for the most part, by the International Maritime Organization (IMO) or in the provisions of treaties negotiated under the auspices of the IMO. But the IMO, which is an intergovernmental body, has little capacity to handle the implementation of the resultant regulations or to administer them on a day-to-day basis. This is where IACS and the insurance industry enter the picture. These actors are able to certify whether ships meet regulatory standards (e.g., those dealing with double-hull construction for tankers or the possession of a valid Polar Certificate for ships operating in polar waters) and to ensure compliance by providing insurance to or withholding it from the owners and operators of the vessels. The result is a regulatory system that takes the form of a collaboration between intergovernmental bodies and nonstate actors in which the nonstate actors are autonomous entities capable of making contributions that extend beyond the capacity of intergovernmental bodies like the IMO.

The third cluster includes nonstate actors that engage in programmatic activities that are independent of the oversight of intergovernmental bodies and that generally extend beyond the reach of states. A particularly prominent examples involves the role of the Rockefeller Foundation in initiating and funding what is generally known as the Green Revolution, a concerted effort taking place during the 1950s and 1960s and focusing on increasing food production through the development of high-yielding varieties of wheat and rice and the use of chemical fertilizers (Mann 2019). While the Green Revolution has been criticized from a variety of perspectives, there is no doubt that this nonstate initiative has made a significant difference in expanding the production of food crops in a number of developing countries. More recently, the Bill & Melinda Gates Foundation, operating both independently and in cooperation with intergovernmental bodies, has emerged as an influential player in the realm of public health (Snowden 2019). The foundation has played a leading role in the Global Fund to Fight AIDS, Tuberculosis, and Malaria; it has devoted substantial resources to the campaign to eradicate polio. Some critics have questioned the choice of priorities by nonstate actors like the Gates Foundation. But there is no doubt that such actors have made a difference at the global level with regard to developments in the realm of public health.

Finally, there are cases featuring public/private partnerships in which inter-governmental bodies and nonstate actors join forces as equal partners in efforts to address societal issues (Andonova 2017). A striking example is GAVI, the Vaccine Alliance that joins government agencies, intergovernmental bodies (e.g., WHO, UNICEF), industries, research agencies, foundations, and other private philanthropists to promote the development and administration of vaccines for a variety of diseases (Andresen and Iguchi 2017). Given the political sensitivities surrounding immunization, it is not surprising that some of GAVI's initiatives have been controversial. The performance of actors like GAVI in the distribution and administration of vaccines for Covid-19 will constitute an important test for such partnerships. More generally, the idea of turning to public/private partnerships has been promoted vigorously in settings like the 2002 World Summit on Sustainable Development. The available evidence suggests that many efforts of this sort fail to achieve their goals. Yet there is also evidence that public/private partnerships can make a difference under some circumstances, a finding that suggests that it will be important in the coming decades to pay careful attention to the significance of this development for the future of the global order (Andonova 2017).

Some analysts, influenced by the extensive literature on the role of civil society in domestic systems, have suggested that the activities of these several clusters of nonstate actors are indicative of the "rise of transnational civil society" or the emergence of a layer of social organization at the international level that resembles what we generally think of as civil society at the domestic level (Florini 2000; Kaldor 2003; Keane 2003). Although this is an interesting way to think about recent developments, it is not clear that it helps us to make sense out of what is happening at the global level. In the mainstream literature, organizations belonging to civil society are generally seen as operating below the state but above the level of the individual or individual family unit. Much of this literature deals with the role a robust civil society is thought to play in protecting domestic systems from the threats posed by authoritarian leaders who seek to undermine civil society in order to exercise direct control over the lives of individuals. This accounts for the influence of work by analysts like Robert Putnam who have raised searching questions about the decline of civil society in the United States (Putnam 2001).

How do recent developments at the global level map onto this line of thinking? There is no overarching state in international society. Far from worrying about authoritarian leaders capturing the apparatus of the state at the international level, we are concerned with the question of whether intergovernmental mechanisms can operate effectively enough at this level to handle routine needs for governance. Conversely, it is doubtful whether it makes sense to think of nonstate actors operating above the level of states treated as the individual members of international society. As the preceding account makes

clear, nonstate actors are capable of playing a variety of roles that are not dependent on the approval or support of states. But they are not bodies that join together the individual members of international society to pursue a variety of interests that are not of any direct concern to some sort of world government.

