The Evolution of Knowledge
Rethinking Science for the Anthropocene
Jürgen Renn
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Jürgen Renn's *The Evolution of Knowledge: Rethinking Science for the Anthropocene* is a book to read twice, or not at all. A global history of knowledge is breathtakingly ambitious, even more so when oriented toward our current global challenges. Renn argues that such an expansive perspective is prerequisite for addressing those challenges. His sweeping, synthetic account of knowledge throughout human history aims to show how the structure of knowledge today contributes to—and offers a platform for addressing—the potentially existential threats of the Anthropocene. Renn faces down the difficulties of crafting such an account with skill and resolve. The result is provocative, challenging, and asks much of its readers.

The book's five sections are arranged according to scale. Knowledge, for Renn, consists in mental, material, and social factors, as set out in the synoptic first section. Evolved features of our minds determine the categories we can easily apprehend and incline us to certain patterns of abstract thinking. We use mental abstractions to generate material representations of ideas, which facilitate both their manipulation and their dissemination. Human communities are then structured in ways guided by these representations, and push back on them by conditioning our expectations for the sorts of things that are possible. The interdependence of these three dimensions of knowledge is critical.

Renn turns in part 2 to knowledge, and how it changes, at the scale of individuals and their local social environments, drawing on developmental psychology and biology. Key here is the insight that abstract reasoning is not a straightforward consequence of our mental architecture; it is conditioned by the material and social resources available during cognitive development. That set of resources has its distinctive "challenging objects"—phenomena that behave recalcitrantly with respect to contemporary knowledge systems—and "borderline problems"—those questions that straddle knowledge systems and prompt their extension. