1 Worldviews in World Politics

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> The fact that financial markets went markedly into shock has to be attributed to a lack of confidence in policies and leadership. It's a failure of worldview.
>
> Adam Posen, March 2020[1]

> I found out to my intense surprise and disappointment that my father did not have, what I then thought was a basic necessity for any real person – a "Weltanschauung"! The subsequent history of my life and thought could probably be written in terms of the progressive discovery on my part how right my father had been.
>
> Albert O. Hirschman, March 1993[2]

Sometimes we get overwhelmed by the uncertainties of life and the open-endedness of the future. The pandemic gripping the world in 2020/21 is one such instance. As the virus spread, a sense of personal vulnerability and radical uncertainty spread as well, barely masked by incessant talk about changing risk calculations.[3] In such moments many of us do not turn to theories, models, or hypotheses. Instead, we turn to worldviews to give us some traction in a world suddenly turned upside down. President Trump's worldview valued national borders that could be closed to foreigners. Early on, he imposed a ban on travel from China. The World Health Organization and many others were aghast. Their worldview valued open borders and unobstructed travel. In January 2021, during his last day in office, President Trump lifted travel bans his administration had previously imposed, only to have the incoming Biden administration immediately reverse his decision. This is not to deny the obvious. After four years in office, President Trump's general

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[1] Phillips 2020: B4. [2] Meldolesi 1995: v. [3] Roberts 2020; Fisher 2020.

worldview had affected state and local officials of the Republican party, not to mention tens of millions of his supporters.[4]

The 2020/21 pandemic is merely the latest example of the kinds of uncertainties students of world politics confront on a daily basis.[5] On March 3–4, 2020, for example, it was unclear how the stock market would react to the biggest emergency rate cut of the Federal Reserve since the Great Recession of 2008. Most market analysts expected a bounce in stock prices; instead, the market tanked. A few weeks later – again to everyone's total surprise, as the real economy cratered and the number of unemployed topped 30 million – April 2020 turned out to be the best month Wall Street had recorded since 1987. Politics is similarly unpredictable. For example, the outcome of the Super Tuesday Democratic primary of March 2020 was entirely uncertain. Nobody had a clue how it would affect the relative standing of the main contenders. In the event, Joe Biden's string of victories stunned analysts and practitioners alike. Shomik Dutta, a veteran of Obama campaigns, lamented: "It's a bizarre feeling to realize that all the things I obsess over in politics . . . did not seem to matter very much at all."[6] Eight months later, most pollsters agreed that Joe Biden would win the 2020 US Presidential election comfortably, and perhaps with a blow-out. Pollsters had tweaked their models, learning from their 2016 mistakes. All the hard work was to no avail. The cliffhanger election disproved a tsunami of surveys.[7]

With its unexpected turns and twists, time and again world politics has stumped participants and analysts with momentous events. The end of the Cold War, German unification, the peaceful disintegration of the Soviet Union, the 9/11 attacks on the World Trade Center and the Pentagon, the 2008 financial crisis and its aftermath, the Arab Spring, Brexit and the election of Donald Trump, the surge of protest across the United States after the murder of George Floyd, the coronavirus pandemic, and the wildfires engulfing the American West coast in 2020 were all big surprises. Insider knowledge and the political intuition of central protagonists are of little help. Chancellor Kohl's 1989 predictions about the process of German unification were wrong, as were those of Prime Minister Cameron in 2016 about the outcome of the Brexit referendum. And so too were the well-considered judgments of leading American international relations theorists. In the late 1970s and early 1980s, Kenneth Waltz bet that the Soviet Union would last another century, Robert Keohane that the era of American

[4] Lerer and Epstein 2021. [5] Jervis 2017: 175–82.
[6] Quoted in Gamio and Goldmacher 2020.
[7] For a rare exception, see Enns and Lagodny 2021, who predicted a Biden victory with 54.5 percent of the popular vote and who accurately predicted 49 of 50 states, missing only Georgia. Their forecast incorporated operational uncertainty by running 70,000 simulations, analysis of which suggested that the probability of a Biden win was 60 percent.

hegemony had passed.[8] When the unexpected undermines or overturns our most respected theories, we often fall back on our worldviews for guidance.

For Theodore White, "It is the nature of politics that men must always act on the basis of uncertain facts . . . Were it otherwise, then . . . politics would be an exact science in which our purposes and destiny could be left to great impersonal computers."[9] Putting aside the concept of uncertainty, most students of world politics have followed economics in focusing their attention on calculable risk.[10] For example, in her authoritative and sophisticated analysis of risk and uncertainty in international politics, Rose McDermott writes that risk and uncertainty comingle.[11] She thus combines both as she identifies mechanisms of risk propensity that occur under conditions of "high" uncertainty. In the remainder of her book, however, she puts aside the problem of uncertainty and focuses exclusively on the domain of risk.

While it is not possible to scale the magnitude of uncertainty, it is possible to distinguish between two types: operational uncertainty and radical uncertainty. Known unknowns create operational uncertainty which, given more or better information, may transform into calculable risk. This, however, is not a panacea. Under conditions of operational uncertainty, better and more information and knowledge, as in the squeezing of a balloon, can simply push radical uncertainty into some other, unrecognized part of the political context.[12] On questions of security and political economy, this is standard practice in the analysis of world politics.[13] Uncertainty is conflated with the concept of risk and thus remains invisible.[14] McDermott acknowledges this fact. "It is impossible," she writes, "to predict the characteristics of many different variables simultaneously in advance, especially when they may have unknown interaction effects. Even the nature of many of the critical variables may be unknown beforehand."[15] Analysis proceeds based on the unrealistic assumption that, separated by different information, parties to a conflict in world politics share in the same understanding of how the world works. New information leads to revised risk calculations and thus offers a way forward.

Withdrawn from the precarious domain of uncertainty, the future is domesticated into the more agreeable form of risk, thus retaining a family

[8] Waltz 1979: 95; Keohane 1984: 244. [9] White 1961: vii, quoted in Lepore 2020: 18.
[10] Classical realists are a notable exception. See Kirshner 2022 for a far-ranging, critical discussion of structural realism and bargaining models and their neglect of uncertainty and contingency in world politics. For longer discussions of uncertainty and risk, see Wenger, Jasper, and Cavelty 2020; Beckert and Bronk 2018; Katzenstein and Seybert 2018b: 41–50; Katzenstein and Nelson 2013a: 234–35, 238–42; Katzenstein and Nelson 2013b: 1103–109; Nelson and Katzenstein 2014: 361–69.
[11] McDermott 1998: 3–5, 30. [12] Katzenstein and Seybert 2018c: 276–78.
[13] Katzenstein and Seybert 2018b: 42–50. [14] Katzenstein and Seybert 2018b: 45–46.
[15] McDermott 1998: 5.

resemblance with the present and the past. Measurable confidence intervals strip the future of the deep anxiety that attends the unknown. We live life forward while understanding it backward. The malleability of the world is reflected in the multiple ways we have convinced ourselves of knowing the future. Prediction becomes a specific technology of "future making and world crafting," made possible by severing the link between a man-made future and religion.[16] This offers us an avenue for managing expectations and thus to exercise some control over time. But such efforts can run up against manifestations of uncertainty such as technological breakthroughs, authority crises, consensus breakdowns, revolutionary upheavals, generational conflicts, and other forces that restructure the political landscape.[17] Theories and models are thus defeated by the unpredictable as world politics moves beyond control.[18] And, as Ernst Haas observed long ago, theories and models can unwittingly exacerbate problems of turbulence by pretending to create predictability for parts of political reality while weakening our understanding of the whole.[19]

Worldviews differ in the salience they assign to risk and uncertainty. Approaches such as subjective probability theory explore ways of thinking about rationality and its relation to risk and uncertainty.[20] Rationality can take the form of different, situationally specific kinds of reasonableness. Since total chaos and existential uncertainty are terrifying, concepts such as ontological security probe different forms of reasonableness under conditions of risk and uncertainty.[21] And reasonableness differs in worldviews populated by different cosmologies, memories, imaginaries, emotions, and moral sensibilities: "It is not the information but the worldview that drives actors."[22]

The concept of a risk-inflected control of nature and society is so reassuring that we simply close our eyes to the self-evident: the ineluctability of the uncertainties of life. Why we do so is not self-evident. To be sure, the idea of risk is profound and has been immensely beneficial in human affairs. Indeed, a couple of centuries ago it was revolutionary to think that the future could serve the present, and that the chance of loss is an opportunity for gain.[23] But these important insights should not make us deny the obvious: uncertainty and an open future are important aspects of world politics. Uncertainty results in part from people holding different theories of how the world works. The financial meltdown of 2008 showed widely accepted risk models to have been utterly useless in

[16] Andersson 2018: 6, 75–97, 216.
[17] Rosenau 1990: 8; Rosenau and Durfee 1995: 33–44. [18] Ridley 2015.
[19] Levine and Barder 2014, 873. [20] Friedman 2019, further discussed in Chapter 10.
[21] Daston 2019: 45–53. Kinnvall and Mitzen 2020, further discussed in Chapter 10.
[22] Katzenstein and Seybert 2018b: 45. [23] Bernstein 1996: 1, 337.

predicting the crisis. Very little has changed either in the specific field of finance or in the broader analysis of world politics. We have been so fully seduced by the Hobbesian notion of control that we overlook the surprises Machiavelli writes about. We have placed all of our bets on the all-controlling Leviathan, while forgetting about the jolts fortuna administers regularly.[24]

This is not to argue that uncertainty is the only factor shaping political life. Social science and common sense offer tools that equip us to cope with "knowable unknowns" and the risky aspects of life in a partly orderly world.[25] However, "unknowable unknowns" also exist, and these radical uncertainties shape a reality not amenable to risk analysis. Compared to the Great Recession of 2008, the 2020 pandemic raised broader uncertainties, thereby linking challenges in public health to escalating individual and social fears, and to collapsing economies. And this global pandemic is mild compared to the dramatic environmental changes that may well be unfolding under conditions of global warming. That crisis, Scott Hamilton writes, may pose "an unprecedented existential and temporal *uncertainty* concerning the future of human subjectivity, and of the Earth itself."[26]

The first typical reaction to our encounters with uncertainty is bafflement at the unexpected, and subsequently a labored process of normalizing the abnormal, followed by amnesia. Metaphors help. Echoing George Kennan's insistence that we are gardeners, not mechanics, former Secretary of State George Shultz once remarked that "diplomacy is like gardening. The layout of the garden is set. It just has to be tended."[27] But times have changed. For many students of politics, today's world looks and feels like a jungle. Robert Kagan, a prominent neoconservative public intellectual, captures this mood in the title of his book, *The Jungle Grows Back*.[28] He explains that liberalism "took root, spread and evolved" in an order that "was always artificial and tenuous, challenged from within and without" by the natural forces of an anarchic geopolitics. "Like a garden, it can last only so long as it is tended and protected. Today, the US seems bent on relinquishing its duties in pushing back the jungle."[29] Susan Rice, who served as National Security Advisor under President Obama, concurs

[24] Katzenstein and Seybert 2018a, 2018b, 2018c; Seybert and Katzenstein 2018.
[25] Putting aside the question of unknowable unknowns, the most creative and important work on operational uncertainty and risk focuses on combining specific forecasting question clusters about the short term with broad scenarios about the long term, thus giving decision-makers an evolving sense of plausible futures that leaves unanalyzed inescapable, radical uncertainty. Scoblic and Tetlock 2020: 16–18. See also Tetlock and Gardner 2015.
[26] Hamilton 2019: 610 (emphasis in the original).
[27] Kennan 1966/1954: 93; Shiraishi 2020: 3. [28] Kagan 2018a. [29] Kagan 2018b.

when she speaks of "Trump's Hobbesian jungle."[30] And an unflappable, rational former physicist, Germany's Chancellor Merkel, watches as the liberal multilateral world she helped sustain is "shoved aside by the law of the jungle."[31] Like Germany, Canada too must learn how to navigate a "jungle-like world."[32] Today, the jungle has become a common metaphor for the many disruptions and weirdnesses of the unpredictable.[33] Jungle and garden metaphors are stand-ins for worldviews that often remain unspoken while helping us navigate the turbulent currents of world affairs.

We should be wary, though, of loading the dice only on the side of looming threats. Jungles and forests are not only places of dread but also sites of hope. Uncertainty can reveal vulnerabilities that lead to creative responses and empowerment of the disempowered. Such bigger issues could be environmental or social. Viewed in a broader context, Jared Diamond argues, a "successful resolution of the pandemic crisis may motivate us to deal with . . . bigger issues that we have until now balked at confronting."[34] Aided by the shocking vulnerabilities of African Americans revealed once again by the pandemic, the explosion of the Black Lives Matter movement in America in the summer of 2020 created a powerful multiracial coalition that vented its fury at police violence as one among many instances of systemic racism. This was the latest installment of a rights revolution that has spread globally during the last half-century, in fits and starts to be sure, and often in unpredictable directions.

Although they provide important anchors at many moments of uncertainty, the lack of attention to worldviews in the analysis of world politics is striking. Measured by Google Books Ngram Viewer, in sharp contrast to the concepts of "theory" and "model," Figure 1.1 shows that the concept of "worldview" is barely used.[35] Two decades ago, Peter Haas popularized the concept of epistemic communities, writing in the most cited article of *International Organization*, the highest-ranked journal of world politics in the United States, that epistemic communities refer to networks of knowledge-based individuals "who share the same worldview."[36] While many scholars have followed his lead in developing the concept of

[30] Rice 2020. [31] Barber and Chazan 2020. [32] The Economist 2019.
[33] Liik 2019; Erlanger 2018; Le Vine 2018; Wainer 2016. [34] Diamond 2020.
[35] The *Ngram Viewer* is a research tool for "quick-and-dirty heuristic analysis" (Chumtong and Kaldewey 2017: 8). It is worth remembering that this tool does not measure what people are talking about but what they are publishing about, only in English, and only in texts that Google has digitalized.
[36] Haas 1992: 27.

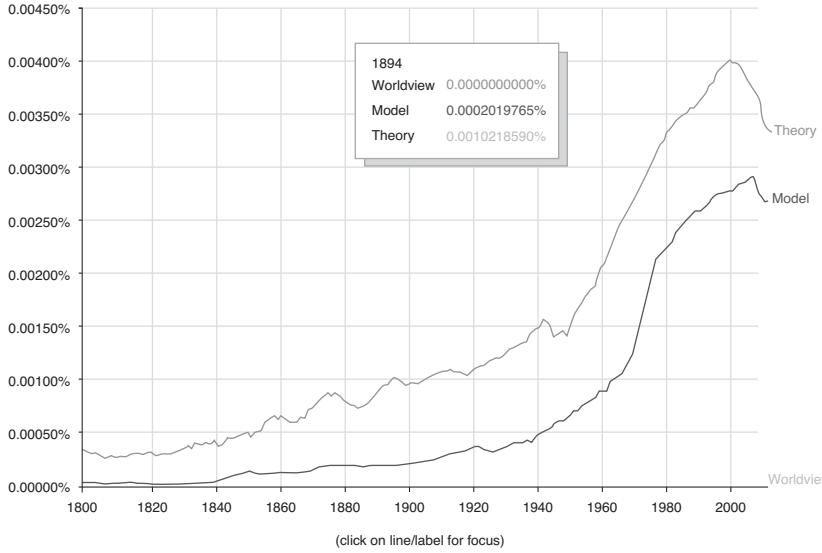

Figure 1.1 Ngrams: worldview, theory, model

epistemic community, none, to my knowledge, has followed up to inquire into the concept of worldview. While we might be vaguely aware of uncertainty's role in global politics, we seem to prefer not to look this challenge in the face by examining our worldviews.

In conceiving and contributing to this book, I have ventured for a third time off the conventional garden path of international relations scholarship. As was true of all other scholars of world politics, the end of the Cold War caught me by surprise. I wanted to understand why and turned to cultural sociology for new insights. *The Culture of National Security*,[37] mainstream realists and liberals thought in the mid-1990s, was no more than a futile exercise in postmodern flim-flam that had nothing to do with respectable social science. It turned out, however, that cultural sociology was central to the constructivist theories of international relations that quickly secured for themselves seats at the high table of theory. Seeking to understand the Great Recession of 2008–09 two decades later, I tracked the broader political implications of uncertainty and developed a conceptualization of power that was less materialist and less focused

[37] Katzenstein 1996.

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on Hobbesian notions of control. Film and cultural studies provided me with valuable insights into the dynamics of unpredictable possibilities and potentialities of what Lucia Seybert and I called *Protean Power*.[38] The evident difficulty that book's argument created for many of my colleagues, as it forced them to come to terms with uncertainty and potentiality, has led me in this book to turn to the natural sciences, which for more than a century have been no strangers to these two concepts. *Uncertainty and Its Discontents* seeks to show the deep Newtonian roots of the firm convictions of what a scientific study of world politics entails, and our never-ending amazement when the unexpected derails those scientific endeavors. I will argue that "the relational revolution" in twentieth-century physics, and many of the natural sciences more generally, can enrich sociological relationalism in the social sciences.[39] It embeds risk-based, Newtonian thinking about a "world of being" in an uncertainty-inflected, Post-Newtonian thinking about a "relational world of becoming." Thus, it explicitly acknowledges uncertainty and the open-ended potentialities of world politics.

This chapter seeks to better understand the scientific worldviews that make us overlook uncertainty as a central aspect of world politics. It examines the concept of worldview (Section 1.1); considers for the field of world politics the substantive and analytical formulations of worldviews in the form of political and analytical paradigms, as well as substantialist and relational ontologies and epistemologies that are embedded in them (Section 1.2); differentiates between Newtonianism and Post-Newtonianism (quantum mechanics) and humanism and hyper-humanism (scientific cosmology) as two dimensions structuring different worldviews (Sections 1.3 and 1.4); exemplifies the resulting four worldviews as presented in greater detail in Chapters 2–5 (Section 1.5); and concludes briefly with two illustrations (Section 1.6).

This chapter's presentation of four strikingly different worldviews is balanced in Chapter 10 by a discussion of some workarounds and commonalities that provide a shared intellectual space for Newtonianism and Post-Newtonianism. Newtonianism prefers sharp distinctions. Philosophically, Post-Newtonianism does not. Chapter 10 thus adheres to Samuel Beckett's admiration of "greyness."[40] Moving from clearly demarcated "either–or" conceptual spaces in Chapter 1 to entangled "both–and" spaces in Chapter 10 suggests a radical reconceptualization

[38] Katzenstein and Seybert 2018a. [39] The term is coined by Smolin 2013: xxviii.

[40] "Whether all grow black, or all grow bright, or all remain grey, it is grey we need, to begin with, because of what it is, and of what it can do, made of bright and black, able to shed the former, or the latter, and be the latter or the former alone. But perhaps I am the prey, on the subject of grey, in the grey, to delusions." Beckett 1958: 17.

of conventional understandings of science operating at both macro- and microlevels. Specific approaches in the field of scientific cosmology and quantum mechanics put the individual human experience rather than objective laws of nature at the center of the universe. This eliminates the traditional insistence on the difference between the natural and social sciences and holds forth the promise for the analysis of uncertainty *and* risk, rather than the insistence that world politics is marked simply by risk.

1.1 Worldviews

Worldviews offer global overviews evident in relatively constant, repetitive habits of beliefs and emotions that mediate the relations between an individual or group and the world.[41] They are animated by a sense of being in the world and of viewing how the world works or should work. Worldviews are neither purely descriptive nor purely explanatory. They contain both prescriptive and practical elements. Far from immutable, they are susceptible to fluctuations brought about by personal experience and change in the world. They comprise a flexible conceptual apparatus rooted in values. Relationally mediated by discourses and institutions, worldviews create narratives about what is possible, what is worth doing, and what needs to be done, as well as what is impossible, what is shameful, and what needs to be avoided. They thus have effects on the purposes and interests that shape policies and practices. Many techniques and rules, on their own terms, might be considered inadequate or too weak to justify policy and practice, yet they acquire a deeper legitimacy when embedded in a broader worldview. What Daston writes about natural orders is also apposite for worldviews: they are "long-lived, polyvalent, and evocative of powerful emotions."[42] Operating at different levels of abstraction, several authors in this book point to a close relationship between worldviews and other, commonly used concepts. For example, in Chapter 5, Michael Barnett disaggregates holistic worldviews and points to the internal contradictions of their different components; and in Chapter 8 Bentley Allan considers worldviews built from more encompassing cosmologies.

Worldviews are concerned with viewing the world and understanding one's place in it. They are suffused with epistemologies and ontologies. But in the discipline of international relations, in the words of John Ruggie, "epistemology is often confused with method, and the term

[41] Gollwitzer 1980: 176–77; Geuss 2020: xiii. This section has benefitted enormously from discussions among this book's authors in a series of Zoom meetings in June 2020.
[42] Daston 2019: 33.

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'ontology' typically draws either blank stares or bemused smiles."[43] Today, almost without fail, social theories "posit an ontological beginning point . . . that one takes to be the foundations of the (world-) view being explored or posited."[44] As epistemologies, worldviews concern the scientific or religious basis for knowing the world. Worldviews can be analytic or substantive. Paradigms, theories, models, and the explanatory constructs they deploy are analytic. Liberalism, Realism, and Marxism are substantive. Worldviews provide elastic interpretive guides to help navigate the world. They differ from both universal, trans-historical cosmologies and more specific, time-bound ideologies. The concept of worldview is contested and, for some, considered inherently contestable.[45] The chapters in this book provide ample material for both contestation and inherent contestability.

Because they are foundational, worldviews are important for understanding and evaluating human choice. Embodied in both views and practice, they both passively "re-flect" and actively "re-present" the world, offering views both *of* and *for* the world.[46] Because "we believe what we do largely because of the way our beliefs fit into our worldview,"[47] our diagnoses and solutions are not cheap talk. Worldviews consist of big yet simple ideas that operate at both individual and collective levels. They reflect and shape individual ideas, experiences, memories, and imaginations that always remain open to modifications and reinterpretations.[48] They are also collective systems of thought that offer some measure of coherence and consistency in an often unfathomable world.[49] Worldviews can incorporate contradictory and tension-inducing elements. Loosely coupled, they compete, coexist, and coevolve with one another.

The growing schisms dividing "metro" from "retro" have prompted a few observers to apply the concept of worldview to contemporary American politics.[50] Reflecting on the partisanship of the 1990s and early 2000s, cognitive scientist George Lakoff writes that "contemporary American politics is about worldview."[51] Conservatives and Liberals have a very difficult time understanding each other because they rely on different commonsense notions as they interpret what they experience. Conservatives hold to a "Strict Father," Liberals to a "Nurturing Parent" trope. In a similar vein, and adapting Max Weber to twentieth-century America, Eric Oliver and Thomas Wood try to capture the different intuitions and modes of reasoning that distinguish American's disenchanted and enchanted worldviews.[52] Marc Hetherington and

[43] Ruggie 1993: 170. [44] Arfi 2012: 191. [45] Geuss 2020: 22.
[46] Phillips and Brown 1991: 29; Griffiths 2007: 1–2; Haukkala 2011: 30–38.
[47] Dewitt 2004: 11. [48] Rösch 2015: 11–16. [49] Betz 1980.
[50] Meyer 2001: 1–2, 22–23. [51] Lakoff 2002: 3. [52] Oliver and Wood 2018: 4–5.

Jonathan Weiler, finally, develop a related argument that focuses on two worldviews epitomized by pick-up truck and Prius, John Wayne and Jane Fonda, meatloaf and vegetable biryani, and a preference for a fixed or fluid politics.[53] During the last half-century, operational political ideologies have increasingly lined up with such underlying worldviews and are now creating a polarized politics that is threatening the very fabric of American democracy. The notion of a unique and singular American worldview captured by the trope of American exceptionalism is mistaken. American worldviews express political inclinations and moral sensibilities that differentiate liberals from conservatives along a number of dimensions. On closer inspection, though, all of these dualities are oversimplified and fail to capture the fractal patterns of political change in America.[54] Despite such qualifications, it is difficult to deny that worldviews play a substantial role in American politics.

Individually experienced yet irreducibly social, worldviews circulate through society.[55] They have emotional and rational components that are seamlessly fused.[56] As modern neuroscience tells us, one does not exist without the other.[57] "Emotions are not irrational pushes and pulls," Martha Nussbaum writes. "They are ways of viewing the world. They reside at the core of one's being, the part of it with which one makes sense of the world."[58] For Nussbaum, emotions are "appraisals or value judgements which ascribe to things and persons outside the person's own control great importance for the person's own flourishing."[59] The Latin root of the word emotion means to "move out" from the individual toward others and the world. Although emotions are individual, they also have an inherently social character.[60] Their collective reality is closely linked to individual identity.[61] Emotions are an important aspect of how we view the world. This is not to deny that a worldview is also grounded in rational beliefs with little or no emotional content. Newtonian and Post-Newtonian scientific worldviews, for example, differ in their rejection or acceptance of uncertainty as a constitutive aspect of both the natural world and the political world.

Emotional and rational worldviews, Miriam Steiner has argued, can appear in a modified form that acknowledges the fuzzy boundary between

[53] Hetherington and Weiler 2018: ix–xiii, 17–18, 215–24; Hetherington and Weiler 2009.
[54] Putnam 2020.
[55] Intergroup emotions theory has informed a number of clinical experiments (Sasley 2011: 458–65). See also Wolf 2012a, 2012b.
[56] Bially-Mattern 2014: 590–91.
[57] This line of thought is not pursued further here. For one example, see Damasio 1994.
[58] Nussbaum 1995: 375. [59] Nussbaum 2001: 4.
[60] Fierke 2013: 79, 92–93; Hutchinson 2016: 18–20. [61] Koschut 2018: 321–29.

optimization and intuition.[62] A modified rationalist worldview incorporates the notion of bounded rationality operating under constraints that encourages satisficing rather than optimizing behavior.[63] A modified nonrationalist worldview highlights the importance of intuition and subjective awareness. Some rationalist elements are always present in predominantly nonrationalist views, and vice versa. A comprehensive worldview integrates elements of both, featuring complex configurations of rationality and non-rationality.[64] Feelings of being in the world and being anchored in a particular worldview thus can challenge or reinforce our core beliefs. Such complementarities or contradictions can reinforce worldviews, alter them, or make them crumble.

The concept of worldview operates at a higher level than several related concepts that scholars of world politics have deployed in their analyses of world politics.[65] Foreign policy ideologies, belief systems, strategic cultures, operational codes, causal beliefs, cognitive maps, narratives, and policy and political paradigms are all related to, though distinct from, overarching worldviews. For example, worldviews are less coherent than Mark Haas's foreign policy ideologies.[66] They are conceptually less clear than Ole Holsti's belief systems, Alastair Iain Johnson's strategic cultures, and Nathan Leites's operational codes.[67] They are broader than the causal beliefs that interest Jeffrey Legro and the cognitive maps Robert Axelrod has deployed, and less determinative than the narratives that concern Ron Krebs.[68] They are less cognitive, less influenced by academic and bureaucratic experts, and socially and culturally more deeply embedded than are policy paradigms.[69] And they are overtly less political than political paradigms.[70]

Worldviews can act as both stabilizing anchors and emergent processes. They can be both explicit and implicit. The very idea of a choice of worldview is itself the product of a specific worldview. In fact, some strands of neuroscience suggest the possibility that reason and consciousness set in only after – rather than before – the act of choosing has

[62] Steiner 1983: 376–79, 382–83. Steiner's distinction resonates with the Japanese one between *tatemae* (formally established rational principles) and *honne* (authentic feelings and desires that cannot be openly expressed).
[63] Simon 1956: 129, 136. [64] Steiner 1983: 392–400, 409–12.
[65] Terhalle 2015: 77–80. The concept of worldviews is mentioned briefly in a number of texts; See Bain 2020: 16–17; Chuang, Manley, and Petersen 2020; Maas 2018; Suleman 2017; Narlikar and Narlikar 2014: 6; Narang and Staniland 2012: 76–77; Kagan 2008; Pouliot 2008: 260; Hurrell 2007: 17; Tan 2007; Vennesson 2007: 8–9; Kagan 2003: 3; Nisbett 2003: xx; James 2002: 69; Keohane 2002: 45; Norwine and Smith 2000; Tilford 1995; Sanders 1989: 13; Sharma 1989: 324–25; Sabel: 1984: 14; Range 1961.
[66] Haas 2012. [67] Holsti 2006; Johnson 1995; Leites 1951.
[68] Legro 2005; Axelrod 2015; Krebs 2015. [69] Hall 1993; Wilder and Howlett 2014.
[70] Gilpin 1975: 215–62.

occurred.[71] Worldviews shape the views of both scholars and of the various actors they study. Worldviews connect the interpretation of the self in the analysis of the other and the world. In this chapter, for example, I am particularly interested in the scientific worldviews of scholars and the effect they have on the neglect or recognition of the constitutive importance of uncertainty in world politics. By contrast, in Chapter 2 Mark Haas and Henry Nau examine the worldviews of political leaders and the effects these worldviews have on political norms and practices. In Chapter 7, Prasenjit Duara covers the worldviews of both scholars and leaders.

These general characteristics of worldviews find more specific expression in the difference between the Newtonian and Post-Newtonian scientific worldviews that concern me here.[72] In the analysis of world politics and the social sciences, Newtonianism has been hegemonic. In contrast, quantum mechanics, with its insistence on the centrality of uncertainty at the subatomic level, has occupied a marginal position in the social sciences – including the study of world politics.[73] Furthermore, the relational revolution in scientific cosmology and several other branches of the natural sciences puts the concept of uncertainty into a much broader context. Both quantum mechanics and scientific cosmology are instances of a Post-Newtonian scientific worldview with far-reaching ramifications for our understanding of society and history. Yet, students of world politics have shown little interest in exploring and learning from Post-Newtonianism.

Newtonian uncertainty is cast in agentic terms and is believed to be manageable through the exercise of control power and risk management. In Post-Newtonianism it is considered systemic and can include protean power effects that thrive in the domain of the unexpected.[74] In the analysis of world politics, scholars with a Newtonian worldview typically downplay or overlook the distributed agency that is highlighted by Post-Newtonianism. Newtonianism offers a commitment to intervening in the world by accountable agents who seek to achieve some purpose or value. Post-Newtonianism is less focused on individual accountability. It points instead to the inherent contradiction within a Newtonian worldview, with its firm belief in laws or causal mechanisms that deny or limit freedom and

[71] Jairus Grove made this point several times in our discussions. See also Damasio 1994.

[72] The distinction between Newtonianism and Post-Newtonianism focuses on the difference between the ontology and epistemology of classical and quantum physics, but also goes beyond it to incorporate other natural sciences, such as scientific cosmology, which have taken a relational turn in the twentieth century. Even though it went well beyond Newton, nineteenth-century energy physics was classical. I am concerned here with scientific worldviews rather than the science of worldviews Dilthey tried to develop, as I discuss in Section 1.4.

[73] Wendt (2015) is the notable exception.

[74] Katzenstein and Seybert 2018a.

agency while at the same time insisting on the primacy of agency and accountability. Although Newtonianism reigns supreme in the analysis of world politics and some of the other social sciences, it has been sidelined in physics and the natural sciences. Debates in quantum mechanics, for example, do not seek to attack or defend Newtonianism in general; they focus instead on which elements of a closed Newtonian system can be usefully incorporated in a broader view of a universe that is open.

