3 Theories, Models, and Methods

Attended by a large number of bigshot celebrities, the *New York Times* 2023 DealBook conference marks today's uncertainty as "a palpable feeling that seems to be affecting virtually every major figure at the top of the leadership complex across the world."[1] Political instabilities, wars, recessions, and technological disruptions are among the factors that feed a sense of unfathomable uncertainty – a sense expressed all too often in the familiar and acceptable language of risk. P(doom) is Silicon Valley's math-speak for the probability of doom following from AI as a threat to human survival. Often referred to as the "godfather of AI" and a co-recipient of the 2024 Nobel Prize in Physics, Geoffrey Hinton believes that an unregulated AI industry will have a 10 percent chance of leading humanity to its extinction in the next thirty years. Yann LeCun, who helped to give birth to the AI boom, thinks that AI is dumber than a cat.[2] Nobody knows. The point of p(doom) is to express the unsettling fear of the uncertain in the familiar language of calculable risk. "Admitting that one does not know," Janice Gross Stein writes, "is psychologically uncomfortable. It seems to convey either a lack of knowledge or an absence of confidence or both."[3]

Hamas's terrorist attack on Israel in October 2023 and the subsequent war in Gaza illustrates the pervasiveness of uncertainty in world politics. Little more than a month before the Hamas attack, China's Foreign Minister Wang Yi hailed a "wave of reconciliation" sweeping the Middle East. He credited China's pragmatic diplomacy for brokering a deal between two great sectarian rivals, Saudi Arabia and Iran, and helping the broader region to achieve "good neighbourliness and friendship."[4] Not to be outdone by the perspicacity of his Chinese colleague, in an essay written before the October 7 attack and published in *Foreign Affairs* two weeks later, President Biden's National Security Advisor, Jake Sullivan, wrote "although the Middle East remains beset

[1] Sorkin 2023: F1–2. [2] Taylor *et al.* 2024. Mims 2024. [3] Stein 2024: 4.
[4] *The Economist* 2023e: 42.

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with perennial challenges, the region is quieter than it has been for decades."[5] Yi's and Sullivan's global audience may be permitted one simple question: Really?

This chapter looks at theories, models, and methods as tools for dealing with the complementarities of risk and uncertainty. They embody the tacit knowledge provided by encompassing worldviews with an unavoidable intellectual incoherence that is concealed by the depth of their institutionalization in thought and practice. And it is that incoherence which provides the space for the articulation and deployment of different theories, models, and methods of analysis.

Like language, discussed at length in Chapter 2, theories, models, and methods are telling Janus-faced stories. They represent the world. And they also re-present the world, performing in and for the world and thus creating or magnifying the very effects they predict or highlight. This is Deirdre McCloskey's central point. Science is a way of talking.[6] Stories are important drivers of all human inquiry, including in all of the sciences. The risk-uncertainty conundrum is the subject of one of the most enduring and important of all stories. The findings of every scientific theory or model are expressed in language that seeks to persuade. The greater prestige of the natural sciences compared to the social sciences and humanities may be traced to the idea that stories reporting the results of experiments are more compelling than stories based on backward-looking history or counterfactuals.[7] Some stories are linear and are told as if all variables are known, all mechanisms identified, and all causes clearly specified. Others are non-linear and involve feedback effects, opaque mechanisms, and configurations of causes. Captured best by differential equations, they can tell stories about very large effects of very small changes, such as catastrophic accidents. For McCloskey there is no "actual," "real," or "true" account of the world.[8] Often relying on metaphorical language, for her there are various attempts, some more successful than others, by individuals or groups to persuade others about something. Facts are a very important part of being persuasive though not the only one.[9] Science occurs through language, and language use is a social act. It requires paying attention to others. Adhering to a pragmatist stance, McCloskey is not interested in the philosophical foundations or implications of her argument.[10] For her all theories and models are more or less persuasive forays into the world, including metaphorically small and large ones.

[5] Rogers 2023. [6] McCloskey 1985: 21. See also Kay and King 2020: 215–20.
[7] Taleb 2007: 120. McCloskey 1990: 92–93. [8] McCloskey 1994: 188.
[9] McCloskey 1994: 38–52; 1985. [10] McCloskey 1994: 270; 1985: 30.

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In this chapter I explore theories, models, and methods. The narrative turn in the social sciences and in the analysis of world politics has been fostered by and drawn attention to McCloskey's work and the importance of story-telling (section 1). Theories and models tell stories that are created by acts of individual imagination and that exist as collective imaginaries (section 2). Experiments and experimentation are different ways of testing and test-driving scientific theories and models in a world that is both risky and uncertain (section 3). And the simplicity or complexity of the stories told by theories and models always grapples with the risk-uncertainty conundrum (section 4).

1. The Narrative Turn

Humans are a story-telling lot. They rely on metaphors and language in its "representational" and "re-presentational" metaphorical forms. Differing in form and function, narration is ubiquitous and remains "intuitively attractive, capturing commonsense understandings."[11] E. M. Forster once wrote "'The king died and then the queen died' is a story. 'The king died and then the queen died of grief' evokes causation." Narrative bias is causal.[12] Linking narrator and audience, stories create or convey meaning.[13] Physics relies on math to narrate the epic tale of the universe with great precision and in concrete detail. But it also relies on stories and metaphors for doing science. At its core, researcher Jamie Zvirzdin holds, "physics is fundamentally a word problem. A story problem."[14] Einstein's relativity theory was told first as a story of traveling clocks and later, for bigger impact, as a story of the traveling twin returning to his brother but now of a different age. Dead or alive, Schrödinger's cat is a thought experiment, straight science fiction. For Ernst Mach thought experiments are a necessary precondition for physical experiments.

Because of growing interest in and concern with self-fulfilling prophecies, story-telling is no longer the laughing stock of the social sciences. Consumer surveys affect consumer confidence and the real economy. Political conspiracies feed off and are magnified by social media. How issues are framed is vitally important for the meaning making and success or failure of social movements.[15] And in the field of foreign policy, moral stories lead to intransigence and impede pragmatic bargains.[16] With words, numbers, and images, theories and models tell stories about politics that can be tested with different methods.[17] Those who belittle

[11] Western 2001: 357. [12] Quoted in Klaas 2024: 73, 136; see also 136–41.
[13] Mayer 2014: 53–55. [14] Zvirzdin 2024. [15] Tarrow 2022: 121–40. [16] Post 2023.
[17] Goodson and Gill 2011. Berger and Quinney 2005.

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"mere story-telling" are missing the ship of theorizing and the fun of the cruise. Narratives, furthermore, set the agenda by defining the parameters of public debate, tell actors who they are and what is in their interest, frame what is possible and impossible in a given situation, and thus shape the actions of states and individuals.[18] The narrative turn has affected not only the humanities and history, but also other disciplines such as psychology, medicine, law, biology, and physics.[19]

Three intellectual developments laid the groundwork for the narrative turn in the analysis of world politics. First, structuralist and poststructuralist accounts underlined the performative character of language.[20] Language was not merely a mirror of reality that provided a linguistic "representation" for things in the world. Instead, language was productive and evolved with social and historical developments that encased and enacted power through "re-presentation."[21] Even as analysts of world politics restrict themselves to small worlds operating in homogeneous contexts and invariant processes that lend themselves to generalization, language retains its capacity for making rather than mirroring the world. The philosophical work of Alasdair MacIntyre and Walter Fisher's application of literary theory in political science were a second development. Interested in virtue, MacIntyre articulated a philosophy of the good life in small communities. He argued that first and foremost human beings are narrative creatures.[22] Narrating their lives to themselves and others, they constitute themselves and meaningful social worlds. Fisher adopted this idea and coined the term *homo narrans*.[23] He also connected it with mid-twentieth-century literary theory that addressed the nature and structure of narrative.[24] Cognitive psychologist Jerome Bruner's work provided a third impetus for the narrative turn. One of Bruner's most important contributions was the idea of the narrative construction of reality. In two books and an important article Bruner made the case that the social world is a narrative construct.[25] The "domain of social beliefs and procedures – what we think people are like and how they must get along with each other" – is organized through narration, cultural products taking shape in and shaping historical context.[26] For scholars of world politics like Ron Krebs, Bruner offered a way to recognize how elite consensus and states' views of each other are shaped by narratives.[27]

[18] Krebs 2015a: 1–3; 2015b: 811. Lerner and O'Loughlin 2023. See also Sugamani 2008 and Roberts 2006.
[19] Somers 1994: 613. [20] Barthes 1972, 1975. Derrida 1981. Foucault 1984.
[21] History (White 1973, 1981) and literary studies (Mitchell 1981) turned to such insights even earlier. See Hyvärinen 2010.
[22] MacIntyre 1981, 1988, 1999, and 2016. [23] Fisher 1984.
[24] Burke 1969 [1945], 1969 [1950]. [25] Bruner 1986, 1990, 1991.
[26] Bruner 1991: 4, 21. [27] See Krebs 2015a: 10 and 2015b: 813.