Is there an alternative way to think about the rise of nonstate actors and what this development means for the future of the global order? No one expects that the state will wither away to be replaced by some assemblage of nonstate actors as the basic units of some successor to international society. The social institutions that constitute the foundation of international society are too deeply embedded in contemporary practices for any such development to occur during the near future. Yet it is also the case that nonstate actors are finding a variety of ways to escape the superordinate position of the state, operating as autonomous actors playing significant roles on a global scale. The result may be the rise of a social order that differs from international society by according membership to more than one type of actor. Whether or not such an arrangement would prove transitional in the sense of catalyzing a shift from international society to some alternative form of global order is impossible to foresee at this stage. Still, the prospect that the future may feature a global order including two or more types of actors operating on a basis of equality is an important observation. I will come back to this idea in the final substantive section of this chapter.

5 CHANGE AGENTS 3: THE ONSET OF THE CYBER AGE

A third change agent emerging over the last several decades but becoming a focus of attention among students of world affairs largely during the 2010s centers on a stream of innovations in digital technology leading to the onset of the cyber age (Young, Yang, and Guttman 2020). Of course, technological innovation has been a major driver of societal evolution throughout human history, accelerating with the start of what is often called the First Industrial Revolution in the later decades of the 18th century (see also Chapter 7). What makes the cyber age distinctive is the development of digital technologies that make it possible to engage in many activities virtually rather than physically and give rise to a growing range of interactions between virtual reality and material (biophysical and socioeconomic) reality (DeNardis 2020). Today, the activities of many actors not only highlight virtual relationships; some actors operate largely in cyberspace rather than in material or physical space. The result is a world in which new types of actors have become influential and existing actors must learn how to use digital technologies and pursue their goals in cyberspace. There is no sign that the flood of technological innovations underlying this development is slacking off.

With regard to the future of the global order, what makes this development profoundly important is the growth of virtual reality alongside material reality. States, treated as the members of international society, are territorial entities with well-defined boundaries that enclose spaces identifiable in geographical terms (Opello and Rosow 2004). It is true that states have succeeded in expanding the scope of their jurisdiction in spatial terms in modern times. Thus, states now exercise jurisdiction over Exclusive Economic Zones encompassing marine areas stretching out 200 nautical miles from their coastlines and over the airspace above their territories. Nevertheless, the social institutions that define the character of international society are framed in territorial terms. States have sovereign authority over activities occurring within their boundaries; they engage in interactions with other states on the basis of the principles and practices of international law. The high seas and outer space are international spaces that fall outside the jurisdiction of the individual members of international society. But they are subject to rules agreed to by the members of international society in the form of legally binding agreements like the 1982 UN Convention on the Law of the Sea.

The onset of the cyber age, by contrast, has triggered the creation of a variety of actors that are not organized as territorial entities and that do not exercise jurisdiction over any spaces identifiable in material terms. Some of these actors are single individuals who are able to engage in extensive virtual relationships with others and who can initiate disruptive interventions in the activities of government agencies and private corporations through actions that are difficult to track to their sources. In other cases, these actors are organizations, sometimes large organizations like Google or Facebook, that do have material bases of operation even though their activities largely take the form of transmitting data through virtual channels. But they are not deeply rooted in spatial terms. It would be relatively easy for such actors to shift their bases of operations from one location to another to escape or circumvent the regulatory authority of government agencies. The result is that we now operate on a global scale in a world populated with a mix of actors, some of which are conventional actors located within spatially defined boundaries and producing goods in material facilities, while others are virtual actors operating largely in cyberspace.

Needless to say, states can and do make use of digital technologies both to pursue their own interests in their dealings with others and to implement their policies domestically (Kaplan 2016; Kello 2017; Klimburg 2017; Segal 2017; Perlroth 2020). The Stuxnet episode in which the US (probably with the collaboration of Israel) made use of offensive cyber operations to disrupt Iranian uranium-enrichment centrifuges is a particularly prominent example of the deployment of digital technologies in the pursuit of national interests. But the deployment of weapons systems that make use of digital technology in one

form or another is now routine in a variety of applications. Examples include the use of drones to guide weapons to selected targets from remote control centers, the deployment of unmanned aircraft guided remotely, and reliance on robots that are subject to remote guidance to defuse bombs and other explosive devices and to clear minefields. More developments along these lines are in store, especially as advances in artificial intelligence increase options for deploying unmanned weapons that are capable of learning as they go along and adjusting their actions to maximize their effectiveness in specific situations.