The determinism and certainty of Newton's macro world, softened by the laws of probability, has been replaced by the indeterminism and uncertainty of the micro world of quantum physics. According to Feynman, Mermin, and Baeyer, Newtonian and quantum physics are examples of scientific worldviews.[75] Taken together, these two scientific worldviews illuminate a politics marked by risk and uncertainty. In the Newtonian worldview, "the future after a fashion repeats the past."[76] Novelty in Newtonianism is conceived of as recombinatorial, in contrast to the possibility of radical creativity and innovation in Post-Newtonianism. In the conventional understanding of world politics, the world is viewed as closed and inhabited by actors who feel threatened by uncontrollable uncertainty. Envisaging a world that is open and actors who are enabled by new possibilities seems implausible and uncomfortable.

Only a handful of scholars of world politics have explicitly introduced the concept of worldview into their analysis. For Patrick James, building on Rosenau, worldviews provide complex, holistic foundations for scientific research. They are not analytically consistent.[77] They subsume paradigms, theories, models, and hypotheses that seek to understand and explain patterned or specific events. Worldviews are inescapably normative and shape the understanding and explanation of reality. They are often self-confirming and sometimes self-invalidating. Divergent worldviews do not get resolved by appeals to logic and evidence but through individual experiences and social processes.[78] In contrast to James, worldviews for Jürg Gabriel are extremely simple and highlight a few

[75] Mermin 1990: 175, 195; Baeyer 2016: 185, 192, 195. I justify my radical simplifications of an exceedingly complex analytical terrain because doing so highlights the central distinction I wish to make between two scientific worldviews (Baeyer 2016: 140). This discussion abstracts therefore from different interpretations of quantum mechanics, such as pilot-wave, spontaneous reduction, many-worlds, modal, consistent history, and spontaneous collapse (Bächtold 2008: 843–44; Baeyer 2016: 235–39). For a general overview, see Lewis 2016.

[76] Wiener 1948: 42.

[77] James 2002: 68–72; Rosenau 1997: 26–31. See also Rösch 2015: 11–16; Krell 2000; Nau 2012.

[78] James 2002: 72.

concepts that for centuries have remained largely unchanged.[79] He identifies optimists among scholars who believe in a general accumulation of knowledge, and pessimists who are frustrated by the fact that, beyond a handful of small islands, accumulation is smothered by a proliferation of often incommensurable approaches. In contrast to the cumulative process of knowledge creation in the natural sciences, knowledge creation in international relations is repetitive. Time and again, students of world politics deal with foundational issues and concepts in light of new circumstances and information.

The stabilization of an uncertain world through worldviews is a political act.[80] Worldviews offer basic ideas that shape the questions we ask or fail to ask, provide us with explanatory and interpretive concepts, and suggest hunches or plausible answers.[81] They are a handle that organizes many of the world's unknown or poorly understood facts. For Max Weber, a world image (*Weltbild*) or worldview consists of concepts and judgments that can provide the groundwork for a thoughtful ordering of the world and a narrative shaping of "salient areas of daily, human practice."[82] But, contra Weber, worldviews operate in all societies and in all historical times.[83] They are imaginaries that are built around basic and often unarticulated assumptions such as "time, space, language and embodiment."[84] Worldviews contain arguments about the ontological building blocks of the world, the epistemic requirements of acceptable knowledge claims, and the origin and destiny of humanity. They find expression in institutional and symbolic orders. They are legitimated by being part of the natural order of things, privilege some actors, such as priests or scientists, and embody shared values that are considered "natural." Within a given worldview there can always exist a variety of different and often competing ways of understanding. Christianity's religious wars are one example. Scientific schisms between Aristotelian and modern science and within modern science, between classical physics and quantum mechanics, are another. Lacking tight internal integration, worldviews infuse meaning into world politics. Inchoate as they often are, worldviews are central to our readiness to accept uncertainty as a constitutive aspect of world politics.

[79] Gabriel 1994: 1–2. [80] Allan, Chapter 8, this volume.
[81] The concept of *Weltanschauung* is normally translated as "worldview" even though the German *anschauen* describes a conscious activity, while viewing can also be unconscious (Rösch 2015: 11).
[82] Weber 1956: 253, 260, 414–17, 430; Naugle 2002: xvi, 291–92, 297–303.
[83] Trownsell et al. 2020; Waters 1999. [84] Phillips, Brown, and Stonestreet 1991: 24.

1.2 Paradigms, Substantialism, and Relationalism

In their discussions of worldviews, students of world politics have tended to collapse this concept's multifarious analytical and political components into the more mundane "paradigm." [85] Specifically, since the 1970s they have debated both Thomas Kuhn's work on analytical paradigms and substantive political paradigms such as liberalism, realism, and Marxism. Commitments to Newtonian substantialism and Post-Newtonian relationalism, and the attendant (in)ability to conceptualize uncertainty as a constitutive part of world politics, are embedded in discussions about both types of paradigm.

Paradigms. Historian of science Thomas Kuhn used the concept of paradigm to characterize and distinguish the foundational assumptions of different scientific approaches.[86] Scientific progress was not a story of continuous and cumulative progress. It consisted instead of periods of normal science interrupted by brief periods of revolutionary science. Normal science is marked by the ascendance of a single paradigm that determines the central research questions, theoretical vocabulary, and acceptable methods and criteria for assessing how well a given question has been answered. When fully institutionalized, weak links of dominant paradigms are no longer recognized, foundational assumptions are no longer questioned, and anomalies are consistently overlooked or considered as lying outside of acceptable research programs. Revolutionary science occurs in brief spurts when scientists are frustrated by increasing numbers of anomalies, interested in new research questions, and committed to developing new approaches that might resolve troubling anomalies. Once the insurgents have acquired sufficient clout, conditions are ripe for the emergence of a new paradigm. Controversially, for Kuhn, paradigms are incommensurable with one another, so it is impossible to integrate or compare theories developed within different paradigms.

Kuhn's argument about "paradigm shift" and "paradigm incommensurability" is analytical.[87] It tells us nothing about the world itself. His argument is about the perception of reality and not about the real world. In a *Gestalt*-flip paradigm shift, we do not necessarily lose the ability to see the rabbit or the duck, but we may not be able to see them at the same time. The argument about incommensurability that captured the imagination of the humanities and some of the social sciences resonates with shifts in the "soft" parts of paradigms. It fails, however, to capture their "hard" parts that deal with predictive accuracy, explanatory depth, and

[85] I thank Rudra Sil for commenting helpfully on this section.
[86] Kuhn 1962. Sil and Katzenstein 2010a: 4–5, 26–34. Sil and Katzenstein 2010b.
[87] Sil and Katzenstein 2010a: 13–16.

power. The incommensurability account mischaracterizes the process of inquiry in the modern natural sciences, specifically in the maturing of paradigms and their theoretical developments over time.[88] Difficulties of understanding across paradigms are not the same as the impossibility of understanding. The question of "what is," after all, is not the same as "what is known" or "what can be made meaningful."[89] Such difficulties do not imply that all statements about truth are contingent.[90] As a matter of fact, Kuhn's later writings reflect a modified view on incommensurability, toward a more circumscribed claim about meaning variance across paradigms and the limits of our ability to translate adequately from one paradigm to another.[91] In any case, as Gunnell observes, "philosophy is no more the basis of science than social science is the basis of society."[92] For those who believe that there is a reality outside of and apart from the observer, it makes little sense to ask a natural or social scientist whether they have nature or society right.

Kuhn sometimes likened revolutionary, paradigm-shifting scientific progress to the process of Darwinian evolution: nondirectional improvement with no specific purpose. By contrast, change during normal times, within a well-understood paradigm, is directional.[93] There are multiple truths in all scientific endeavors and, on the record of the last several centuries, natural scientists have ruled out many things previously thought to be true. There is thus justified hope of movement in the direction of greater truth.[94] That hope is weaker in the social sciences – which Kuhn saw as lingering in a preparadigmatic state[95] – including the analysis of global politics, especially as long as it is captured by a worldview that fails to recognize the constitutive effects of uncertainty.

Since the middle of the twentieth century, students of world politics have debated their worldviews, first by employing the terminology of images and subsequently of substantive political paradigms. Carried by the unspoken assumption that we live in a world of probabilistic laws and risk, uncertainty has not been a subject in any of those debates. In the 1950s, the debate focused on the "image" of international relations.[96] For Wright, a synthesis of different mental images defined each scholar's perspective on international relations.[97] The world thus generates a uniform picture that lines up with the worldview accepted by individuals or groups. McClosky, Boulding, and Waltz all assumed that a stable, external world is reflected in multiple, shifting, subjective representations that scholars imagine to be images of unified, coherent

[88] Weinberg 1998. [89] Wight 1996: 301. [90] Morris 2011 part 3: 10; part 4: 1.
[91] Jackson and Nexon 2009: 910–11. Jackson 2015: 19–21. [92] Gunnell 2011: 1467–68.
[93] Weinberg 1998: 14. [94] Weinberg 2015: 6–7. [95] Wight 1996: 292, fn 7.
[96] Hamilton 2017: 148–55. See also Kristensen 2016. [97] Wright 1955: 484, 492–95.

wholes.[98] The image of world politics thus was embedded deeply in a Newtonian worldview. As Robert Dahl wrote in a foundational article on power in 1957, power and risk may be complicated, but "they don't defy the laws of nature as we understand them."[99] The role of uncertainty in the world was not a matter of concern within a Newtonian worldview or paradigm.

In the late 1960s, Graham Allison shifted away from anchoring international relations scholarship in images.[100] He developed three conceptual lenses or paradigms to capture how individuals, organizations, and governments behave. Allison was not interested in developing a comprehensive view of the world as much as picking up different pieces of the world that warrant explanation. As was true of the 1950s, his perspective betrayed a Newtonian worldview. His conceptual lenses perceived a real, known, and knowable world that remained an external and stable reference point.

This was true also for the prolonged discussion of realist, liberal, and Marxist paradigms by scholars of international relations in the 1980s and 1990s, which paralleled the discussion of rationalism, institutionalism, structuralism, and culturalism in the field of comparative and American politics.[101] Paradigmatic "isms" became the foundational worldviews or approaches for understanding world politics. Disagreements among analytical or substantive paradigms occurred on the firm ground of a single, real, stable world that was subject to law-like generalizations or mechanism-based analyses. The uncertainties of that world did not figure in the discussions. Furthermore, substantive political paradigms offered communities of purpose and value and focused on the problem of alternative consequences of action. With no single paradigm prevailing, each one asserted its own particular view as sacrosanct.[102] Indeed, each paradigm sought to "convey a world view more basic than theory"[103] and, following Kuhn (indeed, often directly inspired by him), viewed itself as incommensurable with all other paradigms. Hence, engagement with proponents of competing paradigms was viewed as a futile exercise. These paradigmatic worldviews were not dynamically competing but frozen in Newtonian time and space; and so too were the risk-based, theoretical worlds they generated.[104]

[98] McClosky 1956: 283; Boulding 1959: 120; Waltz 1959: 6, 10, 12.
[99] Dahl 1957: 214. [100] Allison 1970: 249, 279.
[101] Gilpin 1975: 215–62; Rosenau and Durfee 1995: 9–69; Lichbach and Zuckerman 2009.
[102] Little 1984: 7. [103] Banks 1984: 15.
[104] Hamilton 2017: 153; James 2002: 215–21. In contrast to explicitly political paradigms, analytical perspectives such as rationalism and constructivism offer different discourse communities and a shared concern with the problem of alternative causes of action.

Substantialism and Relationalism. Analytical and political paradigms[105] deal with epistemological problems of the relation between the observing mind and the observed world. They can also embody substantive ontological claims about the world and objects in it.[106] Their more or less explicit epistemological and ontological claims take the form of substantialism or relationalism.

In Newtonianism, substantial entities such as individual objects or persons exist with their internal characteristics prior to interacting with other entities. Social entities are aggregates of individuals.[107] In short, substantialism takes pregiven entities as the starting point and imbues them with properties and agency. Strong versions assume that individual choices are driven by objective or intersubjective features of the world.[108] Substantialism thus includes actor-centered approaches that rely on the logic of appropriateness.[109] Norms, culture, and identity are structural features that shape individual and state action. Both rational choice and norm-based approaches view individual human action as the elementary unit of social life. For rational choice approaches, preexisting actors typically "generate self-action" that is consistent with preexisting interests and attributes. Similarly, many norm-based approaches view individuals as "self-propelling ... entities" that follow internalized norms that are fixed for the timespan under investigation.[110] Substantialism expresses the Newtonian worldview in which classical conceptions of atoms as the smallest entities constitute the physical world, just as independent social entities are the building blocks of the social and political world.

Two key concepts in relationalism are processes and yoking.[111] Rescher defines processes as "coordinated group[s] of changes in the complexion of reality, an organized family of occurrences that are systematically linked to one another either causally or functionally."[112] He emphasizes processes as prior (and irreducible) to substances, arguing

[105] There exists a vast literature in different fields of scholarship that discusses different formulations of these two concepts (Emirbayer 1997: 290–91). I provide here no more than stylized sketches to advance my argument. I thank Nina Obermeier for her excellent work in helping me draft this section, and Patrick Jackson for reading and commenting on an earlier draft. See also Nordin and Smith 2019.

[106] Gunnell 2011: 1452–53, 1455, 1462, 1465–66; Jackson and Nexon 2013: 551. Wight 1996: 291–95.

[107] Abbott, 1995: 860–64.

[108] Jackson and Nexon 2013: 555.

[109] Jackson 2010; Jackson and Nexon 2013; McCourt, 2016; March and Olsen 1998.

[110] Structural arguments focus on social aggregates and do not take individual human action as their starting point. But they, too, adhere to the view of "durable, coherent entities" as the starting point of analysis and therefore are further examples of substantialism (Emirbayer 1997: 284–85).

[111] Nexon 2010; Jackson and Nexon 1999: 301; Rescher 1996; Abbott 1995.

[112] Rescher 1996: 38.

that this allows for an approach that prioritizes change. Unowned processes, such as nuclear proliferation and the growth of economic interdependence, cannot be viewed as the product of any particular agent's actions.[113] Rescher ties a process-oriented view of the world to quantum physics, which suggests that "at the microlevel, what was usually deemed a physical *thing*, a stably perduring object, is itself no more than a statistical pattern – a stability wave in a surging sea of process."[114] He regards the shift away from the atom to particle physics in the understanding of the physical world as analogous to the shift from substantialism to relationalism.

Focusing on boundaries rather than entities, Abbott shares Rescher's interest in relations.[115] According to his analysis, social entities come into existence when actors tie social boundaries together in specific ways. He defines boundaries as "difference[s] of character," which are gradually sorted into two sides to form stable properties through social interactions.[116] The idea of *yoking* refers to the connection of such boundaries by social actors in a way that defines entities inhabiting one or the other side of the social boundary. Abbott offers the example of the concept of social work, which did not exist prior to the late nineteenth century. It was created by the yoking together of different boundaries related to gender, training, and prior professional attachments. Abbott's description of relationalism thus stresses intersubjectivity and social context in a way that Rescher's process-oriented philosophy does not.

Extending this perspective, Laura Zanotti follows Karen Barad's lead by taking "quantum ontologies" as the starting point for her analysis of a strong version of relationalism.[117] The fundamental ontological indeterminacy in the natural world "can only be contingently resolved in the intra-action between the observer, and the observed, the human, and the non-human. " In giving relations rather than substances primary ontological status, this is similar to the approaches discussed earlier. But it goes beyond them in positing a specific relationship between human and nonhuman aspects of the world. Zanotti relies on the concept of "apparatus" – ways of engaging with the world – to refer to the means by which boundaries and properties of objects are determined and ontological closure is achieved. Agency should not be considered a property that individuals possess. It operates, rather, through the apparatuses we use "to bring about differentiated forms of materialization of matter and the social."[118] Agency is not a free-floating means for humans to enact their will on the world. It is instead caught up in

[113] Rescher 1996: 42; Jackson and Nexon 1999: 303.
[114] Rescher 1996: 98 (emphasis in the original). [115] Abbott 1995.
[116] Abbott 1995: 862. [117] Barad 2007; Zanotti 2018: 4, 57–58.
[118] Zanotti 2018: 67.

complex entanglements of the human and nonhuman.[119] This version of relationalism incorporates uncertainty even more fully into its analysis than versions that focus on processes or boundaries.