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These developments provided ground for the narrative turn. That turn bridged old dualities that separated discourse from numbers, the non-explanatory from the conditionally propositional, and the non-theoretical from the theoretically driven scientific. The narrative turn makes a claim that supersedes distinctions such as narration and causality. Narration is both an epistemological and an ontological condition of life. Life is a storied condition, an instance of what one might call "epi-ontology." But scientific convention is not a rule that has to be followed. Stories explain and stories guide action. Including both deepens our understanding and sharpens our analysis.[28] Selves/subjects talk and produce discourses, just like states. The ongoing production of stories offers insights about those who speak, their wants, and how power operates within and among them. The production of discourse(s) over time leads to coherence and binding positions at the international level.[29] Charlotte Epstein includes the body in the constitution of the modern state. For thinkers like Hobbes, she shows, language and narrative imbue the reality of subjects and states with "order," rendering them more amenable to scientific investigation and subject to political control.[30]

Advancing the narrative turn, Ronald Krebs contends that narrative is how human beings order disordered experience.[31] International actors do not automatically respond to events wholly based on their position in the balance of power. They respond, rather, as a feature of the narratives they and others construct to make sense of events. Competition over the meaning of events results in some narratives becoming dominant, and they structure how elites view foreign policy, what the public does and does not support, and how states behave in particular situations. For Krebs, states do not respond to global events by virtue of their position within an international system. Events must be woven into a narrative that makes sense of them, of what others think and might do, and of how a state should respond.[32] In contrast to Epstein, for Krebs narratives are a lens for viewing the world rather than part of a larger claim about the discursive character of reality. Margaret Somers adds usefully that the narrative constitution of identities can imply weak causal connections.[33] A story about how one thing connects to another draws the listener in. But the connections may be weaker than the story suggests. And when the two

[28] Somers 1994: 606, 613–16. Epstein 2010: 334–38, 341.
[29] Epstein 2010: 342; 2008. Lerner 2022: 72–80.
[30] Epstein 2020: 3–12, 28–30, 87–89.
[31] Krebs (2015a: 2, 16–17, 22) notes similar work by the Copenhagen School. See also Barnett 1998 and Ringmar 1996.
[32] Krebs 2015a: 2–3 and 2015b. See also Barnett 1998 and Campbell 1998.
[33] Somers 1994: 613–17.

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things are totally unrelated, the story traps us in a "narrative fallacy," purgatory for "mere" story-tellers.

2. Theories and Models as Stories

Because of the astounding successes of the natural sciences over centuries, Newtonianism serves as a model for many students of world politics. It leaves them distrustful of the never-ending debates preoccupying the humanities. Despite many decades of disappointment, the hopeful belief remains unshaken: building many picturesque chapels will in the end create one magnificent cathedral. Nancy Cartwright, a leading philosopher of physics, has placed a different bet.[34] In her argument many small orderly worlds sum to one large messy one. If we follow her lead, we see that the generalizations of international relations are never truly general but always situationally and historically specific, shaped by humans' highly variable capacity for reasoning. We navigate the domain of risk aided by theories and models that test hypotheses and draw implications from them. There are many forms of test. They can be observational, experimental, or counterfactual. Often we navigate the domain of uncertainty by relying on our imagination, cast in story-telling theories and models, and the discernment of broad patterns based on practices of experimentation and learning by doing. All theories and models express the worldviews they implicitly hold. Once human minds are "inhabited with a certain view of the world," they will consider only those instances that prove them right.[35] And on no issue is this claim clearer than the legibility of the world. Speaking metaphorically, small world theories and models hold that the world is fully legible; large world theories and models demur.[36]

Immanuel Wallerstein has insisted that he is engaged in world systems analysis, not world systems theory. The construction of plausible explanations of complex, large-scale, long-term phenomena, he argued, is helped by relying on theoretical hunches without being bound by them.[37] His was an exploratory voyage in large rather than small worlds. Wallerstein's stance was shaped by listening to a lecture by chemist Ilya Prigogine. Chemists were traditionally chided by physicists for merely describing rather than explaining. Prigogine would have none of that. He received the Nobel Prize for his work on non-equilibrium processes and dissipative structures in chemistry and biology. In his view equilibrium processes are a highly unusual case of the physical world. We may well ask, and what about the social and political world? Central for Wallerstein

[34] Cartwright 1999. [35] Taleb 2007: 59. [36] Lennon 2015: 1.
[37] Wallerstein 2002: 358.

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were three of Prigogine's arguments. First, following the two laws of thermodynamics, energy in the universe is constant and entropic while it changes its form: ordered system states are replaced by chaotic ones.[38] The pathways between order and chaos cannot be predicted. Foreknowledge is impossible. Second, the Newtonian idea of time reversibility is absurd. All natural and social systems are historical and thus subject to the forward movement of the arrow of time. Finally, matter and nature are not passive but active and not bound to rest in equilibrium states.[39] Global warming is an example of the long, unpredictable entropic tail of short-term economic exchanges, the irreversibility of time, and the non-equilibrium state of the natural world. These arguments pose a challenge for analyses of world politics that take the same approach as conventional economics with its adherence to Newtonianism.[40] For such analyses equilibria are normal. Time is reversible. And long-term costs are marginal compared to the short-term benefits gained at the moment of exchange or consumption.

Theories and models are driven by real and fictive experience. They are shaped by individual imagination and collective imaginaries.[41] However, "If imagination ... is to fulfill its potential as a driver of social and economic progress," Jens Beckert and Richard Bronk write, "it must be schooled by reason and empirical analysis."[42] Imagining produces new ways of viewing the world and deploying forever-changing insights cast in the form of theories and models.[43] For example, "international relations" conducted among states and "global politics" evolving beyond the confines of states do not exist simply on their own. They are constructs that express and define an imagined domain of social life. They are made observable through repetitive practices. And they point to actors and their relations conceived, respectively, as homogeneous, unified, and coherent states or as an assemblage of heterogeneous, disunited, and incoherent actors.[44] The first can be expressed as "robust" visions measured by their probability of success; the second as "creative" visions that expand the horizons of possibilities.[45]

Individual imagination and collective imaginaries are not reality-denying fantasies but reality-affirming devices put to use in scientific theories and models. No sharp break separates sensory from fictitious experience.[46] Imagination and play are not passing stages of child

[38] Schweller 2014. [39] Wallerstein 2002: 369–70.
[40] Schweller 2014. Rifkin 2022: 30–34, 37–38.
[41] Beckert 2016: 283. Gabriel 2021: 17, 21–34. Spruyt 2020: 6, 33. Suckert 2022.
[42] Beckert and Bronk 2018: 4. [43] Lennon 2015: 12. Connolly 2019: 10–11.
[44] Reus-Smit 2020: 3. Strauss 2006: 322–23. [45] Berenskoetter 2011: 657–62.
[46] Bottici 2014: 1–11. Castoriadis 1987: 336–37.

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development, as Freud and Piaget argued. They are life-long human experiences in the symbolic social world and creative interactions between the experience of the inner and the perception of the outer world.[47] In science as in art creativity is a basic source of energy.[48] And as Knight and Keynes both recognized, creativity is inseparable from uncertainty.[49] Theoretical advances are made by "discovering," "inventing," and "giving" explanations. Such advances make us see in familiar things "what no one else has seen before."[50] Science consists of both looking at the ground while putting one foot before the other, and of lifting the gaze while scanning the horizon. Einstein's genius was his capacity to both compute and dream.[51]

And as in science, so in politics. All modern states, political scientist Richard Bensel writes, "embody myths, fictions, and abstractions that enlist mass support for the state's sovereign right to rule. While symbolically indispensable, these fictions are grounded in metaphysical assumptions that cannot be construed or referenced as empirical realities."[52] Imagination matters not only at the initial moment of state founding. It suffuses all forms of politics. The security imaginary of a state, for example, provides the cultural raw material for the construction of a state's basic interests.[53] Similarly, like money powerful legal fictions surround the posting of collateral as essential props that make global derivative markets function. Quotidian practices create fictions of calculability in contracts that circumscribe the indeterminacies of financial markets. In fact, collateral is a chain of legal fictions about the rights of parties that appear to be well understood when, in fact, they are not. These fictions are placeholders that communicate a collective commitment among market participants to arrangements that are useful though false. Readily accepted they become reliable creators of market realities.[54] More generally, capital is coded as law. "With the right legal coding," writes Katharina Pistor, any asset "can be turned into capital and thereby increase its propensity to create wealth for its holder(s)."[55]

More generally, make-believe imaginaries help stabilize actor expectations. Actors cope with life's contingencies through imagining an unfathomable future that looks and feels like the familiar present. As in literary fiction, a "present future" creates its very own world. The radical contingency of the world is stabilized by playing pretend games which, in moments of crisis, can suddenly collapse as the abyss of the unfathomable

[47] Harris 2000: x–xii, 6–7, 26–27, 118, 138, 192–94; 2007: 208, 209, 223–24. Vygotsky 2004: 9–13, 20, 17, 30, 32. Winnicott 2005: 3, 15, 54–55, 67–68, 87–88, 128–39.
[48] Rubin, Rick 2023. [49] Kay and King 2020: 47. [50] Hanson 1961: 30, 157.
[51] Lightman 1993. Galison 2000. [52] Bensel 2022: 474. [53] Weldes 1999: 10, 13–15.
[54] Riles 2011. [55] Pistor 2019: 2.