States also make use of digital technologies in pursuing domestic objectives. A particularly striking example is the development by the government of China of what has become known as the Great Firewall, a complex of digital systems intended to limit the access of Chinese citizens to information approved by the state and to enhance the capacity of the state to monitor and control the activities of citizens (Klimburg 2017). This firewall allows censors to prohibit access to information deemed inappropriate for public consumption and to take down materials quickly that are not caught by censors before they are posted on the internet. New developments in the realm of digital technology, such as sophisticated systems allowing for facial recognition, are enhancing the capability of the state to monitor the activities of individual citizens on a day-to-day basis. While precise figures are unavailable, most analysts believe that China's investment in the Great Firewall equals or exceeds the size of its defense budget.

Still, it is important to recognize the limitations associated with these uses of digital technologies on the part of states pursuing their own interests. Military uses of digital technology may have the effect of undermining the sovereignty of even the most powerful states. The reason the Stuxnet episode has attracted so much attention is that it points to the prospect that states can make use of various forms of malware to destroy or at least erode the dependability of the command-and-control systems on which the security of states depends. Most analysts believe that applications of digital technology for offensive purposes are likely to outpace defensive applications during the foreseeable future (Perlroth 2020). This opens up the prospect of a world of states that are nominally sovereign but find their capacity to exercise power at the international level compromised and their ability to protect themselves from disruptive interventions in their internal affairs (e.g., disruptions of their electoral systems) more and more limited. These are not good developments from the perspective of the stability of international society as a society of sovereign states.

Nor is the ability of states to make use of digital technologies to manage their internal affairs without significant limitations. China's experience with the Great Firewall is interesting in this regard. There is no doubt that this effort has proven effective in restricting the access of ordinary citizens to a variety of

materials. But as Chapter 7 makes clear, despite the scale of the resources the government has expended on the construction and reinforcement of the firewall, it is remarkable how easy it is for those with a desire to do so to get around it. Anyone with a real incentive to circumvent the restrictions of the firewall can do so with relative ease using a sophisticated VPN, taking advantage of virtual software like Zoom, and even engaging in casual interactions via WeChat. None of this is to say that the Great Firewall is ineffective or unimportant. But it does make it clear that the onset of the cyber age has complicated efforts to control the behavior of citizens, even as it has provided public authorities with new tools for exercising influence in a variety of settings.

Perhaps even more pertinent to this analysis of the future of the global order is the fact that the onset of the cyber age has opened up opportunities for new actors to engage in a variety of activities that are difficult, sometimes nearly impossible, for states to regulate effectively. Some of these activities, which may be the work of isolated individuals who are often difficult to track down effectively, are designed to reveal state secrets or disrupt the capacity of states to function effectively. The success of Wikileaks constitutes a dramatic example. But we are also witnessing a growing number of situations in which hackers break into the systems of public agencies (e.g., the Internal Revenue Service) or private corporations (e.g., hospitals and banks) in order to demand ransoms or simply to demonstrate their capacity to disrupt the ordinary flow of business. There is no question both that activities of this kind pose a large and growing challenge to public order in the cyber age and that public authorities are often behind the curve when it comes to exercising control over individuals and organizations engaging in such activities, whether their intentions are honorable or dishonorable.