In the field of political economy, the Open Economy Politics (OEP) approach exemplifies some of the advantages and disadvantages of substantialism and relationalism. OEP is readily intelligible and generates useful baselines for what to expect in the world. But it lacks "sensitivity to the social fabric of international politics."[120] That shortcoming was readily apparent after the financial meltdown of 2008–9. After the dust had settled, OEP had precious little to offer by way of analysis or interpretation to help in our understanding of the greatest uncertainty-induced calamity in the international political economy since the 1930s.[121] Similarly, international relations scholars often characterize international interdependence in substantialist terms. They describe international interdependence with a focus on the strategic interaction among purposive actors. According to Milner, under conditions of interdependence, states' "actions and attainments of their goals are conditioned by others' behavior and their expectations and perceptions of this."[122] This conceptualization emphasizes preexisting entities with interactions that affect their ability to achieve various objectives. An alternative, relational account of interdependence might "focus on the ways in which trade and other networks are constitutive of boundary conditions of the state and other projects," as Jackson and Nexon argue.[123] These examples highlight the differences between a substantialist approach that takes entities as the starting point for analysis and a relational approach that looks at how one set of relations gives rise to others. Indebted to Newtonianism, substantialist approaches tend to focus on the concept of risk and neglect uncertainty's central place in world politics.

In short, substantialism expresses a Newtonian worldview. A wide range of outcomes in closed systems can be explained with reference to a few abstract, universal principles.[124] Autonomy refers to the notion that "actors are analytically distinguishable from the practices and relations that constitute them."[125] Rational choice approaches seek to abstract from specific contexts. Models are generally transposable. This produces "timeless, context-free, and abstract knowledge,"[126] as opposed to a relational, practice-oriented Post-Newtonian worldview. It emphasizes an indeterminacy that can be resolved in contextually specific processes of materialization. Mayntz and Scharpf's actor-centered relationalism

[119] Kaufman 2008: 23–46. [120] McCourt 2016: 482.
[121] Nelson and Katzenstein 2014. [122] Milner 1991: 83.
[123] Jackson and Nexon 1999: 304. [124] Zanotti 2018: 29.
[125] Jackson and Nexon 2013: 553, 555. [126] McCourt 2016: 476.

combines actor autonomy with contextual factors.[127] It does not give explanatory primacy "to specific features of the immediate spatial-temporal environment in which actors operate."[128] Instead, it assumes that social relations embed actors and constrain their autonomy. The relations in which actors are embedded generate key actor attributes, capacities, and characteristics. Contextualism can be either "thin" or "thick." Thin contextualism allows for some level of generalization about actor relations and positions; actors and context are analytically separable. In contrast, "thick contextualism" focuses on immediate life-worlds and the local experiences of actors; actors do not have a clear analytical status independent of their contexts and analysis is more resistant to generalization.[129]

Yaqing Qin's eclectic view of world politics draws on both substantialist and relationalist elements.[130] It is partly substantialist and Newtonian, as it highlights the importance of cultural background knowledge of civilizational communities. Culture for him is an indelible birthmark, a crystallized background knowledge of worldviews and all theoretical systems. Qin argues that practice theorists such as Adler and Pouliot limit their notion of communities of practice with shared background knowledge too severely to those that form around specific groups (such as activists, diplomats, and epistemic communities) operating in bounded issue areas (such as national security, the environment, or the economy).[131] He defines culture as "the way of life of a people who share a lot in terms of behaviors, values, beliefs, and perspectives without consciously knowing them … [A] cultural community is a group of people bound by background knowledge."[132] According to Qin, the differences between, for instance, Western and Chinese cultures mean that scholars based in these cultures develop different social theories of how the world works.[133] Like Huntington, this formulation flirts with a reification of culture as a unified object neglecting contestation and conflict within and encounters and engagements between cultures and civilizational complexes.[134]

Qin is also a Newtonian humanist. While Mustafa Emirbayer, like Jackson and Nexon, views relations as a "general term … [that] may involve human and non-human factors," Qin's approach specifically concerns relations between humans in a Newtonian manner;[135] the Confucian and Daoist philosophies Qin draws on understand relations

[127] Mayntz and Scharpf 1995; Scharpf 1997. [128] Jackson and Nexon 2013: 553.
[129] Jackson and Nexon 2013: 554–55.
[130] I thank Yaqing Qin for checking the accuracy of my rendition of his book.
[131] Qin 2018: 36–37. [132] Qin 2018: 41. [133] Qin 2018: 204.
[134] Huntington 1996; Katzenstein 2010, 2012a, 2012b. [135] Qin 2018: 112.

between humans to be the foundation of social theory and ethics. Importantly, "state actors" are treated as humans and, apparently, as unitary actors. And so are civilizational complexes, as illustrated by Qin's discussion of the relations between China and the Soviet Union.[136]

The focus on human relations entails a focus on human agency. Qin critiques the concept of yoking as a "temporo-spatial chance with few human elements involved. In other words, nothing would happen if the necessary processes were not related, perhaps by chance."[137] By contrast, his focus on human relations puts human agency at the center of relationalism. This is reflected in his discussion of Jackson and Nexon's view of "relations before states," by which they mean that relations are ontologically prior to states.[138] Qin does not believe that relations should be seen as prior to actors. Instead, relations and actors are constitutive of one another: actors are defined by their relations, and relations are always between actors. In this way, actors and relations are coconstitutive "processual simultaneities."[139] The agency implicit in these relations between human actors is in turn important for harmony and balance, key concepts in Qin's approach. He argues that "human agency provides the sufficient condition for harmony . . . When both the self and the other have learned through education and self-cultivation how to behave appropriately, their behavior is neither too aggressive nor too humble. . . . As a result, the relationship between the self and the other is harmonious and society is harmonious, too."[140] Culture, harmony, balance, and human agency are indelibly linked in the production of social orders.

In his treatment of dialectics, in contrast, Qin leans toward processualism and articulates a relational Post-Newtonian worldview. He argues that Western notions of dialectics, typically relied on by both substantialist and relational approaches, are fundamentally different from the idea of "*zhongyong* dialectics" in Confucian and Daoist thought.[141] While Western notions of dialectics – drawn mainly from Hegel – emphasize difference, conflict, and irreconcilability, *zhongyong* dialectics are based on harmony and "immanent" relationships between polarities.[142] In Qin's understanding of a dialectical relationship, each pole is inclusive of its opposite; they are both "always engaged with each other in the

[136] Qin 2018: 118. [137] Qin 2018: 112. [138] Qin 2018: 117. [139] Qin 2018: 117.
[140] Qin 2018: 193.
[141] Qin, 2018: 169–92. This is not an instance of Confucian or Daoist exceptionalism. For example, in his discussion of the Haitian revolution Shilliam (2017: 279) speaks of "Vodou's investment in the cosmological conceit of seminal relationality rather than fidelity towards the principle of categorical segregation embraced by colonial science."
[142] Qin 2018: 174.

process of becoming the other."[143] In contrast to Abbott, entities are not yoked – that is, socially constructed through the tying together of proto-boundaries – as much as each side of a boundary already includes the other.[144] The social world is thus marked by harmony or balance between different poles. Qin's eclecticism works along the substantialist–relationalist continuum. His reliance on both Newtonian and Post-Newtonian worldviews remains implicit, and the potential for incorporating both risk and uncertainty into his analysis remains unexplored. In Qin's approach, worldviews inform analytical perspectives more or less directly. Conversely, and less strongly, analytical perspectives can occasionally have a small impact on worldviews. Both are coevolving, competing, or complementary ways of understanding or engaging with the world. Since Newtonian concepts are baked into our conventional language, Qin's anthropocentrism takes for granted absolute dimensions of time and space as a background into which political actors are placed and analysis is conducted at a distance. In contrast, Post-Newtonianism acknowledges no background, and time and space are active processes of becoming that shape politics and political analysis.

Students of world politics have relied on paradigms as the core construct to debate both analytical and substantive views of the world. With rare exceptions, the substantialism and relationalism that inform their approaches never question a deeply ingrained Newtonian worldview.[145] Typically, that worldview encompasses a substantialist ontology, a probabilistic epistemology, and a commitment to replicable techniques that can help in error reduction. As John Ruggie observed almost thirty years ago, "As for the dominant positivist posture in our field, it is reposed in deep Newtonian slumber wherein method rules."[146] It is this Newtonian slumber that conceals the constitutive part of uncertainty in world politics.

1.3 Newtonianism vs. Post-Newtonianism (Quantum Mechanics)

To grasp more fully the implicit worldview that makes it so difficult for students of world politics to accept uncertainty as a constitutive factor of world politics, this and the next section discuss some salient differences between Newtonianism and Post-Newtonianism (quantum mechanics) on the one hand, and humanism and hyper-humanism (scientific cosmology) on the other. My discussion of quantum mechanics and scientific

[143] Qin 2018: 175. [144] Abbott 1995.
[145] Wendt 2015 and Zanotti 2018 are notable exceptions. [146] Ruggie 1993: 170.

cosmology is selective. Many of the issues I touch on are considered either peripheral (by most experimental physicists) or contestable (by scientific cosmologists). That is not to say that there are no widespread agreements on the meaning of the stunning and rapidly accumulating experimental and observational findings in both fields, as is true, for example, of the broad support for the Copenhagen interpretation of quantum mechanics. I have tried to capture how both fields are thinking about the natural world, in sharp contrast to Newtonianism and the conventional view shared by most students of world politics, which leaves no space for uncertainty.

Although scientific discoveries often defy common sense, worldviews integrate them into social and political life.[147] In the analysis of world politics, the best Newtonian scientific knowledge searches for law-like correlational statements and causal mechanisms.[148] The external world is real. Representational knowledge is located in absolute dimensions of time and space. And knowledge has a status that is independent of the observer. The simple billiard ball model of international relations, conventionally taught to first-year college students, is a good example of a mechanistic application of cause-and-effect reasoning. Following the example of economics, many scholars of world politics look to Newtonian physics as their main source of scientific inspiration.[149] But after he had listened to a Nobel Prize economics lecture, physicist David Mermin observed pithily that with its integrals and derivatives, economics was just "like physics, except physics works."[150]

Newtonianism. Newton's laws of motion articulate a universal set of principles to account for planetary movements: "The prototype for the order of universal natural law is universal gravitation, set forth in all its magisterial generality by Isaac Newton in his *Mathematical Principles of Natural Philosophy*."[151] Newton assumed that movement occurs in relation to absolute space and time. Imagined as a large empty container or background, each bit of space is exchangeable. God invented matter and created the moving objects that fill this space. Nature is governed by objective principles. Thus, Newton arrived at the view of a clock-like universe: a consistently working machine that reflects a hidden order, captured by the universal laws of motion and accessible to human reason and observation.[152]

[147] Kurki 2015: 788. [148] Jackson and Nexon 2013: 549; Wæver 1997.
[149] Mirowski 1989: 4–5, 357, 366, 374–95. For the cosmological configuration that enabled this affinity, see Grove, Chapter 4, this volume.
[150] Mermin 2016: 132. [151] Daston 2019: 23.
[152] Maudlin 2012; Smolin 1997: 141–42.

A scientific Newtonian worldview began to replace a metaphysical religious one in sixteenth-century Europe. Knowable laws of a predictable Nature replaced the unknowable arbitrariness of an all-knowing God. Science encouraged self-organization and undermined existing hierarchies. In the hands of Kepler, Galileo, Descartes, Newton, Spinoza, and Leibniz, mathematics as the most knowable of the sciences was always also philosophical or even religious. The Newtonian worldview does not deny God as the creator of the world. But it does make God a mathematician and His logical plan becomes available for scientific interrogation. Human perception of the world is skewed; mathematics is not. It can fully understand and predict the linear interactions between the discrete objects of this world. Matter is dead; the human mind is not. And it can control and bend Nature to humanity's will. Relying on an inherent universalism, linearity, and reductionism, and superseding Aristotle's syllogistic logic and Descartes' deductive tendencies, Newton's inductive scientific methodology led him to the higher scientific truths articulated in his three laws:[153] "Newton, more than any other man, had banished mystery from the world by discovering a "universal law of nature," thus demonstrating what others had only asserted: that the universe was rational and intelligible through and through, and capable, therefore, of being subdued to the uses of men."[154]

Newtonianism has a powerful grip on the social sciences, including important strands in political science and, specifically, international relations.[155] In the Newtonian worldview, "the world was considered to be deterministic. Blended with the atomized and axiomatic approaches to the study of science, reason had in many senses become rationalism. Society was there to be solved."[156] It made "the world feel less anarchic and more predictable," and "strengthened the commonsense belief in a world designed by a higher intelligence and a superior force" – for some God, for others the Laws of Nature.[157] The assumed order of the world held forth the promise of control. The sciences do not eliminate from our lives the irrational, mystical, and religious. Far from it. But, as illustrated by conventional scientific practices, the notion of control continues to have a powerful grip on students of world politics and the social sciences more generally, at times as a metaphor "with a quasi-poetic function."[158] Since the eighteenth century, atomistic natural philosophy and, specifically, Newton's image of the universe, has left an indelible mark on political thought.[159]

[153] Louth 2011: 66–67. [154] Louth 2011: 68. [155] Kurki 2020: 42–46.
[156] Louth 2011: 73. [157] Hage and Kowal 2011: 7. [158] Hage and Kowal 2011: 9.
[159] Camilleri 2011: 51; Allan 2018: 207–62.

As the reigning scientific worldview, Newtonianism thus informs the conventional understandings of world politics. For example, the mechanical foundations of Newtonianism have had a strong effect on the progressive imagination of the American Founding Fathers and modern theorists of a recurrent balance of power.[160] Liberalism and realism share the Newtonian view of the political universe as self-sustaining and self-regulating objects or actors. In both, the flux of events is viewed as subject to fixed laws or statistical regularities. Entities are knowable and can be governed by humans. And humans are set apart in nature by the power of their reason.[161]

In search of intellectual simplicity, the analysis of world politics typically homogenizes reality by conflating a large number of diverse political phenomena and entities under a small number of concepts. It also adopts strong assumptions about how world politics works, using statistical analysis or experiments to support its search for simple causal relations. This approach to understanding the world hews closely to Newton's own words: scientific truth is to be found, "in the simplicity, and not in the multiplicity and confusion of things."[162] When we explain world politics by making simple distinctions – East and West, land and water, then and now – we follow Newton's advice.

As a matter of fact, Newton encountered multiplicity and confusion in human affairs, and painfully so. In the spring of 1720 he sold his shares of the South Sea Company, pocketing a 100 percent profit of £7,000. The price of the shares continued to rise. Not wishing to lose out on this speculative frenzy, Newton bought shares back at three times the price of his original investment. The bubble burst a few months later and decimated Newton's savings as he reportedly lost the equivalent of $3 million in today's money. He subsequently lamented that "I can calculate the motion of heavenly bodies but not the madness of people."[163] This "multiplicity and confusion of things" is central to a Post-Newtonian worldview.

Although students of world politics share Newton's befuddlement about the unexpected, they hold fast to his orderly worldview. The typical response to the often shocking predictive and explanatory failures of their preferred constructs has been to reexamine their theories and models with the hope that, eventually, the Newtonian strategy of simplification will lead to the discovery of valid laws and causal mechanisms that generate compelling explanations and

[160] Foley 1990; Allan 2018: 22, 117–35.
[161] Kurki 2020: 131–32; Grove and Chandler 2017: 79.
[162] Snobelen 2005: 273: fn 154.
[163] Lehrer 2007: 27; Christianson 1984: 571; Westfall: 1980: 861.

accurate predictions.[164] This, however, is not how it turned out in physics. Most physicists agree that quantum mechanics has superseded Newtonian physics and simply get on with their work.[165] Modern physics and cosmology have discarded Newton's notion of absolute space and time. Although the classical model remains a convenient computational tool for many practical problems, it conveys a misleading view of nature as orderly and accessible to neutral observation, when the reality is rather disorderly and often barely accessible. Furthermore, despite its practical usefulness, the classical model is inadequate for understanding the subatomic world and thus fails to account for the many practical applications of particle physics. It does not offer a general explanatory framework.[166] To be sure, some physicists held tight to their belief in a Newtonian world. Slowly but surely, however, most acknowledged the failings in their worldview and moved on. This process became less difficult after a plausible alternative presented itself.