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comes into full view. Fictional expectations that rely on an inherently open future and contingent expectations make the future an ambiguous screen on which different actors project their hopes and fears.[56] Discussed further in Chapter 4, the financial crisis of 2008, for example, teaches us that fictional expectations in the large world differ greatly from rational expectations in the small one.

Informed by implicit worldviews and often inconsistent theories and models, imaginaries and imagination are essential for learning how to navigate small and large worlds. With some difficulty, the future is ascertainable in small worlds, but it is unknowable in large ones. And to the delight of historians, the past is not fixed but fluid in both worlds. Forever changeable, humans refashion it to deal with the experiences of the present and expectations of the future. We are driven by history while thinking that we are the drivers.[57] Furthermore, the counterfactuals we deploy to test theories and models are unavoidably fictitious.[58] Theories and models thus can express both the "if-then" factual logic of hypothesis-testing in small worlds and the "what-if" fictious logic of play-acting in large ones.[59] As long as they meet public standards of accountability, writes Daniel Deudney, both "are integral, not antagonistic, to scientific and technological progress."[60] Both are order-seeking. They create a sense of control by generating predictable outcomes in small worlds. And they search for broader patterns in the unpredictable outcomes in large worlds.[61]

Theories are fictions that abstract from the world.[62] One of the preeminent theorists of international relations, Kenneth Waltz, created images that shifted our thinking about international politics.[63] Following Newton, for Waltz theories "convey a sense of unobservable relations of things. They will be about connections and causes by which sense is made of things observed."[64] Theory is not offering an objective representation of the world. For Waltz it is an abstraction that presents an image of a specific domain of the world. We arrive at a theory by moving away from rather than toward reality.[65] This is the reason why theories are dangerous things to have. They are fraught instruments for real-world usage.[66] Waltz's systemic theory of world politics seeks to account for an ever-recurrent process of balancing behavior throughout history. This is

[56] Beckert 2016: 9–10, 61–67.
[57] Lennon 2015: 1–2, 73, 96. Taleb 2007: 211. Castoriadis 1987. [58] DeMartino 2021.
[59] DeMartino: 2022: 92. [60] Deudney 2020: 105.
[61] Beckert 2016: 8–12, 61–67. Little and Pepinsky 2016: 435.
[62] Little and Pepinsky 2016: 439. [63] Waltz 1959, 1979. Wæver 2009: 202, 209.
[64] Waltz 1979: 9. [65] Waltz 1979: 8, 10, 68–69. Corry 2019: 2–5. Toon 2012: 34–83.
[66] Taleb 2012: 116–17.

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profoundly interesting. But Waltz's spare theory tells us nothing about the direction of balancing, for example balancing with or against rising powers – a matter of great importance for political actors who must navigate in the world. This is not Waltz's concern. He is doing "pure theory."

Not so with models. They are "purpose-relative" tools.[67] Models deliberately misrepresent reality. For Einstein they are as simple as possible, but no simpler.[68] They are props that offer a helpful view of the world.[69] The props can be verbal, pictorial, numerical, or physical. Models are simplified representations that get essential parts of the story right. In the study of climate change/AI discussed in Chapter 6, for instance, Earth Systems Science (ESS) models are the current state of the art. Their thousands of equations capture complicated feedback loops, aim for high temporal and spatial specificity, and can cover very short or very long time periods. Compared to these physical models, social ones developed, for example, during COVID, have had a very hard time. Neither the virus nor people behaved as predicted. Citing low reliability, the US Centers for Disease Control thus shut down its case-forecast project. That failure was due to the distance between the model and the phenomena it tried to capture. "Art is the lie that makes us realize the truth," Picasso once said.[70]

Models are imaginative descriptions of things relevant for some aspect of the world. We are test-driving models rather than testing them. The evaluative criterion for models is their pragmatic usefulness.[71] Good models help us act in ways that work in relevant circumstances. In deciding whether a model works, the primary criterion is not logical inference but pragmatic reasoning. Does a model offer an effective means to achieve a valued goal? What matters is that a model is correct (*richtig*) rather than true (*wahr*).[72] Models as maps can be made to learn as we go along.[73] So-called Bayesian neural networks, for example, deal with the risks and uncertainties of the world. Training such models on the world does not rely on set parameters. Therefore, the model does not give the same prediction every time it is used. In the domain of language, for example,

[67] Clarke and Primo 2012: 53. See also Blair *et al.* 2023: 8–10, 35–38, 41–51.
[68] Cartwright and Nakamura 2009: 13.
[69] Corry 2019: 8–10. Toon 2012: 34–60. Walton 1990: 4–5, 12, 21–24, 35–34.
[70] Rockmore 2024. Patterson 2023: 59–60.
[71] Clarke and Primo 2012: 83–93. Kay and King 2020: 393.
[72] Giere 1999: 6–7, 50–53. Corry 2019: 2. What is the relation between model and reality? An older, indirect, "syntactic" view differs from a later, direct, "semantic" view of model representation (Morgan and Morrison 1999. Giere 1999: 97–99. Wæver 2009: 202, 206–07. Corry 2019: 3, 5–7. Toon 2012).
[73] Humphreys and Jacobs 2023: 3, 6. Christian 2020: 282–88.

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ensembles of models tend to agree when they are applied to texts close to the training data, and disagree when applied to texts that are far removed. The variability in predictive accuracy gauges the model's uncertainty about the state of the world. Wild oscillations in the recognition of different verbal or visual cues representing, for example, dogs, sofas, hamburgers, and books give a clue that the model is flawed; stable representations suggest that the model knows what it is talking about. Disagreement thus becomes a proxy for model error. Furthermore, randomly unplugging different parts of the model in successive training sessions reveals which parts of the model are central and which are not, and which can be combined into robust and efficient model subsets and which cannot.

Theories and models operate differently in (metaphorical) small and large worlds.[74] The small world can be clouded by bias and incomplete information, but with sufficient data it is nonetheless fully knowable. We cull data from the past so that we can "learn the lessons of history" and apply methods that permit us to make probabilistic assessments of the future. As in a casino, the generators of processes and outcomes are visible. Eliminating bias and improving information makes the world fully legible. Theories and models can thus correspond with important aspects of reality. In contrast, the large world is not fully knowable. Bias, misperception, and informational incompleteness remain unchecked. The past may be irrelevant for the world's unpredictable process of emergence. Without knowledge of relevant parameters, conventional statistical calculations are impossible. Large world outcomes are due to unobservable causal generators that can leave the world, for example, in unpredictable financial bubbles and the inscrutable fog of war. Yet, on questions of money, war, and climate, as Chapters 4–6 illustrate, it is common to mistake large worlds for small ones. Newtonian humanism makes small worlds the default option.

In acquiring a causal force of their own, like language, theories and models can reinforce the entanglements of small with large worlds. We make sense of the world, living life forward, aided at times by false, stabilizing backward narratives. Whatever their weaknesses, the narratives that theories and models provide can help in coordinating human behavior and nudge the large world, at least for a while, toward the small one. "Modeling the world as it is," writes Brian Christian, "is one thing. But as soon as you begin *using* that model you are *changing* the world, in ways large and small."[75] In Donald Mackenzie's words, theories and

[74] Taleb 2007. Blyth 2009: 447–53. Taleb and Blyth 2011. Taleb and Treverton 2015.
[75] Christian 2020: 49.