It is interesting to note that the governance system dealing with uses of the internet and the world wide web has evolved over the last several decades in a self-generating fashion with little intervention on the part of states (Brousseau et al. 2012; DeNardis 2014). In contrast to efforts to address needs for governance relating to trade and the environment, there are no legally binding treaties or conventions negotiated by states in an effort to govern cyberspace. Yet, at least until recently, the governance system for the internet has worked surprisingly well and demonstrated a capacity to evolve steadily as new digital technologies have come on stream. Now, the future of this governance system seems considerably less promising. This is, fundamentally, a consequence of growing misuses of cyberspace, ranging from identity theft and bullying on the part of individual hackers to the disruption of essential services (e.g., hospitals) and the delegitimization of political institutions (e.g., election systems) on the part of those motivated to use digital technologies in an unethical fashion. It is unclear at this juncture whether it will prove possible to adapt or restructure governance systems dealing with digital technologies

in an effective and timely manner. But one thing that does seem clear is that this is not a challenge that is likely to yield to conventional efforts on the part of states to come to terms with needs for governance through the creation of intergovernmental agreements in the form of legally binding treaties or conventions (DeNardis 2020).

6 WHERE ON EARTH ARE WE HEADED?

Given the analysis I have set forth in the preceding sections, what can we say about the global order of the future? This is a difficult question to answer. Without doubt, we live in a system that is tightly coupled on a planetary scale, so it certainly makes sense to cast this discussion as an effort to think about order at the global level (Testot 2020). That said, the fact that the Earth system is highly complex and becoming more so with the onset of the Anthropocene makes any effort to offer predictions regarding the evolution of the global order over time hazardous. Systems of this kind feature nonlinear changes, critical transitions, and emergent properties that make surprises a common occurrence. Still, this does not mean that we cannot engage in a disciplined assessment of the future of the global order.

Whether or not the state is obsolete, states are clearly obstinate. There is no evidence to suggest that states are prepared to eschew efforts to exercise influence beyond the boundaries of their own jurisdictions or to tolerate restrictions on their authority to deal with internal matters. Individual states may come and go. But it would be naive to expect a withering away of the state as a primary form of social organization on a global scale. Nonetheless, the impacts of the change agents I have discussed in this chapter are growing. This may be particularly important in the case of the onset of the cyber age, which is raising growing challenges to the capacity of states to exercise effective control even over activities occurring within their own borders. So, it would be shortsighted simply to accept the assumptions about the character of international society I described at the beginning of this chapter and to avoid probing enquiries into the future. So, where does this leave us in thinking about the global order of the future?

The gap between the ideal and the actual with regard to the character of international society treated as a society of sovereign states is great and may well be growing. It is true that membership in international society has almost quadrupled in the decades since the close of World War II. Some may regard this as an indicator of the robustness of international society. But the persuasiveness of this proposition is open to question. Many small states – especially the raft of micro-states – lack the capacity to function effectively as members of international society. They must rely often on the services of personnel from outside sources, such as large and well-financed nonstate actors, to

handle routine tasks like representing themselves in intergovernmental forums. A significant number of states are experiencing civil strife or various forms of domestic turmoil that impede their ability to govern effectively within their boundaries. A number of states have become or are on the verge of becoming what we now think of as failed states. Some states – especially small island states – may become uninhabitable or literally disappear as a consequence of the impacts of climate change. Several micro-states are making plans already to relocate their entire populations to new homes located within the jurisdiction of other states in the event that sea-level rise and intensified storm surges make them uninhabitable. Even large and powerful members of international society are now finding their political systems compromised by politically motivated hacking on the part of outsiders. In short, the remarkable growth in the number of members of international society may prove quite deceptive as a measure of the robustness of the character of international society treated as a society of sovereign states.

Equally important is the growing realization that international society may not provide an effective arrangement for dealing with a range of needs for governance, such as the grand challenges of global governance in the 21st century I introduced in Chapter 2. The states system got under way in Europe during the 17th century largely as a response to a crisis regarding needs for governance that the preceding order was not capable of addressing effectively. There are good reasons to conclude that the spread of the states system beyond the boundaries of Europe is attributable in large part to the global reach of European influence, especially during the 18th and 19th centuries (Morris 2011). The process of decolonization that marked the second half of the 20th century is widely interpreted as a measure of the decline of European domination of a global scale. But it is worth emphasizing that the flood of new states emerging in the wake of decolonization has resulted in the globalization of what is essentially a European invention. The fact that this institutional construct does not fit the circumstances prevailing in some parts of the world comfortably is one source of the large gap between the ideal and the actual documented earlier in this chapter.