Post-Newtonianism. In the late nineteenth century, experimental physics began to probe the subatomic structure of matter. Electrons, quarks, photons, gluons, neutrinos, and a few "Higgs bosons" are the elementary particles studied by quantum mechanics.[167] It describes these particles and their movement. They are not real, like little pebbles; "They are the elementary excitations of a moving substratum ... miniscule moving wavelets."[168] Einstein's special relativity theory of time and space, and relativistic quantum field theory more generally, opened up an invisible world of energy governed by randomness. Nineteenth-century philosophical relationalism inspired the first, philosophically informed generation of quantum physicists to think relationally about many of the new phenomena they discovered with ingenious experiments. Only subsequently did a materialist and quantized version of relationalism claim to be foundational because it was "real." Although the weirdness of the

[164] Searle (1984: 75) argues that we must abandon the idea that the social sciences are like physics before Newton and that we are waiting for the arrival of a set of Newtonian laws of mind and society. Many students of world politics disagree. They subscribe to a scientific approach based on a Newtonian worldview, hoping that they are in the process of articulating scientific laws.

[165] Barad 2007: 134, 440 fn6; Unger and Smolin 2015: 373–84, 391–92.

[166] Barad 2007: 24, 134, 440 fn6; Unger and Smolin 2015: 373–84, 391–92; Smolin 1997: 125. Kauffman 2008 extends that criticism to include all of physics, Newtonian and quantum.

[167] Physicists who work on different portions within this broad perspective describe the new field of theory as quantum theory, quantum mechanics, quantum physics or particle physics. All four of these terms will be used (more or less) interchangeably in this chapter.

[168] Rovelli 2016: 32.

quantum world has defied all attempts at explanation, the new theory became a marvel of predictive accuracy. It has generated technological innovations and applications that continue to revolutionize the social and political world despite the scant attention paid by students of world politics.[169]

Early on, though, some prominent political scientists recognized the importance of new developments in physics. William Bennett Munro, President of the American Political Science Association, delivered his address on the topic of "physics and politics" in 1927, regretting that the study of government was "still in bondage to the eighteenth-century deification of the abstract, individual man."[170] In *Scientific Man vs. Power Politics*, which he described toward the end of his career as his favorite among his voluminous writings, Hans Morgenthau explicitly recognized the significance of changes in physics for the analysis of world politics.[171] This work was published in 1946, a few decades after the quantum revolution, and Newtonian physics for Morgenthau already was "a ghost from which life has long since departed."[172] Since the classical model had been disproven and rejected by physicists, it no longer could serve as an adequate guide for the social sciences and students of world politics. It needed to be replaced by the complex worldview of quantum mechanics. Morgenthau argued that the scientific studies of world politics would have to settle for a disquieting mixture of the knowable and the unknowable.[173] Quantum physics had introduced indeterminacy and thus radically transformed the calculable, determinist universe of the classical model.[174] Complete knowledge of either past or future had become a chimera, as scholars came to acknowledge that their current approach to understanding world affairs would never yield reliable predictions of individual events: "The next quantum jump of an atom is as uncertain as your life and mine."[175] Out-of-equilibrium nature does not know its own future, and neither do we. And while probabilistic predictions and scientific laws can provide insights into the modal tendencies of statistical aggregates, they are like quantum physics in that they cannot provide any insight into individual units of observation. Morgenthau thus called for a thorough revision of simplified social science modeling.[176] He

[169] For a few notable exceptions, see Uphoff 1992; Barad 2007; Wendt 2015, 2022a, 2022b; Zanotti 2018; Der Derian and Wendt 2020. James Der Derian's Project Q, housed at the University of Sidney, has tried to act as a catalyst.
[170] Munro 1928: 3. [171] Frei 2001: 206. [172] Morgenthau 1946: 132.
[173] Uncertainty was central to the work of economist Frank Knight, Morgenthau's colleague at Chicago, whom he singles out for special thanks in the preface to his 1946 book.
[174] Morgenthau 1946: 132. [175] Morgenthau 1946: 136.
[176] Morgenthau 1946: 144–45.

pleaded that the unification of the natural and the social sciences should be triggered by their shared ignorance when confronting the unknowable and the insuperable. We can thank Morgenthau for positing that, when we take quantum mechanics rather than the classical model as our guide, "the structure of the natural world finds its exact counterpart in the social world."[177] Seventy-five years later, students of world politics are still trying to catch up.

Many baffling aspects occur in the subatomic world. Quantum physics cannot be visualized. It is not determinist. Quantum effects depend on the size of an object multiplied by its typical momentum; for electrons moving in an atom, quantum uncertainties predominate.[178] The world is not a causal machine but a creative generator of realized and unfolding propensities and potentialities.[179] The inventors of quantum theory also discovered the observer-created reality that flies in the face of notions of objectivity.[180] Quantum mechanics directs our attention to apparatuses of measurement and argumentation, and the performances and practices they entail.[181] They bring to light relational aspects of difference; the boundary-producing effects of measurement and argumentation; and the entanglements between objects and subjects, matter and meaning, and the natural and social worlds.[182]

Life does not evolve in space and time conceived, respectively, as a collection of preexisting points in an empty container that matter inhabits and as a succession of evenly spaced intervals available as a referent for all bodies. Instead, following Einstein, life is an iterative evolution of four-dimensional spacetime.[183] Space is not empty. Far from being vacant, a vacuum teems with possibilities.[184] The fields that make up the world are subject to tiny fluctuations. Basic particles have ephemeral existences that are continually created and destroyed:[185] "The world is a continuous, restless swarming of things, a continuous coming to light and disappearance of ephemeral entities ... A world of happenings, not of things."[186] Indeterminacy provides the condition for an open future. Possibilities are not static. They are always reconfigured and reconfiguring.[187] New possibilities open up as others close down. Although the world's presentation of an infinitude of relational possibilities cannot be controlled, it can be captured by conventional experiments and the imposition of isolated, efficient cause-and-effect chains. In this view, uncontrollable surprises are normal in a world of changing possibilities. Subatomic particles are

[177] Morgenthau 1946: 136. [178] Pagels 1982: 90. [179] Popper 1995: 17–20.
[180] Pagels 1982: 64–66, 72. [181] Barad 2007: 29–30.
[182] Barad 2007: 26, 72, 75–88, 93. [183] Rovelli 2017: 69–91.
[184] Barad 2007: 92, 141. [185] Rovelli 2016: 33.
[186] Rovelli 2016: 33; Rovelli 2017: 79–84. [187] Barad 2007: 234–35.

wrapped up in infinities of possibilities that have changed our image of the atom and our practices of imagining.[188] Quantum mechanics puts uncertainty, indeterminacy, potentiality, and possibility, rather than constraint and necessity, at its center. It offers an alternative to Newtonianism that students of international relations are largely unaware of as they think about the nature of world politics and its many uncertainties.

A century of astoundingly successful experimental work has yielded no agreement about the meaning of quantum theory.[189] However, it has generated powerful experimental results establishing, for example, particle entanglement without any observable mechanisms, creating what Einstein called "spooky action at a distance." Different approaches and interpretations illustrate that crucial aspects of the meaning of quantum physics remain unresolved.[190] But most physicists would agree with Rovelli that the key insight of quantum physics is "the *relational* aspect of things."[191] Smolin goes so far as calling "the 20th-century revolution in physics the relational revolution . . . in full swing in the rest of science."[192] Although it is not free of internal contradictions, what has come to be known as Niels Bohr's Copenhagen interpretation remains the most widely accepted. This is not to deny the existence of important critics of Copenhagen, including Albert Einstein, David Bohm, Hugh Everett, and John Bell.[193] Disagreement centers on the nature of measurement.[194]

"Quantum Realists" believe that the history of the world is a history of endless splits, which occur every time a macroscopic body is tied to a choice of quantum states. This view stipulates the existence of an inconceivably large number of uncorrelated multiverses. For David Mermin, this is "the *reduction ad absurdum* of reifying the quantum state."[195] Its plausibility, furthermore, is impaired by the requirement that conditions in our universe have to be just right.[196] Realists are waiting for a post-quantum revolution that, perhaps, would make quantum mechanics a special case of a more general theory, such as "objective collapse models" or some other theory not yet invented. Such a revolution could thus repeat a new cycle in which quantum physics would be subsumed, just as it subsumed Newtonian physics in the early twentieth century. Physics Nobel Prize winner Steven Weinberg characterized that quest as interesting but also "to some extent whistling in

[188] Barad 2007: 354. [189] Weinberg 2017: 3.
[190] The online *Stanford Encyclopedia of Philosophy* is an excellent source for tracking some of these discussions: https://plato.stanford.edu/.
[191] Rovelli 2017: 119 (emphasis in the original).
[192] Smolin 2013: xxviii. See also Smolin 2000: 49–65; Smolin 1997: 276–84.
[193] Barad 2007: 249–52, 414–15 fn48; Cushing 1994; Healey 2017; Freire 2015; Becker 2018: 49–50, 84, 271; Ney and Albert 2013.
[194] Weinberg 2017: 5–8. [195] Mermin 2019: 6, fn15. [196] Kauffman 2008: 27–30.

the dark."[197] And while physicists work, scholars of international relations wait and remain beholden to Newtonianism and the denial of uncertainty as a constitutive part of world politics.

"Quantum Instrumentalists" believe that measurements of the world taken by humans themselves affect that world at a most fundamental level. The world is therefore not governed by impersonal physical laws that control human behavior together with everything else. Discussed further in Chapter 10, Quantum Bayesianism (or QBism), for example, offers a radically subjective interpretation of quantum mechanics that provides a coherent, unconventional answer to the mysterious meaning of the subatomic world.[198] The probability that one or another quantum state will emerge is not regulated by firm Newtonian laws that are irrevocable and universal. Instead, individual human actors assign these probabilities on the basis of their private beliefs. Based on past experience, updating that experience with new information, and adhering to the rules of Bayesian statistics, individuals calculate what might happen next. This process does not involve any physical laws or mechanisms operating on the wave function conceived of as a mathematical abstraction, rather than as an objective entity existing out there in the real world. It involves only individual experience, belief, and updating. Individual experience is intrinsically private and cannot be accessed by others. This does not mean that the world exists only in an individual's head. QBism is not solipsistic. Instead, each individual holds to the subjective belief, with the highest degree of confidence (p=1.0), that others experience the world as oneself does, and all rely on verbal or nonverbal communication to create the intersubjectivity and entanglement which, in turn, create a social world out of individual experience and belief. We are not free to make up our own individual world. QBism provides instead for a world that exists external to each actor without reifying that world as an extant, external entity.

QBism differs diametrically from Wendt's pathbreaking book on quantum consciousness.[199] Wendt's research program is foundational. He seeks to create a consistent, coherent, and complete system of knowledge, grounding human consciousness in the materiality of the world. His work is in line with the view of 2020 Nobel Prize–winning physicist Roger Penrose. QBism is pragmatic. It takes experience (or Wendt's consciousness) as given before making its argumentative move. QBism works in the tradition of Dewey's pragmatism.[200] Knowledge is not a set of securely anchored systematic propositions. "The claims to knowledge we can

[197] Henderson 2020: 39. [198] Mermin 2019. [199] Wendt 2015.
[200] Sil and Katzenstein 2010: 43–48.

defend by our impressive scientific successes," writes Nancy Cartwright, "do not argue for a unified world of universal order, but rather for a dappled world of mottled objects."[201] Knowledge is a set of successive attempts to cope with problematic situations that are more or less successful in historically variable, polymorphic contexts.[202] Like all of physics, QBism is a product of human thought and culture. For QBism there is no "reality" out there; it is all in our heads and the world is created through individual experience, beliefs, information updating, apparatuses of measurement and argumentation, and the creation of intersubjectivity through communication. For QBism, human experience (or Wendt's consciousness) is foundational and creates the quantum world; for Wendt, quantum physics is the foundation on which he grounds his far-ranging search for consciousness (or QBism's experience). For QBism, the move is from individual experience (or consciousness) to the world; for Wendt, the move is from the world to individual consciousness (or experience). For QBism, worldviews are epistemologically grounded; for Wendt, individuals are ontologically walking wave functions. These research programs and argumentative moves are opposite but not necessarily antithetical. Chewing on different ends of the same stick, it is not a far-fetched hope that somewhere, sometime, someone will succeed in making them meet.

1.4 Humanism (Dilthey and Weber) vs. Hyper-Humanism (Scientific Cosmology)

The concept of worldview is tied indelibly to the names of two iconic humanists: Wilhelm Dilthey and Max Weber. Both were committed to empirical investigations of intellectual and social history, including the analysis of worldviews. Both tried to find regularities in human affairs, eschewing metaphysical certainties. Dilthey's basis of historical processes is a feeling for and an attitude toward life as expressed in religious, artistic, and philosophical worldviews.[203] Max Weber focuses on the tensions introduced by modern capitalism into the civilizational legacies of the past, specifically the relationship between ideas and the structure of social action. Different in their intellectual focus and temperament as well as methods, both grappled with the issue of historical relativism: Dilthey retrospectively, by highlighting human self-analyses in history as acts of creativity; Weber prospectively, by inquiring into social necessities in history that increasingly came to circumscribe human existence.[204] For

[201] Cartwright 1999: 10. [202] Geuss 2020: xii, 17–22, 28–30.
[203] Dilthey 1931: 3–42. [204] Bergstraesser 1947: 92–95, 108–10.

both, the analysis of worldviews is a part of their encompassing historical inquiries.

Hyper-humanism offers a different vision of the world. Hyper-humanism refers here to a worldview that goes "beyond" humanism.[205] It describes "the 'more-than-human' character of human existence."[206] Conceptualizing the cosmos as an evolving set of processes and relations is quite common in, for example, biology, chemistry, and geology.[207] At the macro level, hyper-humanism can be found in scientific cosmology. It suggests our scientific theories and models are not representations of the universe but integral parts of its evolution.

Humanism. For Dilthey, worldviews touch on foundational questions about the meaning of life in the face of death.[208] He thus shifts the problem of history and philosophy from the universalism of concepts such as the world-in-itself (*Welt an sich*) to inherently partial and plural notions of worldviews (*Welt-ansicht*).[209] Emerging from the totality of life, worldviews serve as the foundation of religion, art, and philosophy.[210] Each of these three domains makes different demands on mental faculties. Religions mobilize will, art feeling, and philosophy thought. In the history of humankind, religion preceded the other two. Like prophets, poets and philosophers seek answers to the basic riddles of existence: its purpose and meaning, its transitory nature, and its beginning and end. Reality and its artifacts are texts that invite interpretation. For Dilthey, human existence is lived interpretation of these texts. He might well have agreed with Lucretius, for whom "our appetite for life is voracious, our thirst for life insatiable."[211] For Dilthey, life is the basic root of all worldviews.

In a nutshell, Dilthey distinguishes between three phases of history that are expressed in the worldviews of the monotheistic Abrahamic religions, all of which envision salvation through communion with a living God. These contrast with the philosophies of Greece and Rome, which articulated universally valid patterns of thought and developed rules, laws, and obligations for the imperium and its people. This was turned on its head

[205] Morton 2013: 2; Cudworth and Hobden invoke "posthumanism" (2018: 5, 7; 2013: 651–54). Ferrando's 2013 discussion of the many overlapping and contradictory strands and meanings of posthumanism, transhumanism, antihumanism, metahumanism, and new materialisms have made me choose hyper-humanism for the purpose of this discussion. It shares with much of Ferrando's discussion the insistence on dismantling strict dualisms including between matter and language, as in Barad's 2007 version of new materialism, and between humans, animals, and technology, as in Haraway's 1991 cyborgs. See also Banerji and Paranjape 2016.