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models are engines not cameras. They are performances that have causal effects by bringing into being the very conditions they are concerned with, thus narrowing the gap between the two worlds.[76]

Theories and models are closely linked. A theory can spawn a collection of different models, understood as more or less useful objects rather than more or less true linguistic entities.[77] For Waltz models are neither a construction of truth nor a reproduction of reality.[78] Instead they provide convenient intellectual elevators. It is models all the way up and all the way down the theoretical-empirical ladder. At the top, families of models are grouped under the heading of a theory. At the bottom "model-data" are offered as descriptions and explanations. All data are theory- and model-laden. For Waltz "we are therefore inclined to see what we are looking for, to find what our sense of the causes of things leads us to believe significant."[79] Models provide heuristic images and a common way of talking about the world. Imagination and pragmatism are central. "Robust visions" focus on the probability of success in navigating small worlds, "creative visions" on expanding them toward large ones.[80] This model-theoretic view works in both small and large worlds.[81]

Theories and models as imaginaries are typically formulated with the aim to persuade. All graduate students who have been groomed for the grueling experience of finding a job practice an "elevator pitch" of their dissertation project, a story so condensed that it can be told during a short elevator ride to a senior professor too busy to attend the student's job talk. Elevator pitches are dotted with attention-grabbing "stylized facts." The predilection to summarize runs the risk of Taleb's "narrative fallacy."[82] Confronted with a sequence of events humans are predisposed to weave

[76] Mackenzie 2004, 2006. Blyth 2009: 462.
[77] Clarke and Primo 2012: 63, 67–74. Giere 1999: 5–6, 91–94. See also Kincaid 1990, 2004b; Roberts 2004.
[78] Waltz 1979: 7.
[79] Waltz 1979: 12. For Waltz (1979: 8–9, 13–16, 123–24), model- or theory-testing is extremely difficult if not impossible (LaRoche and Pratt 2018: 154, 160–62). And yet both kinds of tests remain desirable, even necessary (Waltz 2008: 90). This contradiction remains a deep problem not only for a materialist like Waltz but also for idealists and institutionalists (Corry 2019: 1, 4). All face the challenge of how to test hypotheses or the observable implications derived from either theory or model, against a reality that does not exist independently from theory or model. This challenge has never been satisfactorily resolved in the empirical research on world politics (Corry 2019: 2). Since models represent theories rather than reality, falsification is not an appropriate strategy (Waltz 1979: 8). And yet, having shown that it is extremely difficult, if not impossible, Waltz (2008: 92–95) insists on the desirability of testing theories to weed out wrong ones. Even though Waltz was skeptical of falsification, he gave instructions of how to test his theory (Waltz 1979: 13–16). In short, for Waltz theories and models could neither be falsified nor verified but, in an unspecified way, needed to be tested.
[80] Berenskoetter 2011: 657. [81] Clarke and Primo 2012: 4–9. Klaas 2024: 65–79.
[82] Taleb 2007: 63–64.

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explanations into them, by forcing logical links or establishing causal connections. We are drawn to what happened – the tangible and the visible. And we ignore what could have happened – the abstract and the hidden. This deeply ingrained predisposition to simplification and order-seeking explanations fosters the strong belief that the world is less random than it actually is.[83] Although we often inhabit large worlds, this predisposition tempts us with small world thinking.

3. Methods: Experiments and Experimentation

The natural and the social sciences are based on trial and error. Experiments are events; experimentation is a process. Both are "multifaceted, epistemologically opportunistic" and not dogmatically associated with a particular philosophy.[84] The small world of risk lends itself to Newtonian humanist thinking. It is made of systems that can be taken apart and tested in laboratory, field, or survey experiments.[85] Experiments presume that the world is marked by discrete causes and effects that can be captured by probabilistic or deterministic laws. Though often overlooked, experiments also can take the form of experimentation. Experimentalism enriches the limitations that inhere in routine applications of individual experiments. It can help in navigating the large world of uncertainty and intervene in evolving processes that are open to manipulation.[86]

Small world, intervention-centered approaches aim at effects operating in contexts that are homogeneous and generalizable. They identify causal mechanisms often encapsulated in one or a small number of treatment variables, with or without the requisite knowledge of how that variable operates or how that mechanism is put together.[87] In international relations, mechanisms are often invoked holistically by generic labels such as coercion, coordination, and imitation that compress, conceal, or short-circuit information necessary for understanding what is going on. In an active society that tries things out by exploring possibilities, Donald Campbell argues, "a certain amount of trial-and-error is essential."[88] For the large world is filled with many higher-order interactions between variables – interactions that all too often an experimenter looking for main effects is not even aware of. This may be one reason why, in contrast to Newtonian physics, no laws have yet been discovered in the social sciences and why the successful replication of experiments in the social

[83] Taleb 2007: 69, 132. [84] Wight 2013: 340.
[85] Green and Gerber 2002: 822–23, 828. [86] Campbell 1991: 231.
[87] Cartwright 1999: 50; 2019: 67. [88] Campbell 1991: 224.

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sciences is so difficult. Social scientists who design experiments in the small world should be careful, argues Campbell, and act as servants of and not guides for politicians. What the social sciences, including the study of world politics, do offer, however, are technologies of experiments and practices of experimentation that can help explore and navigate small and large worlds.[89]

Experiments

In a Newtonian worldview the world is a complicated, decomposable system that we hope to understand better by testing some of its constituent parts.[90] Specifically, the testing of large theories is helped by scrutinizing subsidiary propositions or exploring causal mechanisms in controlled environments. Furthermore, experiments are conducted under the presumption that the world is marked by discrete causes and effects that can be captured by probabilistic or deterministic laws.[91] The attempt to control for all but one or, at most, a small number of variables makes laboratory studies and the method of randomization applied to many trials so important.[92] To conduct field or survey experiments outside the laboratory is tricky because it is difficult to control all or most relevant variables. Even well-designed experiments in the real world can be difficult to replicate. Compared to psychologists, economists focusing on causal identification tend to be quite rigorous in their application of experiments and typically do better in reducing the noise created by uncontrolled variables. Psychologists typically are more relaxed and are less focused on reducing noise. As they develop their own approaches, students of world politics, and politics more generally, have learned from advances in both fields. Everywhere, though, the incentives are strong to report statistically significant findings. This may be misleading when the effects are small, of short duration, and highly unstable over time. What is of interest is the existence of effects as well as their size.[93] And assessment of size requires substantive argumentation and agreement among communities of experts. Physicists, for example, do not rely much on standard tests of statistical significance and are wary of replacing judgments with tables of conventionally defined goodness of

[89] Campbell 1973: 75. Riecken and Boruch 1974.
[90] Green and Gerber 2002: 822–23, 828.
[91] Druckman *et al.* 2011. Teele 2014. Gerber and Green 2012. Chilton and Tingley 2013. Hyde 2015.
[92] Hainmueller *et al.* 2014.
[93] Gaines *et al.* 2006. McCloskey and Ziliak 2008a. Gerber and Green 2012: 65–66.

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fit measures.[94] As on questions of policy and matters of personal conduct, in experiments there is no substitute for judgments.

It is reassuring to know that survey experiments relying on non-representative online samples have been found to be reasonably reliable in some studies.[95] But their validity can be suspect on other grounds. For example, asking respondents about their policy choices in an imagined nuclear crisis simply cannot duplicate decision-making dynamics, as in Defense Secretary McNamara's fear at the height of the Cuban missile crisis in October 1962 discussed in Chapter 5. Field experiments, furthermore, are typically considered a neutral mirror of reality, leaving little or no trace in the world. This presumed distancing between observer and objects in the world is a marker of the Newtonian worldview that often does not bear out in the social sciences. With quantum mechanics very much on his mind, as early as 1946 Hans Morgenthau warned against the use of experiments, for both theoretical and practical reasons.[96] In taking measurements of the world, the social scientist cannot help but change that world. She "does not remain an indifferent observer but intervenes actively as both product and creator of social conditions."[97] Measurement alters the characteristics of the object that is being measured.[98] It is thus very difficult, and often impossible, to create the proper set-up for field experiments. On questions of economic development, for example, foreign agencies and their local agents have heavy boots and deep pockets. In the administration of treatments in the field, a lot goes on other than the treatment.[99] "Experimental regularities should perhaps be interpreted in terms of human skill rather than [of] stable, underlying entities and the functioning of the laws of nature" of society and politics.[100]

Understandably, proponents of experiments disagree. Experiments typically focus on individuals making choices. Each subject's access to other subjects is either forbidden (in individual choice experiments) or tightly controlled (in game theory experiments). Tight controls over all plausibly relevant conditions except the treatment establish firm grounds for causal inference. But a philosopher of physics, Nancy Cartwright, and a heterodox economist, George DeMartino, question those very grounds. Cartwright argues that as we shift from controlled small worlds to uncontrolled large worlds, we run into the fact that all "generalizations" in the

[94] McCloskey and Ziliak 2008a; 2008b: 42–44, 51–52.
[95] Mullinix *et al.* 2015. Coppock 2019. [96] Morgenthau 1946: 125–44.
[97] Morgenthau 1946: 143. [98] Morgenthau 1946: 141, 143–44.
[99] Deaton and Cartwright 2018: 11. Bédécarrats *et al.* 2020. Rajagopalan and Pritchett 2022. Ravallion 2012, 2020. Reddy 2013. Dehejia 2016.
[100] Porter 1995: 13.