When it comes to addressing the grand challenges of the 21st century, there are growing doubts about the efficacy of the states system. Starting with the signing of the UN Framework Convention on Climate Change (UNFCCC) in 1992, we have sought to come to terms with the problem of climate change using the standard practices associated with international society. But the results unfolding over the last 30 years have been unimpressive; we are far from a solution to this problem, even under the terms of the 2015 Paris Climate Agreement. Any real solution will require fundamental changes in the socioeconomic systems prevailing within states, a transition that is difficult to achieve through the provisions of intergovernmental agreements. We have

not even begun to tackle the other grand challenges through efforts making use of the standard practices of international society. The Covid-19 pandemic provides dramatic evidence of the failure of international governance; there is every reason to expect new infectious diseases to arise and spread globally during the foreseeable future. Disruptive misuses of cyberspace are spreading rapidly and becoming increasingly severe. States are hard pressed to cope with digital interventions in their internal affairs; they have not begun to engage in the hard work of devising effective international governance mechanisms to address this problem. The revolution in biotechnology is producing a cascade of innovations that we are only beginning to understand, much less to respond to effectively from the perspective of governance. It is doubtful whether states will be able to control the action in this realm, even if they come to recognize the scope of this emerging challenge.

So, we may find ourselves facing governance challenges in the 21st century on a scale that rivals the challenges that European leaders struggled to deal with during the first half of the 17th century. But recognizing these challenges is one thing; doing something about them is another. A striking observation in this regard is that significant innovations would require major shifts in entrenched social practices embedded in the constitutive institutional arrangements of international society. The efforts of states seeking to solve problems by negotiating international legally binding instruments may be inadequate to come to terms with the grand challenges of global governance in the 21st century. But only entities that meet the qualifications for acceptance as states are eligible to become members of international society and to participate in such efforts. The negotiation of international treaties or conventions constitutes the principal means of addressing problems of governance in international society. Only states are qualified to become members of intergovernmental organizations, ranging from formal global bodies like the United Nations to informal regional forums like the Arctic Council. With a few exceptions, states are the entities authorized to initiate litigation in international courts and tribunals (Squatrino et al. 2018). In the case of the International Court of Justice, states cannot be made to appear as defendants in legal actions initiated by others in the absence of their consent. We can point to inroads on some of these institutional principles at the margins. Nevertheless, it is hard to find convincing evidence that the institutional foundations of international society are on the verge of collapse.

How might this situation change, and what might the consequences be for the global order of the future in the event that we do begin to witness significant shifts in the constitutive institutions that define the character of international society? The first thing to note in thinking about this question is that social institutions are not facts of life. They are human constructs that reflect the character of the societies in which they operate. That is why it would be foolish to expect congruence between the governance systems of modern

nation states and those of traditional Indigenous societies or to assume that different societies will converge toward a common system of public order over time. Social institutions are often sticky; they can linger on for more or less protracted periods, even when the societal conditions that gave rise to them have shifted profoundly. Without adopting extreme views like those of Spengler, who imagined obsolete but frozen systems lasting for centuries (Spengler 1991), we can acknowledge that inertia is a powerful force leading to the survival of institutions even when they no longer reflect underlying societal conditions. At the same time, institutions do change. In some cases, shifts in the deep structure of existing orders occur over relatively long periods of time in ways that are little noticed or poorly understood prior to the eruption of crises in which the gathering forces of change coalesce to trigger dramatic developments whose significance is apparent to all informed observers.

Is this observation relevant to the case of international society during the current era? In responding to this question, it is pertinent to emphasize that in the Anthropocene, in contrast to the Holocene, we are operating in a system characterized by increasing complexity on a planetary scale. The contrast between the remarkable stability of the Earth's climate system during the Holocene and the increasing volatility of the climate system today is a striking example of growing complexity. But similar developments are beginning to surface in a variety of spheres. Those who work on issues relating to complex systems draw a distinction between bifurcations or critical transitions from one system to another and oscillations or cyclical changes occurring within the same system (Scheffer 2009). In thinking about the occurrence of bifurcations, they draw attention to what are known as tipping elements along with thresholds and triggers. The challenge is not only to identify thresholds and triggers, but also to explain or predict when triggers will activate tipping elements leading (sometimes suddenly) to critical transitions from one system to another or from one state of a system (e.g., the Earth system) to another fundamentally different state. As the case of climate change makes clear, it is difficult to foresee, much less to predict precisely, when bifurcations will occur in complex systems. We know that there are major tipping elements in the climate system, and we know that volatility is on the rise in this system (Lenton et al. 2008). It is perfectly possible that the climate system will experience a bifurcation in the relatively near future. But no one is in a position to predict confidently if or precisely when such a critical transition will occur.