[206] Kurki 2020: 115–16, 124–26, 134–35. [207] Kauffman 2008.

[208] Koltko-Rivera 2004: 6. [209] Ermarth 1978: 323; Kurki 2020: 13–14.

[210] Dilthey 1931: 26–42; Mul 2004: 269–83.

[211] Lucretius, Book III, line 1084, quoted in Rovelli 2016: 79.

in the modern era of science, starting with the European Renaissance. For Dilthey, the modern European worldview contains elements of all three.[212] Dilthey also distinguishes between three philosophical worldviews: pluralistic naturalism (Democritus, Hobbes, Hume, and positivism), dualistic idealism of freedom (Plato, Descartes and Kant, with antecedents in Christian and Muslim doctrines), and monistic holism or, in Dilthey's terminology, objective idealism (Spinoza, Leibniz, Hegel, and Chinese and Indian antecedents).[213]

Worldviews are not purely rational constructions that explain the world scientifically. They try instead to understand the world synthetically, thus giving life a broader meaning.[214] Incorporating ideals and purposes, they offer insights into what is and postulates of what ought to be. Yet Dilthey develops a science of worldviews that operates at a higher level of abstraction than do worldviews themselves. It analyzes patterns of prescientific meaning that are reflected in major systems of thought. The science of worldviews is not seeking to specify causal laws, but offers instead descriptions of relationships.[215] In specifying types of worldviews, it generates conceptual knowledge and circumscribed generalizations. The science of worldviews seeks to overcome atomistic empiricism and monocausal explanations. It sidesteps both causal inference and transcendental values. For Dilthey, the science of worldviews is always heuristic and provisional: worldviews have an inner dialectic and are open to immanent critiques and thus remain always subject to change. Dilthey's science of worldviews does not rest on a stable and timeless point of observation outside of history. Instead, worldviews allow for shifting perspectives and evaluations that affect them from both inside and outside. The limits and changeability of all worldviews take some sharp edges off the unavoidable conflicts between them.[216]

For Dilthey, life and human experience in all of its richness is part of the ongoing reconfiguration of a world that is always becoming and always full of unexplored potentialities. Dilthey accords to the individual a central role in the world and in the (cultural) sciences. Individuals are both the starting point and the final goal of his investigations. Since he did not present an explicit theory concerning the nature of the individual's formation, Amnon Marom has provided a synthetic interpretation based on a close reading of Dilthey's voluminous writings. Marom's synthesis consists of three ideas about universality, particularity, and potentiality that Dilthey developed at great length. First, human beings can

[212] Masur 1952: 98–100. [213] Makkreel 2020: 325. [214] Mul 2004: 272.
[215] Dilthey 1924: 378–404.
[216] Ermarth 1978: 326–27, 334, 336; Orth 1985: 16–17; Plantinga 1980: 82, 139; Bulhof 1980: 89.

understand only what already exists in their own personal experience. This content is not affected by historical or cultural differences. It is a faculty, or inner universal content, that, with the requisite effort, makes it possible for every human being to understand all humans and human creations from all cultures and eras. Second, all humans share a cross-cultural and ahistorical immanent human nature. Third, this commonality resides in nature and is built on human potentialities. Each of these ideas is of course debatable, but their synthesis, Marom argues, offers a "theory of subjectivity as a unique realization of universal possibilities ... This actual fulfillment of different possibilities is what gives each individual their uniqueness."[217] Dilthey was interested in discovering ways to transcend human limits and enable limitless human understanding. He tracked and theorized "limitless shared understanding" in the domains of religion, the arts and philosophy. QBism does the same for quantum physics and the sciences.

Dilthey's core insight – an understanding of the world grounded in the interpretation of meaning – had a profound influence on Max Weber's general approach to sociology as an interpretive science, and, specifically, on his cross-cultural and cross-civilization sociology of religion.[218] Since they are scattered throughout his writings, Weber's ideas on the subject of worldviews are difficult to track. The comprehensive and highly regarded Max Weber dictionary, for example, does not contain a single entry under this subject heading.[219] My brief account relies on Stephen Kalberg's authoritative summary guide and interpretation.[220] Generally for Weber, worldviews of an ethical universe are somewhat autonomous from other social and political realms of belief and practice. Specifically, they differ greatly from random and strategic, means–ends calculated action: "Orientation to this ethical universe involves an uprooting of action from its common random, pragmatic, and utilitarian flux and flow, and its guidance by a constellation of values."[221]

For Weber, worldviews offer answers to some of the most profound human questions about the meaning, purpose, and conduct of life. The main carriers of worldviews are charismatic, ethical, or exemplary prophets.[222] They make available to their followers "a unified view of the world derived from a consciously integrated meaningful attitude toward life."[223] Prophets give social and cosmic events a systematic and coherent meaning that should govern man's conduct if he aspires to salvation. Their work is a matter of practical evaluation, not logical

[217] Marom 2014: 3, 11. [218] Rickman 1979: 173–74; Byrnes, Chapter 9, this volume.
[219] Swedberg 2005. [220] Kalberg 2012: 73–91. [221] Kalberg 2012: 76.
[222] Weber 1978, I: 439–51; Joas 2012: 17–20, 27 fn34. [223] Weber 1978, I: 450.

consistency. It is a conscious effort to bring order into life's variegated manifestations and to help organize man's practices in ordinary life. The discrepancy between this coherent, religiously infused view of the world and empirical reality is the source of the strongest tensions between inner life and external relationships. Prophecy, priestly guidance, and secular philosophy are all concerned with alleviating such tensions.[224]

Linking religion and secularism was Weber's central contribution. In his seminal *Protestant Ethic and the Spirit of Capitalism*, Weber develops a distinctive monocausal approach.[225] The economic ethic or spirit of capitalism was for Weber of central importance and required a cultural analysis, specifically of sixteenth and seventeenth century ascetic Protestant sects and churches, mainly Calvinist. The Protestant ethic furthered rationalization, especially in economic life but also in all other spheres, and set a standard that all other religions, including Catholicism, failed to meet. The economic practices of Protestant believers were ultimately shaped by answers they gave to the question of salvation rather than by utilitarian considerations. The faithful, Weber argues, came to believe that their capacity for methodical and profitable work and their success in accumulating wealth in this world served as evidence of their salvation. Faith convinced them, therefore, that the conditions of salvation were shaped by their personal conduct. Work acquired religious meaning. Methodical work became sanctified as a religious calling. Looking for signs of redemption sent by God, Protestants saw one such sign in economic success. Weber shows how believers arrived at their conclusions as they created a religious world and subjectively meaningful lives. Asceticism in this world gave the capitalist economy and the West a vital push to greater dynamism and efficiency. Eventually, the religious ethic of small groups of believers transformed into its secular successor: the spirit of capitalism.[226] The religious and magical basis of legitimacy of different religious traditions thus gave way, eventually, to different kinds of rationalisms. Although Weber's analysis of Hinduism, Confucianism, and the three Abrahamic religions acknowledges that each experienced its own distinctive rationalization process, he does not extend that argument to civilizations that believe in magic rather than mastering worldly affairs through calculation. In Weber's analysis, Western civilization remains unique and superior to many others.[227] Yet, the eventual disenchantment of life could not be stopped as science and technology eroded deeply held religious convictions and values, first in the West and eventually

[224] Weber 1978, I: 450–51.
[225] Weber 2009. In his subsequent comparative sociology of religion, Weber moves to a multi-causal analysis.
[226] Kalberg 2016. [227] Shilliam 2009: 152–56; Weber 1946: 267–301.

everywhere. As religious beliefs were increasingly replaced by beliefs in science and technology, durable worldviews were replaced by the thin veneer of custom and interest as the main motivation for individual and group interests and practices.

It is worth noting that Weber does not consider the implications of different scientific worldviews in the era of disenchantment he bore witness to.[228] This is ironic since Weber was writing at the dawn of the revolution in quantum physics. He could not know that the twentieth century would give physics a "Chinese face," generating wonderfully precise predictions and practical applications without providing any convergent understanding of the meaning of quantum mechanics. In the social sciences and in international relations, Newtonian physics retains a strong grip on scholars whose research relies on the everyday technological products of the quantum revolution. Failing to consider the very possibility that modern physics offers a different worldview than the Newtonian one they take for granted is no small matter. It discourages the pursuit of non-Newtonian knowledge of and insights into the social and global world, including on matters of uncertainty.

Dilthey and Weber agree: worldviews express values. But they deployed that construct differently. In contrast to positivists who believe that social inquiry can be value-free, for Dilthey and Weber all inquiry is individually generated, historically shaped, and inescapably relative. On the issue of what constitutes truth, these two positions appear to be irreconcilable. When truth becomes a shared convention, "agreement makes truth, rather than truth inviting agreement."[229] Since time scales matter, this contradiction is not inevitable: "Just as truth ultimately serves to create consensus, so in the short run does acceptability."[230] Max Weber opted for an eclectic combination of both positions. He emphasizes how values shaped the selection of all objects of inquiry. He also argues for the possibility, though not necessity, of a value-free social science, emphasizing that worldviews are important for empirical theories, models, and hypotheses for three reasons: they shape the questions science pose by articulating the presuppositions that legitimize, define, and make such questions salient; they offer key concepts that become the building blocks for varieties of theoretical constructs and practices; and they provide the context in which information acquires political significance.

Hyper-humanism. Hyper-humanism includes the natural world in its animate and inanimate life forms. The human is a messy medley and the nonhuman is more than background.[231] This concept does not reject humanism altogether. Far from it.[232] But it rejects those elements of

[228] Allan 2018: 36, fn28. [229] Bunge 1996: 97. [230] Galbraith 1998: 7.
[231] Kurki 2020: 135. [232] Kauffman 2008.

humanism that regard the human species as somehow exceptional or unique and distinct from the rest of nature.[233] Haraway, for example, argues that the universe consists of collectively produced systems rather than self-regulating ones.[234] Such systems lack self-defined spatial and temporal boundaries and rely on information and control provided by distributed components linked symbiotically in multiple, complex forms of relationships. Humans, as we are being taught once again in 2020, are not self-contained but are an inseparable part of others existing within (bacteria and viruses) and around (plants, animals and other humans) them.

All humans exist inside of this world, not outside of it, looking in. Kohn, among others, advocates an anthropology that stretches "beyond the human" and explores representational forms that go beyond conventional linguistic or symbolic forms.[235] Humans share with other living organisms semiotic modalities that pervade what he calls "the open whole."[236] Similarly, a German forester and global bestselling author, Peter Wohlleben, describes forests as systems of complex interdependence among trees that share a resilient, communal life.[237] For him the forest is a site for the comfort offered by slow evolutionary change. No apocalyptic news disturbs Wohlleben's forest. Below, soft-floor fungal bodies feed trees and extend themselves in skeins that bind roots, nurture organisms, and offer a collaborative, meshed net.[238] Feeling and thinking forests live relationally. In short, humans are not existing in special social settings apart from the natural world. They are porous and relationally connected, rather than self-contained and singular.

Broadly speaking, scientific cosmology shares this worldview.[239] It studies unfolding processes and relations in the cosmos, including the ideas, beliefs, and theories about the cosmos.[240] Contrary to the Newtonian worldview of the world as a closed system, scientific cosmology views the world as an open system and continuously interrogates many of its basic assumptions. Cosmology is "a human intellectual creation, not merely a collection of facts . . . [that] can be done differently by different peoples in different places at different times."[241] It can change

[233] Cudworth and Hobden 2018: 8; Smith 1991.
[234] Haraway 2016: 33; Kurki 2020: 120–22. [235] Kohn 2013: 8–10, 224–25.
[236] Kohn 2013: 27–68; Smith 1991.
[237] Wohlleben 2017; Weidermann 2018. Suzanne Simard's (2021) scientific work supports the same perspective with experimental work that raises the question of whether plants possess some kind of sentience or agency that might be interpreted as either collaborative or a form of reciprocal exploitation. See Jabr 2020.
[238] Tsing 2015: viii, 4
[239] This section on scientific cosmology is greatly indebted to Kurki 2020.
[240] Kurki 2020: 2–3, 14–16, 41–42. [241] Hetherington 1993: 6.

rapidly as it seeks to incorporate new data and speculations as they become available. To the question "how do we think without Newtonianism?" In Chapter 3 Kurki gives the laconic and understated answer "with some difficulty." In scientific cosmology, the cosmos pushes back against the always imperfect and incomplete ideas and beliefs humans hold about it.

In the temporally understood postmodernity that Nau invokes in Chapter 6, the natural sciences are profoundly empirical and experimental. Yet modern natural sciences often do not line up with this characterization by students of politics. What postpositivists always suspected is now embraced as a cornerstone of "a new, emerging scientific worldview" built around the concept of emergence.[242] However, all too often, even now, laws or mechanisms express a mechanical view of the natural and political universe. International relations scholarship has not yet wrested itself from the Newtonian worldview. What is truly remarkable is how out-of-step with much of current scientific beliefs and practices this view is. This shift "makes the mechanical, 'scientific' construction of the social world in international relations appear like a superstitious oddity handed down from ancient times."[243]

Building on data that astronomers had collected through the ages, in the 1920s scientific cosmology started exploring various experimental and mathematical ways of solving Einstein's field equations. This endeavor evolved subsequently into probing matter, energy, and the cosmos at large.[244] Mathematical, experimental, empirical, and non-testable inquiries have continued to define the history of scientific cosmology and its contemporary debates.[245] Vortex theory and cosmophysics then, string theory and multiverse models now are some of the examples of historical dead-ends and contemporary disagreements. New knowledge has rapidly accumulated as new technologies have permitted the generation of new data that support, for example, the theory of the existence of many flat galaxies in an expanding universe rather than the now-discarded belief in the existence of a one-layered galaxy existing in a steady-state universe. Cosmic Background Radiation points to the beginning of the universe as an explosion yielding many observable features, such as matter and energy linked in spacetime, dark matter, and dark energy. Scientific cosmology is forever open to new information and data that pushes back on existing theories and models. It is constituted by a set of processes and relationships that encompass all thinking observers. Scientific cosmology does not view science (in the singular) as an abstract enterprise gazing at its subject matter

[242] Kauffman 2008: ix, 5, 43, 231. [243] Katzenstein and Seybert 2018c: 294.
[244] Kragh 2011: 87–116; 2012; 2013. [245] Kurki 2020: 25–31.

from a distance. In its practice, scientific cosmology embraces instead the sciences (in the plural) as an engaged human enterprise deeply entangled with their various subject matters.

The evolution of scientific cosmology over the last 400 years has yielded the Standard Model, often referred to as the Big Bang Model.[246] It incorporates both particle physics and cosmology, and is today accepted as the standard story informing theories in all of the natural sciences. It accepts the notion of the big bang, a moment of infinitely dense matter and energy about 13.6 billion years ago, followed by an expanding universe marked by smoothness and homogeneity in the distribution of matter and energy, with life emerging about 10 billion years later. Stars and galaxies evolved from the universe's physical and chemical elements rather than from God's will, as Newton believed. Elementary particles of matter waves with sixteen discernible properties make up atoms and electrons, and create the atomic level and everything beyond it that exists in the universe. Alternative theories – among them multiverse models, string theory, evolutionary and cyclic models, and variable law models – seek to address puzzles that the standard model cannot explain in its original form.