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natural and, by extension, social world are *ceteris paribus* laws.[101] They are not general; they obtain only under specifically defined circumstances. In a "non-stationary" world marked by change this fact limits greatly the contribution experiments can make in the search for generalizable findings. Furthermore, DeMartino argues, all causal arguments about the past, present, and future depend on counterfactual reasoning.[102] It is not only our knowledge of the future that is fictitious. It is also our knowledge of the past. For we do not and cannot distinguish between contending counterfactuals concerning past events. This difficulty holds for all randomized controlled trials in field and survey experiments.[103] Whether World War I would have happened in the absence of the assassination of the Archduke is based unavoidably on a constructed historical narrative. Theories are based not only on what is seen but also on what can't ever be seen. Epistemically insecure, theories "hold to distinct fantasies, generated by their distinct theoretical frameworks, which cannot ever be subjected to knock-out empirical or theoretical tests for assessing who, if anyone, has the uniquely correct counterfactual."[104] We solve this thorny problem by fiat, adhering to the convention that only one framework is feasible or legitimate. Put differently, we accept without further thought what we purport to test empirically. For the proponents of experiments, that convention is Newtonian humanism and its disregard of uncertainty in politics.

In all experiments randomized controlled trials (RCTs) are the gold standard. In one over-the-top endorsement, the *British Medical Journal* wrote that "Britain has given the world Shakespeare, Newtonian physics, the theory of evolution, parliamentary democracy – and the randomized trial."[105] Nancy Cartwright is more laconic when she writes that randomized controlled trials are not the gold standard, for the simple reason that there are no gold standard experiments except those held under extremely narrow scope conditions and thus resistant to generalization.[106] Although it may be useful, the average of a treatment effect, for example, does not tell us what percentage of the population is affected positively or negatively or not at all.[107] We need to understand not only the experiment but also its political context, underlying processes, and operative mechanisms before we can evaluate its relevance to our understanding of the world. Without this, the additional knowledge gained from randomized controlled trials is often trivial and oversold.[108] Experiments are good for isolating specific treatment effects. They are narrow by design. Local

[101] Cartwright 1999: 25–29. [102] DeMartino 2018. [103] DeMartino 2018: 10.
[104] DeMartino 2018: 13. [105] Quoted in Deaton 2010: 438.
[106] Cartwright 2007. Deaton 2010: 426. [107] Deaton 2010: 449.
[108] Deaton and Cartwright 2018: 3, 10. Mercatus Original Podcasts 2022.

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average treatment effects apply only to the specific treatment applied to a specific sample. When all is said and done, experiments are useful guides for the world when they are precise and narrow. This is not to deny that when they are done well experiments sometimes can lead to important new insights. In the field of international politics, for example, Michael Tomz's survey experiment of audience costs makes an outstanding contribution.[109]

The questions surrounding experiments go beyond the strictly "methodological." To understand "what works," we need a theory of why things work rather than just experiments testing whether things work.[110] By themselves, simple extrapolation and generalization from repeated, successful replications are not confirming anything. Many practitioners of experiments agree that well-established results do not necessarily travel across heterogeneous contexts. It takes good reasons to justify making that attempt. And such reasons often do not exist.[111] Local results must be linked to more general mechanisms. The chicken infers from repeated evidence that when the farmer comes in the morning, it will be fed – a good inference until Christmas morning, when the farmer comes, wrings the chicken's neck, and feeds it to his family. Experiments can run this chicken risk, not because of the method but because of a lack of understanding of the conditions that give rise to the observed relationship. A carefully crafted randomized control trial of chickens turning up in summertime in the farmyard and being fed regularly would have confirmed the chicken's belief.[112] For a while, the hapless chicken experiences the world as a stationary rather than as a dynamic process – a common mistake when the results of experiments are reported as generalizable findings.[113]

All too often experiments are based on the assumption that "the universe proceeds by causality and so the future that lies ahead of us is as determined as our history."[114] But as Blaug mischievously suggests, history repeats itself because "historians repeat each other."[115] Learning from experience, knowing which stories travel from the past to the present or future and which do not, is difficult. Extensions beyond the context in which an experience has been made create vulnerabilities. The experience of being disastrously wrong is of course salutary. No student of politics and society should be spared it, insisted John Kenneth Galbraith. "And few are."[116] Since for many historians (and some physicists) the past is as open and indeterminate as the future, this is at best an argument

[109] Tomz 2007. See also Kohama *et al.* 2024. [110] Deaton 2010: 442.
[111] Deaton and Cartwright 2018: 10–12. [112] Blastland 2019: 202–03.
[113] Deaton and Cartwright 2018: 11–14. [114] Basu 2014: 459. [115] Blaug 1963: 152.
[116] Quoted in Blastland 2019: 110.

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for a world of weak causal effects. Furthermore, long chains of causation cannot be foreseen with "any degree of certainty."[117] At best, randomized controlled trials can establish "circumstantial" rather than generalized causality. Observable effects occur in specific historical contexts. No easy shortcuts get us around the problems raised by differences in contexts, mechanisms, *ceteris paribus* conditions, and counterfactuals – other than the unthinking confidence that Newtonian humanism instills in us as we deal with the complementarities of risk and uncertainty.

That confidence has been shaken in the sciences. One 2011 study referred to as "Begley's bombshell" replicated only 10 percent of fifty-three studies published in the world's top science journals such as *Nature* and *Science*. Another study reports that on average replication effects were in the same direction as in the originals but only about half their magnitude.[118] In a survey conducted by *Nature* in 2016, 90 percent of the respondents agreed that the natural sciences had a reproducibility crisis.[119] That sense extends to the social sciences. The social world is like a little kid. You tell it to sit still while you take a picture. But as you are fastidiously fumbling with your camera, the kid simply will not wait for you. All too often the world's social and political processes are not static. And this has created problems for the social sciences. The replication crisis was very serious in the field of psychology. As a consequence psychologists have adopted much stricter research protocols in recent years. Political science, the informed consensus view holds, has avoided a serious replication crisis.[120] That is good news. The bad news is what Alexander Wuttke, a well-informed and sympathetic supporter of experiments in political science, reports in his recent assessment. For a significant portion of political science studies

> we cannot be sure to obtain the same results if we re-ran the same analyses on the same data . . . positive findings were forty percentage points (or three times) more likely to be published and sixty percentage points more likely to be written up. In other words, when researchers test a hypothesis and the results do not provide confirming evidence, there is a good chance that the academic community will never know about these results.[121]

It is not surprising that in the world of "publish or perish" researchers tailor their research and publication strategies to advance their professional careers. And it is heartening to see journals beginning to adopt submission (pre-registration) and reviewing (result-blindness) protocols to inhibit systematic distortions created by the misaligned incentives researchers face.

[117] Morgenthau 1946: 127. [118] Spiegelhalter 2019: 6. [119] Blastland 2019: 111–13.
[120] Mullinix *et al.* 2015. Coppock 2019.
[121] Wuttke 2019: 7, 9. See also Brodeur *et al.* 2024.

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But little can be done about the enduring problem that Wuttke recognizes and that has been a central theme in my argument about uncertainty in world politics. "Most political science findings are context-dependent and, thus, do not necessarily generalize across time and space" unless boundary conditions are clearly specified. Unfortunately, current research practice "does not invest much effort on theoretical discussions of boundary conditions or on empirical replicability tests." A recent study found that only one third of twenty-one influential social science experiments that were replicated had "significant effects in the same direction as the original study," larger than similar studies reported in psychology and similar to rates reported in economics. "The insight that the likelihood of replicating a recent and prominent social science experiment is not much larger than the flip of a coin may shake prior beliefs about the predictive power of existing social scientific studies," Wuttke concludes.[122] I take this conclusion as support of the argument that, partly constituted by the risk-uncertainty conundrum, a dynamic world all too often slips through the fingers of scholars conducting experiments.