Similar observations apply to human systems, including international society. At the macro level, we can point to critical transitions, such as the collapse of the Roman Empire leading to a much more fragmented system, the emergence of a states system initially in Europe in the wake of the Treaty of Westphalia in 1648, and the Industrial Revolution initiating the rise of modern capitalism starting in the second half of the 18th century. Bifurcations occur

more frequently at the meso level or the level of individual societies. The collapse of the *Ancien Régime* in France toward the close of the 18th century is a prominent example. So is the unification of Germany and Italy as modern states in the 19th century, the founding of the Soviet Union in 1922, and the subsequent collapse of the Soviet Union at the end of 1991. These examples highlight the facts that unstable systems can linger on for relatively long periods of time, that trigger mechanisms can strike sparks leading to crises catalyzing critical transitions that seem to occur suddenly, and that we are regularly taken by surprise by these transformative events, even when we are aware of the existence of tipping elements in prevailing systems. The relevance of these observations to the future of the global order is straightforward. There are certainly tipping elements in international society; it is not difficult to identify pathways that could lead to a critical transition in which the prevailing system gives way to some fundamentally different successor, perhaps even over a relatively short period of time. But there is no way to go beyond subjective calculations of probabilities in seeking to determine if and when we are likely to experience a critical transition with regard to the character of the global order.

There remains the question of what form an alternative global order might take. In my judgment, there is little prospect that a new global order would be hierarchical in the sense that it would include some entity we could think of as a global or world government possessing both the authority and the capacity to make and implement binding decisions regarding the activities of the members of a new global society. Of course, it is interesting to speculate about options featuring a loose confederation in which the powers allocated to a global public authority would be sharply restricted relative to the powers retained by its constituents. But even a loose confederation at the global level seems improbable. The entities capable of operating as independent actors in world affairs are so diverse on many levels that it is hard to imagine the rise of some sort of liberalism or “solidarism” on a global scale (Hurrell 2007). If anything, diversity in these terms is rising rather than declining today. There is no indication that we will witness what some have described as “the end of history” or the rise of some sort of global community during the foreseeable future (Fukuyama 1992; Keene 2002).

An issue of considerable interest in this realm centers on the question of whether a new global order would be homogeneous with regard to the character of its members. In other words, just as all the members of international society today are entities recognized as states, would all the members of a new order be similar in terms of some defining attributes? Or can we imagine a global order encompassing a mix of different types of actors that are not subordinate to one another in any legal or political sense? Those of us who grew up taking the defining features of international society for granted may

be tempted to assume that there are always powerful forces pushing systems toward homogenization with regard to the character of their members. But it is doubtful whether this assumption can withstand careful scrutiny. Systems featuring considerable heterogeneity with regard to the character of their members prevailed over long periods of time in Europe prior to the middle of the 17th century and in Asia during the long ascendancy of China as the Middle Kingdom. This suggests we should guard against the adoption of simple assumptions regarding the homogeneity of the actors in systems of public order reflecting nothing more than the fact that we have grown up in international society treated as a social system in which all the members are sovereign states.

In the end, there is much to be said for engaging in systematic thinking about the future of the global order, even though we cannot expect to make accurate predictions regarding what form the global order of the future may take. Bifurcations can occur with remarkable speed in complex systems, and the cost of being unprepared to deal with a new order once a critical transition occurs is likely to be high. Mainstream analyses of oscillations within international society are not useless. It is helpful to think about topics like the decline of the American world order or the dynamics of unipolar, bipolar, and multipolar systems. But these analyses do little to build the intellectual capital we will need to operate successfully in a global order that differs fundamentally from the international society of recent times. It is time to turn our attention in a rigorous yet imaginative way to enhancing our understanding of the dynamics of alternative forms of order that may arise on a global scale during the coming decades.

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