The greatest of these is how to theoretically and mathematically integrate relativity theories of gravity with the quantum world.[247] At the beginning of the universe, its moment of singularity, the very big and the very small, cosmology and quantum, were one. At the macro level of relativity theory, spacetime is viewed as curved and smooth; at the micro level of quantized spacetime, that smoothness disappears as discrete quanta jump over a flat spacetime governed by global symmetries:

> The two towering achievements of 20th century physics are the general theory of relativity for the large-scale structure of gravity in the universe that replaced Newtonianism and quantum mechanics for the microscopic subatomic world. Both theories remain partial and contradict one another. In one world space is curved and everything is continuous. In the other, space is flat and made discontinuous by leaping quanta.[248]

The hope is that, eventually, general relativity and quantum mechanics can be brought together and thus provide "the basis for cosmology, the study of the entire universe."[249] That overarching theory runs under the label of "quantum gravity." There, "time and space have disappeared altogether, and the world is dissolved into a swarming cloud of probability that the equations can, however, still describe."[250] Like Escher's famous picture *Ascending and Descending*, it is right now "an impossible

[246] Kurki 2020: 46–49. [247] Smolin 2000: 3–5. [248] Rovelli 2016: 40–41.
[249] Pagels 1982: 54–55. [250] Rovelli 2016: 48.

construction which looks sensible in its local details but does not fit together into a coherent whole when using presently existing building materials."[251] In the absence of such a unifying theory, acceptance of our imperfect knowledge and partial pattern recognition remain the most viable strategies for our understanding of the natural world.[252]

Lee Smolin's relational cosmology and loop quantum gravity theories attempt to meet at least some of these intellectual challenges.[253] It does not purport to offer scientific truth but a philosophically and conceptually productive perspective that supports a rethinking of science, knowledge, meaning, and humanity's position in the evolving universe.[254] Relational cosmology is a wholistic critique of a Newtonianism that seeks to break all systems apart so as to fit its experimental methodology. The Newtonian approach is fundamentally ill-suited to approach questions of cosmology. Contra Newton, space is not a flat background condition with coordinates filled by thing-like objects, such as particles or planets, that move according to the logic of universal laws of motion and that are subject to human codification or control. Even though relativity and quantum theories have shown background-independent theorizing to be wrong, Smolin suspects that many scientists still hope to gain access to eternally valid laws of the universe; they have lost confidence in Newton's laws but not in the idea of laws. Mathematics is a powerful tool in the endeavor to find the universal and the eternal. But the problem with mathematics is that it looks at things in the universe from the outside, as if things were moving against a neutral background. Relational cosmology and loop quantum gravity break with this implicit Newtonianism.[255] To be sure, while astronomers have developed many theories in recent decades, the cosmos itself existed for billions of years before the discipline of astronomy was "invented" or "evoked."[256] Smolin argue that a single, open, and causally highly complex cosmos comprises the universe, but that nothing exists beyond it.[257] The universe is what it has evolved into being – specifically, networks of relationships in time. The relationships that have evolved in the universe cannot be explained by scientific laws any more than they can be explained by religious entities.[258] We are all in and of the universe – and not in or of anything else.

[251] Weinstein and Rickles 2018: 2. [252] Pagels 1982: 127–34, 154.
[253] Smolin 1997; 2000; Unger and Smolin 2015. [254] Kragh 2011: 316–20.
[255] Smolin 2000: 106–24.
[256] Unger and Smolin 2015: 422–23. Morris 2011, Part 5: 15, fn89.
[257] Smolin 2000: 17; Unger and Smolin 2015: 355, 371; Kurki 2020: 58–86.
[258] This explains Smolin's (1997: 207–08) critique of the weak version of the anthropic principle, which in his view reflects the nostalgia for a world in which there is a divine or scientific stance outside of the world. See also Kragh 2011: 224–25.

"That said, the Newtonian assumption about 'background' is deeply implanted into our conceptual vocabulary and continues to exercise a profound effect on social practices and social sciences."[259] Scientific cosmology insists on the "simple fact that all possible observers are inside the system they study."[260] And, in real time, that system is teeming with mini matters that are forever opening up and closing down new possibilities and thus constitute the universe as a history of its relationships.[261] Newton was brilliantly successful for many practical purposes. In contrast to quantum mechanics and relational cosmology, he told a coherent story about the world we experience with the five senses Newton was aware of. Newton's lesson is that, for all intents and purposes, the universe is background and the world is a machine that is governed by simple laws – except, of course, when the uncertainties that inhere in that world trip up the predictions that are based on theories and models grounded in a Newtonian worldview.[262]

By theorizing space and time without smuggling in Newtonian assumptions, loop quantum gravity complements the insights of relational cosmology at the micro level. Space is an integral part of the universe's evolving relationships, rather than neutral background, and it is bumpy rather than smooth. Points in space have no existence in themselves but only as particular features of networks of relationships.[263] Made of mathematically described or imagined quanta, space consists of looped spin-networks. These networks are not things and do not exist in space. They are relationships that give rise to space. Time, in this view, is a measure of change in the evolution of the universe's relationships. Everything changes in this relational universe, including change – that is, time. It is not only phenomena that change but also the observed regularities, the supposed laws and constants of nature.[264] In short, at both the micro and the macro levels and in both space and time, the evolution of the universe is relational. And since all we have of the universe is incomplete descriptions by various observers of various states of the universe, what we are left with is not a multiplicity of different worlds but multiple interpretations of the singular universe with nothing existing outside of it.[265] And that singular universe is constituted in part by an uncertainty that Newtonianism has great difficulty accepting as a central aspect of world politics.

[259] Smolin 1997: 13–14; Wertheim 2011. [260] Smolin 2000: 3.
[261] Unger and Smolin 2015: 385–89; Smolin 2000: 25.
[262] Clarke and Primo 2012: 93–97 argue that prediction is usually the wrong standard by which to evaluate models.
[263] Smolin 2000: 22; Rovelli 2016: 39–49; Unger and Smolin 2015: ix.
[264] Unger and Smolin 2015: 8, 356. [265] Kurki 2020: 60–67.

1.5 Four Worldviews

Different configurations of Newtonian and Post-Newtonian as well as humanist and hyper-humanist worldviews implicate denial or acceptance of uncertainty as a constitutive factor of world politics. The two dimensions that map the analytical space for four worldviews in Figure 1.2 express different epistemological and ontological commitments that can be independent from one another – but might not be. All too often, people use various interpretations of common sense to distinguish between the physicality of the real world and the social constitution of the human world, separating clearly the two dimensions of Newtonianism and Post-Newtonianism and humanism and hyper-humanism. Most such interpretations presuppose an actor-independent reality in which the observer can be placed at a distance from the world. In short, common sense reflects an implicit Newtonian worldview. But, as Rovelli argues, most modern sciences acknowledge that the physical world is not what it appears to be.[266] If physics is a product of human thought and culture, as QBism and scientific cosmology hold, then this commonsensical view

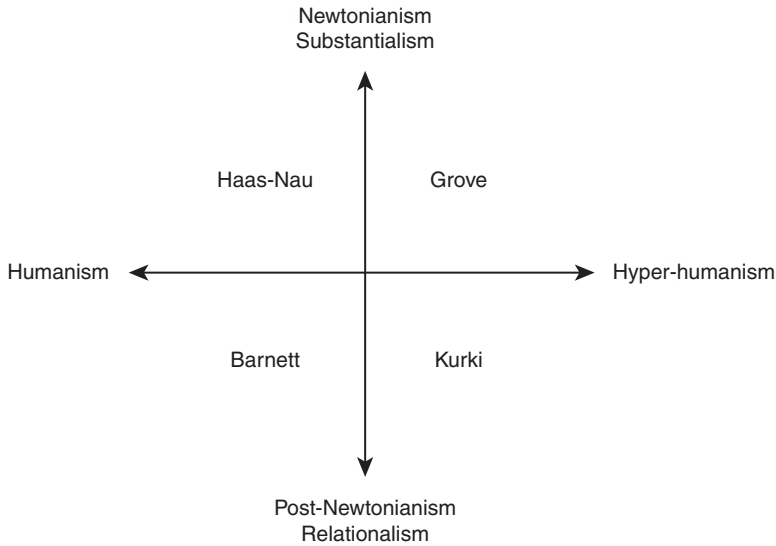

Figure 1.2 Worldviews and analytical perspectives

[266] Rovelli 2017.

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is mistaken, and the two dimensions in Figure 1.2 are not orthogonal. Instead, they capture the epistemological commitments of four different world*views*. The ontological aspect of worldviews is concerned with "being" rather than "viewing," for example, with experiencing the overlapping, meaning-making domains of science and religion discussed at the end of Chapter 10.

Presented here as a heuristic device, Figure 1.2 summarizes schematically the four worldviews that typically inform the analysis of world politics: a "humanist substantialism" that focuses on discrete individuals, groups, states, and objects, and a "hyper-humanist relationalism" that emphasizes entangling processes. Humanist substantialism foregrounds individuals or things operating in a world of risk, hyper-humanist relationalism entangling processes unfolding under conditions of uncertainty. Figure 1.2 also yields two other worldviews: humanist relationalism and hyper-humanist substantialism. Each of the next four chapters exemplifies one of these four worldviews. The denial of uncertainty as a constitutive feature of the world is strongest in the most widely shared worldview: humanist substantialism.

Some worldviews put at their center substantial "entities": individuals, groups, states, or "things."[267] For example, the conventional idea of individual decision-making is based on the assumption that conscious, intentional desires and beliefs will lead to action in a world marked by risk.[268] Its substantialism is humanist and adheres to a Newtonian worldview that accommodates the assumptions of both "universal rationality" and "contextual reasonableness." A strong form of substantialism can focus on "actor identity," as in the analysis of ideology and foreign policy traditions that Mark Haas and Henry Nau offer in Chapter 2. An attenuated form might highlight "embedded agency," as in Jairus Grove's analysis of presidential war-making powers in Chapter 4. Other worldviews put "processes" at the center of their relationalism.[269] For example, indebted to scientific cosmology, Kurki's hyper-humanism in Chapter 3 engages the world through "practices of knowing and doing" that sidestep issues of individual agency and the responsibilities that go with engaging the world.[270] This worldview contradicts the belief in the existence of objective, natural laws or causal mechanisms that are unaffected by scientific measurement apparatuses and practices. In this uncertainty-laden view, analysis focuses on causal forces "coming together in specific (and contingent) ways."[271] Relationalism also takes different forms – "thicker" in its

[267] Jackson and Nexon 1999. [268] Fearon and Wendt 2002: 59; Pouliot 2008: 257.
[269] Rescher 1996: 83–103; Adler 2019: 45–76; Massumi 2002: 6–9; Emirbayer 1997.
[270] Zanotti 2018: 60. [271] Zanotti 2018: 61.

philosophical and quantum form and "thinner" in its sociological variant. Grove and Barnett illustrate that difference in Chapters 4 and 5.

Although Figure 1.2 presents dichotomies, it would be a mistake to conclude prematurely that the four types exist each one in a specific place in each quadrant and all in separate silos. Chapters 2–5 illustrate that worldviews are often fluid and can blend into one another. The complementarities between "either–or" and "both–and" logics are explored further in Chapters 6–9. Chapter 10 deepens that analysis. It relies on the metaphors of garden and forest to explore important differences between the practices of experiments and experimentation, and it deploys the metaphor of the park to inquire into the overlays of Newtonianism and Post-Newtonianism.

Humanist Substantialism: Haas and Nau (Chapter 2). Using ideologies and foreign policy traditions as their empirical material in an analysis of political worldviews, Mark Haas and Henry Nau build an argument for the centrality of "substantive and individualist ideas," "human agency," and individual responsibility and accountability: "Actors are free to imagine new or escape old group relationships. Above all, individuals are always responsible for the effect their ideologies have on the freedom of choice of other human beings." Haas and Nau grant in passing that individuals and groups are never completely independent;[272] however, they strongly oppose a deep relationalism that reifies the whole, where the entanglement of a holistic world eliminates separate individual identities.

Their chapter examines two types of political worldviews: political ideologies coded along liberal and authoritarian party lines, and four universal foreign policy traditions arrayed along the substantialist–relationalist dimension: nationalism is close to the substantialist end and social constructivism to the relationalist end, with realism and institutionalism holding the two intermediary positions. The empirical discussion of domestic ideologies and foreign policy traditions focuses on the degree of overlap or divergence. Overlap points to peace or cooperation, divergence to conflict or war. Haas and Nau conclude that

> our Weberian agency-oriented approach has important advantages that are eviscerated in more relationalist and holistic approaches . . . In holistic worlds, there is no contestation of political or religious perspectives. There is no good and evil. Nothing can be questioned because boundaries are uncertain and everything is in the process of becoming. There are no certainties, no firm truths. Seen critically, the holistic vision is an appeal to disarm intellectually, to abandon the pivot of individual inquiry and insight, to blur any distinction between points of view, and to lose choice which is the very essence of freedom.[273]

[272] Nau addresses this issue more fully in Chapter 6. [273] Chapter 2, this volume.

Some of these arguments derive from the rhetorical strategy the chapter adopts. Haas and Nau are "splitters" while the relationalists they criticize are "lumpers." The variable-based analysis of Haas and Nau is grounded firmly in the substantialist camp, which leaves no room for processes that are "all bundled together" with mutually constituted variables.[274] Thinking perhaps about Haas and Nau's concession that complete independence of actors is a chimera, Grove asserts that "we are all relationalists, just some better and more explicit than others."[275] In contrast to Kurki, who insists on the existence of many relationalisms, Haas and Nau write about relationalism in the singular.[276] They argue that Weber's agency-oriented approach is "eviscerated" by relationalism, downplaying the relational elements of one of the founders of modern sociology. They also insist that relationalism denies the existence of an objective world, is relativist, and prevents the statement of firm truths.[277] This creates a strong disagreement with Kurki in particular, who draws on different kinds of relationalism and shows an interest in their varied cultural and scientific manifestations. Her discussion focuses prominently on Smolin's holistic, objective, relational cosmology, which shares many aspects with Kauffman's "new scientific worldview."[278] For what it is worth, in my reading, Smolin's and Kauffman's twenty-first-century versions of relationalism are no less scientific than the seventeenth-century Newtonianism that informs Haas and Nau.

Haas and Nau do not shy away from stating the implications of their argument. The natural sciences study things lacking consciousness as it is conventionally understood; the social sciences study human beings and their groups or institutions. Like Dilthey, Haas and Nau thus make a sharp distinction between the human and the natural sciences.[279] Human science cannot eliminate that distinction – that is, not without the loss of personal freedom.[280] Kauffman's "new scientific worldview" erases that difference. Nature is not predictable, law- or mechanism-governed lifeless matter but teeming processes of ever-changing possibilities which we meet with courage and faith moving forward as if we knew an unfathomable future.[281] Even though uncertainty appears to be perfectly compatible with their version of Weberianism, implicit in the

[274] Chapter 2 . [275] Chapter 4, this volume.
[276] Kurki 2020. In Chapter 6 Nau elaborates on the different worldviews discussed in this volume. Unlike Kurki, he refers to relationalism in the singular.
[277] Chapter 2 . [278] Kauffman 2008.
[279] Based on a subjective view of quantum physics and scientific cosmology, Chapter 10 suggests an argument that differs from their conventional adoption of Dilthey's position.
[280] Chapter 2 . [281] Kauffman 2008.

Newtonianism of Haas and Nau is the neglect of uncertainty as a constitutive feature of world politics.

Hyper-Humanist Relationalism: Kurki (Chapter 3). In the form of quantum mechanics and scientific cosmology, hyper-humanism jettisons the distinction between humans and things. Insisting on the unity of all sciences implies that the cosmos extends to all aspects of nature and all forms of life. This can be viewed as undermining a belief in human agency and individual responsibility. But it can also be heard as a call for a radical "ethics of alterity," an ethics that contests humanism, its privileging of sameness, and its exclusion of difference.[282]

In her chapter, Milja Kurki draws on the insights of scientific cosmology to articulate a relational worldview that is radically at odds with Haas and Nau. She directly challenges core ontological, epistemological, and empiricist conceptions of humanist substantialism, most notably the separation of nature from society, and the urge to control people and things. For Kurki, the relational turn opens up "questions around religion, secularism, and indeed reason and affect in how we engage the world." Kurki's chapter does not offer definitive answers to pressing questions. Instead, it is a productive provocation for deliberation and dialogue.