Experimentation

Like a simple model, well-designed experiments are useful instruments that can provide some baseline understandings of the world. Experimentation, in contrast, is a practice that operates without design. It focuses on applied forward reasoning to map possible futures that emerge from human actions and their unintended consequences. This is typical of open, non-linear systems where humans interact to shape their environments. A strike of workers on the London Tube forced commuters to seek out alternatives. After the strike was over, tens of thousands stuck to their new routes. For better or for worse, experimentation, it turned out, had created a lasting effect. Experimentation is well suited to a world filled with contingencies.[123] Conventional backward-looking methods that assume the world is stationary do not work well. Analysis-for and prescription differ from analysis-of and explanation. Policy prescription seeks to identify chains of contingency that could shape the future rather than explaining past events in the hope of improving theories or choosing policy interventions to select criteria and predict their effects in single-shot interventions or experiments.[124] Experimental governance is relevant when traditional, top-down command and control are not feasible or are found wanting.[125]

[122] Wuttke 2019: 13–14. [123] Klaas 2024: 61–62. [124] Levin *et al.* 2012: 130–31.
[125] Sabel and Victor 2017a, 2017b. Dorf and Sabel 1998. Sabel and Zeitlin 2010.

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In principle, experimentation works in both small worlds of calculable risk and large worlds of incalculable uncertainty. In practice, in contrast to experiments, experimentation "disavows the notion . . . that causality and its measurement can be fixed across time and place and that any occurrence can be isolated from its context."[126] Contextual specificity and heterogeneity trump homogeneity and generalizability. And experimentation also acknowledges that processes are variable and that language can make rather than mirror worlds. Experimentation assumes that appropriate scientific practice is rooted not in better methods but in a better understanding of the scientific enterprise. It starts with the assumption that a well-designed experiment does not lead to generalization but to insights that another, related experiment can build on. Although they are typically regarded as diametrically opposed, here the nomothetic inclinations of positivist scholars and Weber's idiographic ideal types sing from the same songbook.

Albert Hirschman spoke up for this social scientific approach. It is attuned to relying on causal rules and generalizations with which we meet the future rather than relying on any one "ism," or touting any one "killer method."[127] Hirschman was a heterodox economist with wide-ranging interests who disliked blueprint economics and its cookie-cutter application to any issue, including development economics. Opposed to any and all orthodoxies, he valued new practices and institutional arrangements. His belief in small-scale experimentation resonates deeply with those who work with well-designed experiments. However, Hirschman rigorously opposed the temptation of arguing that any lesson learned from small-scale experiments could be scaled up readily to larger settings marked by unknown yet surely different contexts. Learning by doing in policy making and listening rather than preaching, his approach had two unusual hallmarks: humility and the capacity to adapt to variable processes and changing circumstances. He favored incoherence over coherence, pragmatism over plans.

Simple approaches to complex problems were anathema to him, and so were overblown grand claims in the name of Science (with a capital S), hallmark of an unreflective Newtonian humanism. Urbinati writes that "in a time in which . . . nothing seemed to work without the pre-defined guidance of a weltanschauung, Albert persisted in living outside of and without any weltanschauung."[128] Not quite. His disposition was post-Newtonian. In a complex world filled with unknowable uncertainties, he opposed reductionist models, epistemic certainty, and the pretense of

[126] Adams 2020: 360. [127] Grabel 2017: 29–54. Meldolesi 1995.
[128] Urbinati 2015: 268.

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scientifically based authority over policy. Hirschman's writings from the late 1950s did much to end the "big push, high development" theory of the 1940s and 1950s.[129] After half a century of obscurity, development economics has recently been swept up by the excitement of randomized controlled trials, both widely noted and criticized when this research strand was recognized with the 2019 Nobel Prize for Economics. Taken together with the macro approach of large-N statistical studies, this micro approach may undergird a new and better development economics and social science more generally.[130] But Hirschman would have pointed to both epistemic and ethical grounds for skepticism of the positivist RCT approach. With economist Lant Pritchett he would have challenged RCT's dubious claim that microscopic experiments can lead to actionable knowledge about how to achieve large-scale growth and development.[131] And he would likely have been repulsed by the power disparities between experts and vulnerable populations which, not that rarely, are exposed to ethically dubious experiments. More likely, he would have welcomed the pragmatic learning-by-doing approach to development through an inclusive growth strategy, illustrated by China after 1979.[132]

Intellectual opportunism is central to experimentation. Searching out uniqueness and novelty requires taking advantage of spaces for innovation rather than relying on preconceived notions and plans. Deep knowledge of local contexts, awareness of sequential and cumulative changes that are not legible from quick visits to research sites made accessible by local gatekeepers, and suspicion of efforts to transplant observed local average treatment effects to unrelated and distant sites – all are hallmarks of an experimentation approach. Most important is faith in and embrace of what is possible.[133] An experimentation approach is based on a worldview that acknowledges the existence of uncertainty, and incomplete, dispersed, partial, tacit, and limited knowledge. It is marked by "constructive humility."[134] Knowledge of the future is irreducibly uncertain and typically cannot be accessed by probabilistic thinking. For Hirschman the need for predictability and the embrace of epistemic certainty and parsimony supporting general paradigms and laws constituted a serious neurosis that afflicted economics and other social sciences, including the analysis of world politics.[135] His commitment to the world's complexity was as unshakeable as his commitment to strategies of intervention.

[129] Hirschman 1958. [130] Grabel 2017: 32–33.
[131] Mercatus Original Podcasts 2022. [132] Ang 2016, 2023. [133] Grabel 2017: 33.
[134] Bernstein *et al.* 2000: 45. [135] Grabel 2017: 37.

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Practical intervention always has unknowable effects that are set in motion by contending forces and a totality of circumstances unknown to the researcher or practitioner at the time the intervention is made. Playing off Adam Smith's "invisible hand" operating in small worlds, Hirschman's "hiding hand" operates in large ones.[136] It recognizes ignorance as a precondition for, rather than obstacle to, progressive change. Ignorance and mistakes are unavoidable and productive. Embarking on a project that seems manageable at the outset, and then turns out to be fiendishly difficult, reveals ignorance as the expert cultivator of unknown capacities for innovation and adaptation. Hirschman's hiding hand beneficially conceals difficulties and thus frees untapped powers of creativity. Without ignorance, we would not start and thus would forego the possibility of learning about beneficial outcomes or effects. In small worlds we plan for progress, in large ones we stumble into it. Failed predictions can breed success. We thus can literally "fall from error into truth."[137] Hirschman's possibilism sidesteps both the overconfidence that we can fix everything and the fatalism that nothing can be fixed. Instead of epistemic certainty, Hirschman pleads the case for path-dependent change, small steps, local contexts, unintended consequences, and adaptive learning. Above all, he prizes experimentalism and improvisation, along with a slow reform-mongering holding to the possibility for betterment.

For Hirschman the world is an open and complex system that is contingent, adaptive, and unknowable in many of its features. Shorn of the epistemic error of viewing the world as a simple, decomposable, and analytically tractable system, Hirschman's approach expressed the hope of exploiting unforeseen possibilities for improving it.[138] His "possibilism," Ilene Grabel writes, "is grounded in faith in the demonstrated capacities of individuals, institutions, and societies to develop diverse, creative solutions to unforeseen challenges and development problems. Possibilism encapsulates the enduring bias for hope."[139] Hirschman regarded an uncertain, open future as a truly inalienable right for every person, group, and state.[140] So did the human rights activist and physicist Andrei Sakharov, who won both the Nobel Prize for Peace and the Stalin Prize for designing the Soviet H-bomb. Sakharov wrote in a letter from his exile in Gorky: "fortunately, the future is unpredictable and also – because of quantum effects – uncertain."[141] For both Hirschman and Sakharov uncertainty was filled with hope not fear. As for the social

[136] Hirschman 1967. Gladwell 2013. Meldolesi 1995: 38, 118–20.
[137] Hirschman 1967: 13, 20. [138] Hirschman 1971. [139] Grabel 2017: 46.
[140] Hirschman 1971: 30. [141] Gorelik and Bouis 2005: 358.

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sciences, in Hirschman's view, they often "consider it beneath their scientific dignity to deal with possibility until *after* it has become actual and can then at least be redefined as a probability."[142] In Newtonian humanism, implausibly, time is reversible. With nary a blush, many social science "predictions" published in scholarly journals are "postdictions." They are based on the unstated and unexamined assumption that the political process being examined is unchanging.[143] Convinced of the importance of uncertainty, Hirschman would have none of this. He resolutely refused to cede possibilistic grounds to probabilistic games.

Conclusion

For Donald T. Campbell, who led the social sciences to experiments and experimentation, the small world of experiments and the large world of experimentation are closely related. "The job of the methodologist for the experimenting society is not to say *what is to be done*, but rather to say *what has been done*."[144] Small world social science risks falling into the trap of over-advocacy when it advises what should be done. It should be more modest and admit that we cannot know until we have tried. Occasionally experiments go beyond common-sense understanding, but only because they build on it, not because they are a substitute for it.[145] We learn only by checking things out. For Campbell the experiments of the experimenting society will never be ideal for testing theory. But "they will probably be the best we have, and we should be willing to learn from them even when we have not designed them . . . Measuring the effects of a complex politically designed ameliorative program involves all of the problems of experimental inference found in measuring the effects of a conceptually pure treatment variable – all and more."[146] Since they are scientific by intention and effort but not, at least as of yet, by achievement, social scientists should avoid "cloaking their recommendations in a specious pseudo-scientific certainty, and instead acknowledge their advice as consisting of but wise conjectures that need to be tested in implementation."[147] And in the large world of contingency and uncertainty "the guesses of the experienced administrator and politician are apt to be on the average as wise as those of the social scientist."[148]

Campbell's humility is sorely missing in many studies of world politics that combine statistical methods and the "analysis of" world politics aiming at explanations that contribute to theory with experimental

[142] Hirschman 1980: xii. [143] Bernstein *et al.* 2000: 48–49.
[144] Campbell 1973: 72; 1991: 228. [145] Campbell 1991: 263.
[146] Campbell 1973: 72; 1991: 228. [147] Campbell 1973: 73.
[148] Campbell 1991: 228.

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studies and the "analysis for" world politics aiming at intervention that contribute to policy.[149] Newtonianism holds forth the promise of creating predictability in our lives. God after all gave all the easy problems to the physicists.[150] Covering the full range of human reason and unreason, humanism is more attuned to God's difficult problems. Newtonian humanism thus has the wherewithal to address the risk-uncertainty conundrum. But it fails to deliver on that promise as long as it favors precision over accuracy and experiments over experimentation. It thus creates a bias for "single-shot" interventions based on small world thinking that overlooks chains of contingencies marking large world realities.

Informed by different worldviews, as we make our way we typically are unaware of uncertainty or unwilling to acknowledge its existence. Experiments help us understand the risk-based world we seek to control on the basis of results gleaned either after manipulating conditions in a laboratory or after performing smartly designed field or survey experiments. Experiments share in the hope of studying the effects of treatments and then, implausibly, scaling up local results to offer general solutions to real-world problems. Experimentation has less lofty aspirations. It is based on the notion of learning by doing under always shifting contexts in a dynamically evolving world filled with uncertainties that resist law-like generalizations. Experiments and experimentation are two different methods of dealing with risk and uncertainty. Relying eclectically on quantitative, qualitative, and axiomatic approaches, we may try to fence in uncertainty in the analysis though not in the practice of world politics. But it is a fool's errand to neglect uncertainty altogether or try to chase it over the horizon, saddling us with unresolved risk-uncertainty conundrums.[151]

4. Simplicity, Complexity, and the Risk-Uncertainty Conundrum

Is the risk-uncertainty conundrum best analyzed with simple or complex theories, models, and methods? In the abstract, there exists no obvious ground for choosing. Simplicity has some undeniable advantages. Reducing the risk-uncertainty conundrum simply to risk can, however, be a perilous shortcut. All too often it leaves students of world politics empty-handed in their frequent encounters with the unpredictable.

[149] Levin *et al.* 2012: 131. [150] Bernstein *et al.* 2000.
[151] Shapiro and Bedi 2007: 16–17.

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Simplicity

Following Newton's admonition, most theories and models of world politics aim for simplicity. This has been hugely influential, for example, in economic models and the belief in the beneficial effects of unregulated markets; in Marxist models and the belief in progress brought about by the history of class struggle; in Liberal models and the belief in the possibility of amelioration of both unregulated markets and class struggle; and in Realist models and the belief in the inevitability of war. Simple models aim at useful generalizations and causal propositions about outcomes occurring under a wide variety of different conditions.[152] Simple models can generate strong conclusions especially when they rely on large numbers of observations and are supported by an accumulation of consistent information.[153] For the most part, simple models are based on strong assumptions. One such assumption holds that social reality consists of discrete, fixed entities endowed with attributes measurable as separate variables and linked in linear relations.[154] Causal influence is monotonic; a given cause is equally relevant at all times.[155] Language "represents" the world. Meanings of terms describing the world are unequivocal. There exists only one meaning for the effect that a given variable exerts on another. In short, in this small world conception, domestic and international politics are composed of fixed entities with constant, uniform, and unambiguous causal influences operating without any meaning ambiguity.[156] According to one of his unnamed students who recounted the episode on Twitter a few years ago, John Mearsheimer put his cards on the table when he told his graduate students "In this world, there are complexifiers and simplifiers, you want to be a simplifier."[157] Swiss philosopher Jacob Burckhardt begged to disagree. He warned of the harm done by "terribles simplificateurs" descending on poor old Europe.[158]

Specific methods support Mearsheimer's quest. For example, laboratory experiments strictly control the context so that specific causes can be identified. When laboratory experiments are not possible, quasi-experimental field or survey experiments also seek to isolate causal factors. In quantitative studies statistical controls seek to achieve the same objective by addressing issues such as multi-collinearity, omitted variable bias, and selectivity.[159] Simple models generate behavioral implications

[152] Western 2001: 358–61. Hornstein and Star 1990: 424–25. Little and Pepinsky 2016: 438–41. Kiser and Hechter 1991, 1998. Goldthorpe 1997.
[153] Western 2001: 359. [154] Abbott 1988. [155] Ruffa and Evangelista 2021.
[156] Kincaid 2004a: 211. [157] Avant 2024: 6. [158] Dru 1955: 220.
[159] King *et al.* 1994: 104, 119, 196–97.

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that can be tested and proved wrong, a welcome contrast to the opaqueness of complex models. Simple models are not easily tinkered with to shield them from disconfirmation. They constrain data-mining, the accidental stumbling into false positives, and imputing the presence of a condition or causal effect that does not exist.[160]

In principle, simplification is compelling. In practice, it often runs into trouble mistaking the simplicity of the map as an accurate characterization of the territory of a complex world. Frequently repeated epistemological assumptions about the world morph all too easily into ontological claims about what the world is really like. Maps are not territories. Ken Waltz argues that "a theory, though related to the world about which explanations are wanted, always remains distinct from that world."[161] For Seva Gunitsky epistemological simplification is a "useful capitulation" and an "informed concession to ignorance" of the world's complexity. Simplification "requires both boldness and humility – the boldness of simplifying assumptions and the humility to recognize them as such."[162]

Complexity

Many agree that world politics is not simple. But is it complicated or complex? Focusing on only some of its parts can be a practical step toward eventually understanding the whole.[163] Complicated systems can be disaggregated into their components.[164] With their initial constraints or parameters fixed such systems are often linear and deterministic. As long as underlying processes are stable, historical probabilities in clock-like, complicated systems provide a reasonable guide to a future marked by predetermined regularities under conditions of risk. Complicated weather systems are a good illustration.

However, parameters of self-organizing, non-linear complex systems with emergent properties can shift as they adapt over time. Yuen Yuen Ang's adaptive political economies highlight whole systems that are not reducible to the relations among their parts.[165] Generalizations do not occur across one homogeneous context but across a variety of heterogeneous ones. Since emergent phenomena cannot be reduced to their constituent parts, explaining specific events with the help of overarching concepts is often misleading.[166] Complex models focus on feedback loops operated by a circular causality without the assignment of specific agency to any one entity.[167] Historical probabilities offer no reliable guide

[160] Ron 2002: 131–32. [161] Waltz 1979: 6. [162] Gunitsky 2019: 708, 714.
[163] Lake 2009a, 2009b. [164] Simon 1962.
[165] Ang 2023. Silberstein and McGeever 1999: 182, 184–85, 190–91. Taleb 2012: 56–60.
[166] Houghton 2009. [167] Freeman 1999.

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to an uncertain future marked by low-probability events and unpredictable contingencies. In cloud-like complex systems the future is open under conditions of uncertainty.[168] The movement and shape of individual clouds, for example, remain mysterious, defying prediction, at least for now.

The complementarity of risk and uncertainty blends the known and the unknown in politics. In complicated political systems uncertainty may be due to methods of generating a sample, the incompleteness or inclusion of an element of randomness in a model or theory, and the partial randomness of human behavior.[169] Predictive capacity is limited by the time it takes a system to run through sufficient repetitions to record how things eventually map out.[170] Complex political systems are governed by dynamically changing processes rather than predetermined laws. System dynamics can be tracked only *ex post*; they are not predictable *ex ante*. The coexistence of serendipitous circumstances with circumstantial craziness, the confluence of the unintended consequences of human action, and the unanticipated consequences of system dynamics are some of the factors that make the risk-uncertainty conundrum so intractable.[171]

Nobel Prize winner Robert Solow's "gimmick" was to pick a thing that interested him and simplify everything else. What he was aiming for was to understand "a little piece of the puzzle" by building "toy models."[172] Far from being averse to intellectual elegance, Albert Hirschman warns that "parsimony in theory construction can be overdone."[173] Sometimes our understanding is enhanced by making things more complicated and more complex. Rational choice theories are a case in point. For example, our understanding of preference change can be enriched by incorporating the analysis of meta-preferences. Many actors are internally divided. They have the ability to step back in self-reflection and argue within themselves about the relation between ephemeral tastes and enduring values. This ability to step back is unique to humans, though not present in all of them. Hirschman argues that changes in revealed, first-order preferences are useful guides to validate the concept of meta-preferences. He also argues against the reinterpretation of meta-preferences as ephemeral tastes and against attempts to explain preference change exclusively through price and income changes. Instead, he insists, we must embrace

[168] Lerner 2021: 369–72. Almond and Genco 1977. Kellert 1993. Axelrod and Cohen 1999. Ang 2022: 2–10. Jervis 1997. Byrne and Callaghan 2013. Kiel and Elliott 1996. Harrison 2006. McCloskey 1991. Tetlock and Gardner 2015: 8–10.
[169] Gailmard 2014: 77–79.
[170] Bookstaber 2017. Kay and King 2020. Bousquet and Geyer 2011: 1. Kauffman 2008: 258. Bousquet and Curtis 2011.
[171] Blight 1990: 69–70. [172] Hershey and Weinstein 2023. [173] Hirschman 1984: 12.

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a style of analysis that does not simply rule out the complicated or complex effects of "autonomous, reflective change in values."[174] This conception is at odds with Newtonian humanism's assumption of self-sufficient, rational individuals.

A complex approach can be helpful for capturing an individual's non-routine activities. They include the striving for "truth, beauty, justice, liberty, community, friendship, love, salvation and so on" rather than only productive labor. Such strivings generate more or less temporary experiences of attainment that go far "in accounting for the existence and importance of non-instrumental activities."[175] They cannot be elucidated by simple means-ends calculations. Compensation for the uncertainties about the outcome of striving activities lies in their often intrinsic, "intoxicating" quality. Non-instrumental action, furthermore, often has the effect of making the actor feel like a "real person." As such, it can be interpreted as an investment in individual or group identity, personhood, and sense of belonging. Similarly, morality, benevolence, and civic-mindedness cannot, Hirschman argues, be analyzed sensibly by relying only on the simple scarcity model of economics. An economic approach that seeks insight into a broad class of problems must embrace a view of the world that does justice to "the incredible complexity of human nature" – a view that economic analysis needs to incorporate for gaining greater realism and relevance.[176] Hirschman pleads "let us beware of excessive parsimony."[177] His insistence on incorporating large world phenomena into economic analysis is a useful reminder of the persistent risk-uncertainty conundrum.

Conclusion

That conundrum looks different in closed, decomposable, complicated systems than in open, holistic, complex ones. The first permits calculations of risk, the second insists on acknowledging the existence of uncertainty. Herbert Simon offered a formulation that encompasses both.[178] For Simon the world is a loosely coupled system consisting of clustered variables. Tight clusters lend themselves to simple modeling more easily than do loosely linked ones. More recently, some scholars have pushed beyond Simon's logic.[179] They argue that the world is deeply entangled and open and cannot be approximated usefully by conceiving of it as a series of partially closed systems. Joseph Nye states this point graphically. "The social sciences are like inhabitants of islands in a huge swamp. They could measure and predict pretty well on each island, but were inept at building

[174] Hirschman 1984: 15. [175] Hirschman 1984: 18–192. [176] Hirschman 1984: 27.
[177] Hirschman 1984: 27. [178] Simon 1962. [179] Popper 1990. Adler 2019. Qin 2018.

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bridges between them. So, they tried to link the islands with huge leaps of theory and often wound up floating in the swamp of uncertainty."[180]

In many simple models individuals are the only important information-processing, knowledge-producing, and risk-calculating actors.[181] And the individual brain looks like and can be modeled as a computer. Complexity theory highlights instead the cultural accumulation of cognitive artifacts that are external to the individual. Information processing is distributed across group members and generations. Cognition is socially distributed. Wilcox surmises that rich cognitive artifacts "were accumulated by increments and innovation across years and indeed millennia."[182] Groups of people rather than individuals were the main drivers of learning processes revealed in the production of cultural objects and socially distributed, uncertainty-producing mentalities.

A well-specified outcome or "dependent variable" is central to simple models that conceive of explanations in terms of a funnel of causation. Complex events inside the funnel are the result of many prior causes that have multiple effects. What matters most is the "dependent variable" at the end of the funnel, often a specific political act.[183] The funnel operates not in "real time," for example following voters through the various stages of a campaign. It occurs instead in "causal time" that moves from big background factors to a number of smaller factors affecting the final outcome. In contrast, complex models focus not on outcomes but on processes. They track the flow of variables through "real" rather than "causal" time.[184] Specific events are conceptualized as ongoing sequences of events that flow through networks. Outcomes are the byproducts of processes that constitute social and political reality. Political process is a "continuous sequence of interim results" rather than a "discontinuous sequence of final results." Interim or process outcomes can generate trending outcomes and long-run stabilities that are brought about by large numbers of individual events.[185] Simple models isolate efficient causes. Complex models focus instead on the concatenation of different types of causes. The risk-uncertainty conundrum plays out differently in these two conceptions of causal relations. The first is more congenial to risk-based analysis than the second. But often risk and uncertainty blend into one another and cannot be clearly separated out. Put simply, often simplification does not help us unravel the complementarity of risk and uncertainty.

[180] Joseph S. Nye, personal email correspondence, 12/23/23.
[181] Wilcox 2008: 523–24. [182] Wilcox 2008: 524–25, 527–29.
[183] Abbott 1998: 148–50, 158–59, 161–63, 167–68; 2005: 398; 2016: 170–72. Kurki 2008: 2–13. Ruffa and Evangelista 2021.
[184] Abbott 2016: 167–69, 171–72. [185] Abbott 2016: 176. Abbott 2005: 400–05.

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In line with this chapter's emphasis on stories, one of the fathers of modern macroeconomics and rational expectation theory, University of Chicago economist Robert Lucas, thought of himself and his colleagues as story-tellers operating in the world of make-believe. "We do not find that the realm of imagination and ideas is an alternative to, or retreat from, practical reality. On the contrary, it is the only way we have found to think seriously about reality."[186] In his Presidential Address to the 2003 meeting of the American Economic Association, the Nobel laureate announced that "macroeconomics . . . has succeeded: its central problem of depression prevention has been solved, for all practical purposes, and has in fact been solved for many decades."[187] His story was about rational expectation. It tickled every economist's imagination and convinced most of them. In the make-believe world of rational expectation Lucas made a series of claims. There exists a "true model" of the "real" world. Economists, and everybody else, know what that model is. Everybody has developed expectations that are consistent with everybody else's expectations. And everybody acts on these expectations. In Lucas's story "all agents inside the model, the econometrician, and God share the same model."[188] Five years later the greatest economic crisis since the Great Depression illustrated once more that financial crises, like wars, are the result of dynamically changing processes.[189] Like the captain of the *Titanic*, Lucas had imagined an accident-free world of stationary processes. The Nobel Prize winning story-teller had spun a good yarn that a great many people found compelling. When pressed in Congressional testimony after the crash, Alan Greenspan, then Chairman of the Federal Reserve, remarked ruefully that his view of the world had been shown wanting: "I made a mistake . . . I found a flaw in the model that I perceived is the critical functioning structure that defines how the world works, so to speak. I was shocked, because I have been going for 40 years or more with very considerable evidence that it was working exceptionally well."[190] As *The Economist* wrote in its obituary, Lucas had "built a fantastical new world for wonks to explore."[191] But Lucas had omitted to notice the difference between small and large worlds. As the next chapter argues, the crisis of 2007–08 showed his story to be fatally flawed. Playing the role of pied piper, he had fooled a lot of people. Not all of them were wonks.

[186] Kay and King 2020: 92. [187] Lucas 2003: 1.
[188] Thomas Sargent quoted in Kay and King 2020: 342.
[189] Kay and King 2020: 193, 338–39, 371–72.
[190] U.S. Congress, House of Representatives 2008: 45–46. Greenspan (2013: 68) reports a different interaction with Congressional committee chair, Henry Waxman, on October 2008.
[191] *The Economist* 2023b: 68.

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