For Kurki, relationalism appears as a singular only when compared to substantialism. Itself, it is cut by various dynamic tensions. "Explanation" becomes "explication": the characterizing of processes rather than the specification of variables. And it shifts away from "how we do politics." Kurki positions her argument against the humanist Newtonian worldview shared by most realist, liberal, constructivist, and critical theories. In that view, "humans" are separate from and stand above the "environment," and the world is made up of distinct "things" operating against a background. Contra Haas and Nau's Newtonian-grounded analysis, Kurki insists on giving up on a "God's eye view." Instead, she defines humanity as situated knowers in a relational universe.[283] The environment is not a background for Kurki, the climate crisis is not a human coordination problem, and global warming is not external to human communities and experiences and thus an issue to be managed. She points to the existence of polyphonic families of worldviews "with quite different orientations to substances and relations, human and nonhuman, nature and society." Confronted with enormous ecological challenges, she argues, the conventional analysis of international relations has come to its limits and is failing; the study of world politics must be pushed to consider a radical shift.

[282] Zalloua 2009: 3. [283] Haas and Nau, Chapter 2; Kurki 2015.

In the relational universe there are no things, space is not empty background, history is a set of processes, and the categories and dichotomies with which we conventionally work do not operate. Worldviews are not so much views as fleeting moments of being in a world of becoming, filled with uncertainties. The conceptualization of practices in a thickly relational view of the world deviates from approaches commonly accepted in the analysis of world politics. To Lenin's question "what is to be done?" Kurki offers no actionable answer. In her broader conception of the world, institutional frameworks, global governance structures, patterns of practice, and intersubjective narratives and discourses fail to capture the richness of life in a relational universe. Practice lies beyond policy and politics as conventionally understood. Instead, "the aim is to 'loosen' actors (at the boundaries) to understand co-being, entanglement and co-negotiation across 'beings', actors, species" in a universe built around immanent relationships between polarities in what Qin has called *zhongyong* dialectics that are antithetical to Western liberal and realist understandings of the world.[284] Kurki is agnostic as to whether this politics will save us, but she insists that it offers alternatives to the simplified political practices that have so miserably failed too many humans and nonhumans alike.[285] Kurki's hyper-human relationalism has no difficulty accepting uncertainty as a constitutive aspect of world politics.

Hyper-humanist Substantialism: Grove (Chapter 4). Grove's relationalism is empiricist and focuses on how people and things actually work, rather than making claims about how they should or would work. His approach is "characterized by inhuman encounters and deep relational processes across geographical scales."[286] The human is not the sole focus of thinking and acting. And yet "we can de-center the human without letting go of the very specifically human and often national assemblages."[287] In this formulation, human agency is neither autonomous, as in Haas and Nau, nor fully submerged in relational processes, as in Kurki; instead agency is embedded in thick processes. Problems of accessing the world (representation) and meaning-making (hermeneutics) coexist with other relations. Observation and interpretation are part of the relations that make the world, rather than standing apart from or above the world. Investigating emergent processes tells stories about complex and highly distributed formations and agencies rather than

[284] Qin 2018: 175.
[285] Allan 2017 conceptualizes how the climate became a distinct object through processes that over time came to constitute it. From this perspective the climate is not a pregiven natural system as typically treated in analytical perspectives building on a Newtonian worldview.
[286] Grove 2019: 10. [287] Grove 2019: 10.

about agents and variables which, for Grove, are the effects of processes. Distinctions between dependent and independent variables or agents and structures are arbitrary. The causal relations between them are not bearing any essences but are an effect of the investigation, specifically of the scale at which a question is posed and an answer is sought. Methodological individualism is not a natural unit of analysis. It is instead the result of the feeling we have about the unity of the "I." But relationalism goes all the way down in social as in natural processes. "We are not constituted *by* relations," Grove writes, "we *are* relations." In stressing the relationality of different elements within the individual, Grove's reading of Weber thus differs sharply from Nau's methodological and substantive Weberian individualism.[288]

Grove applies his relational approach to the case of nuclear warfare. That case shows the world as marked by highly distributed agencies and thick relations. For Grove, violence as a relational process illustrates that no specific ethics is associated with relationalism:

> the geopolitical project of planet Earth is a violent pursuit of a form of life at the cost of others – full stop. . . . [T]he violence of geopolitics is an ecological principle of world making that renders some forms of life principle and other forms of life useful or inconsequential . . . Geopolitics, enacted through global war, is itself a form of life.[289]

In his rendering of nuclear violence, sovereignty is an assemblage which incorporates the office and person of the President who does not call the plays. He is "more like a mascot than a quarterback."[290] Instead, various assemblages and networks are the sites where the play involves many distributed agents.

In his far-ranging account, Grove acknowledges that the reduction to unitary actors or instrumental logics is not necessarily useless. As is true of Newtonian physics, reductions and simplifications can yield insights even when they are inaccurate. For example, the President's nuclear sovereignty appears in full sight only when methodological individualism primes the observer to look for an already constituted single decider. But a sovereign nuclear decision is not self-constituted or self-causal. It requires a field of relations and resonances. Yet, Grove does not seek simply to replace sovereignty with assemblages and networks. He insists, rather, that there are many scales of complexity and causality that such simplification conceals. His case study points to the limits that the conventional legal-moral and strategic anthropocentrism and anthropomorphism imposes on our

[288] Chapter 4, this volume. See also Damasio 1994. [289] Grove 2019: 3.
[290] Grove, Chapter 4 .

view of nuclear politics and on possibilities of intervention in that domain of policy.

Grove's stance is motivated by strong normative claims. Camping on the hill of liberal internationalism or "in the dark woods of political realism," the field of international relations is in a weird state of denial of the horrors of the world and potentially apocalyptic change.[291] For Grove this is more than irrationalism or ignorance. It bears the stamp of a deep and corrosive nihilism stemming from a denial of experience in and of the world.[292] The moral engagement that Haas and Nau ask for in their critique of Kurki, Grove delivers in spades on conventional international relations scholarship, informed by his hyper-humanist substantialist worldview. Specifically, he calls out "these old white men [who] still strut around the halls of America's 'best' institutions as if they saved us from the Cold War, even as the planet crumbles under the weight of their failed imperial dreams."[293]

Humanist Relationalism: Barnett (Chapter 5). Within a humanist worldview, Barnett focuses on relational and internal value tensions that can further both the integration and the destabilization of worldviews stretching from the supernatural to the earthly world. Worldviews themselves are constituted by bounded communities and thus are ontologically related to them. As concepts of analysis and practice, nationalism and cosmopolitanism qualify as worldviews for Barnett. Agency is relationally embedded. Politics can lead to change in as well as restabilization of worldviews, specifically how different Jewish communities imagine the relationship between nationalism and cosmopolitanism. In line with his sociological relationalism, the duality of nationalism and cosmopolitanism are intertwined and mutually constituted. Zero-sum and positive-sum views of their relationship are two analytical extremes. Pulls in both directions often occur simultaneously, involving unavoidable political contestations that are shaped by developments in the dominant Christian community; "As the Christians go, so go the Jews."[294]

Among the concentric circles of compassion that define the obligation of a political community to others, tribal nationalism's is small, prophetic cosmopolitanism's large. Tribal nationalism asks "is it good or bad for the Jews?" Prophetic cosmopolitanism insists that identity and duty extend to all of humanity.[295] Because Jewish people are diasporic and transnational, the reconciling of different identities and interests with different calls of obligations issued in different institutional contexts is an unending

[291] Grove 2019: 21. [292] Grove 2019: 22.
[293] Grove 2019: 21, quoted in Kurki 2020: 17. [294] Barnett, Chapter 5, this volume.
[295] Barnett 2016: 9–10.

and unstable political process. Identification with the Jewish people and Israel pulls toward particularism and an inward-looking nationalism, while values associated with American identity pull Jewish communities there toward universalism and an outward-looking cosmopolitanism.[296] Survival, boundaries, the weight of external forces, and conditions of possibility are thus important and incessantly debated topics; "As the punchline to several Jewish jokes goes: two Jews, three synagogues."[297]

In sum, substantialist and relational analytical perspectives are grounded in four competing worldviews. The greatest difference exists between Haas/Nau and Kurki. Haas and Nau commit to a humanist Newtonianism of being and the individual accountability of taking a stance. Kurki's hyper-humanist relationalism highlights the existence of distributed agencies with no apparent link to individual morality and resonates with the concept of becoming. Grove and Barnett operate in distinct, intermediary analytical spaces. The depth of commitments to these four different perspectives is not readily explicable without excavating the links to the worldviews that ground the analysis. The participants in this project learned this important lesson from each other during their intense discussions and interactions. And it is those worldviews which obliterate more or less compellingly, or acknowledge more or less explicitly, the constitutive role of uncertainty in world politics.

1.6 Conclusion

Why should we deny what is so striking in our everyday life and in all domains of world politics: the constitutive role of uncertainty? Why should we indulge ourselves with an exclusive preoccupation with probabilities in a world that is shaped also by uncertainty? Why should the scientific study of world politics, modelled after the natural sciences, remain stuck exclusively in Newtonian thinking when quantum mechanics and scientific cosmology, among others, began to move on more than a century ago? What, more specifically, might be gained by broadening our scientific worldview beyond conventional Newtonianism? I give here two illustrative answers to these questions: one focusing on the planetary politics of the environment, the other on complementary concepts of control and protean power.

Some Earth scientists argue that we are at the beginning of a new era: the Anthropocene. Humans have become geological agents. Their

[296] Barnett, Chapter 5, also discusses diasporic nationalism and prophetic Zionism that global and local political developments sidelined in Israel and the United States.
[297] Barnett, Chapter 5.

activities have become a great force that enmeshes natural and social processes.[298] Human activities are adding new biophysical factors that shape some of the Earth's major systems. Old-style determinism and the concept of control no longer work as before. Everything now is simultaneously human and natural. Nonhuman "actans" (viruses, microbes, materials, and devices) can fundamentally alter human and natural possibilities;[299] "Humankind is no longer the anomaly, the freak of nature. We become *the key* to nature-as-a-whole."[300] And in this process, the subjectivity of the individual Cartesian "I" will quite possibly be transformed into the collective planetary "We." If this is a plausible conjecture, the consequences for world politics will be immense and contradictory. The tension between globalism and nationalism will acquire a new intensity and salience, and may come to encompass not only global and planetary politics, but local and national processes as well.

In the Anthropocene, Gaia is not inert matter that is moved by predictable, physical laws. Past experience of the Earth's system no longer offers a reliable guide for predicting future developments. No place on Earth can now be considered "natural." Man-made instead, nature is becoming "artificial." Entangled with human practices, the universe is undergoing a process of destructive and creative becoming. Nature is not a pristine, unmoved, and balanced landscape that exists apart from man. Human practice is instead endowing nature with its own agency. It often acts with unpredictable effects upon humankind and other living organisms and the cosmos at large, possibly with catastrophic or even existential consequences for humanity.[301] For the most part, existing international relations scholarship is unaware of hyper-humanism, ignores new unpredictabilities, and fails to engage seriously with the possibility of civilizational collapse in the face of disasters of unimaginable scope and scale. And when a pandemic strikes, as it did in 2020 with the Covid-19 virus, it is once again speechless in its surprise.[302] Broadening our scientific worldview by moving the environment beyond the status of a discrete policy issue and an inert object of human control might help us think more capaciously and deeply about incorporating more aspects of the profound ecological challenges we confront under conditions of radical uncertainty.

Control over nature is only one manifestation of the tenacious grip that a Newtonian-inflected, Hobbesian notion of control power has over students of politics in general and world politics in particular. In the

[298] Harrington 2016: 479, 490–91; Underdal 2017: 3; Hamilton 2019.
[299] Latour 2014: 11–13; Harrington 2016: 490–91. [300] Hamilton 2019: 609.
[301] The Economist 2020; Pelopidas 2020; Mitchell 2019. [302] Roberts 2020.

conventional understanding, power equals control: over nature, territory, people, risk, or political outcomes. Although this understanding is helpful in elucidating important aspects of the world, it is far from complete. The coronavirus crisis of 2020 is a vivid reminder that there also exists a second kind of power. The incalculable offers a context and experience for what Lucia Seybert and I have called protean power: "the effect of actors' improvised and innovative responses to an incalculable environment or their experience of the world as filled with uncertainties."[303] It cannot be harnessed consciously. Instead, not unlike the collapse of the wave function's creation of one reality out of an infinity of possibilities, protean power effects emerge in specific moments as they circulate across different political domains. They are always an inextricable part of the admixture of uncertainty and risk that characterizes world politics, bypassing all attempts at control. For Emmanuel Adler, all control power is an illusion, an ephemeral phase of a constantly emerging and reconfiguring reality. In this view all forms of power are special, transient, and unstable instances of protean power effects. The indeterminate condition of the natural and social world rather than lack of perfect knowledge shapes politics.[304] Even without going this far, it is understandable that political analysts and actors are frustrated by the existence of protean power effects. But rather than live in denial, why not acknowledge the existence of such effects and thereby enrich political analysis? After all, Machiavelli theorized *fortuna*'s whims long before Hobbes reconceived power as *Leviathan*'s control and laid the foundation for a convention that has blinded us to the obvious: the role of uncertainty in world politics.

The four chapters in Part I of this book map the contours of four worldviews that resist or accept the importance of uncertainty in world politics. The most resistant one – humanist substantialism – is articulated by Mark Haas and Henry Nau in Chapter 2. Their style of analysis is familiar to most students of world politics, whatever their methodological proclivities may be. Three other worldviews round out Part I. In Chapter 3 Milja Kurki's relational hyper-humanism offers a radical alternative to Haas and Nau. In Chapter 4 Jairus Grove analyzes the nuclear capacities of the United States. His analysis shares in Kurki's thick relationalism, while leaving some space for the substantialism of Haas and Nau. Finally, Michael Barnett's analysis of nationalism and cosmopolitanism of Jewish communities in Chapter 5 is both humanist and relational.

The two chapters in Part II offer disparate reflections on the chapters in Part I. In Chapter 6 Henry Nau mounts a strong attack on relational conceptualizations of world politics that are not rooted firmly in humanist

[303] Katzenstein and Seybert 2018b: 10–11; Katzenstein 2020. [304] Adler 2020.

substantialism. In sharp contrast, in Chapter 7 Prasenjit Duara develops a relational argument that incorporates a broad notion of individual and distributed agency by humans and nonhumans and looks toward the future through the prism of oceanic counterfinalities and environmental catastrophe.

The two chapters in Part III look at scientific and religious worldviews as different and possibly complementary ways of meaning-making in an uncertain world. Bentley Allan argues in Chapter 8 that scientific worldviews are always temporary and contested efforts at the political stabilization of cosmological elements. With a specific focus on Weber's theory of science, Allan highlights how processes of disenchantment and rationalization have shaped materialism and object orientations as the foundation of understanding contemporary world politics. In Chapter 9, Timothy Byrnes argues that religion and politics are not separate variables but coconstitutive and relational ways of seeing and being in the world. More attuned to uncertainty than science, dogmatic and nondogmatic religions alike require a life-defining, faith-supported leap into the unknown.

The concluding Chapter 10 builds on the conjunctive "both–and" logic presented in Chapters 7–9 by tracking different worldviews through the use of garden, forest, and park metaphors. It critically examines the adoption of controlled experiments in the social sciences and the analysis of world politics as the latest manifestation of Newtonian gardens and their insistence on an orderly and predictable world. It contrasts this to forest-like practices of experimentations that point to a world marked by novelty and uncertainty. It explores complementarities and workarounds, relying on the metaphor of parks as zones of contact between garden and jungle, Newtonianism and Post-Newtonianism, and humanism and hyper-humanism. The chapter ends with a discussion of science and religion as meaning-making practices, of experiencing a world marked by both uncertainty and risk.

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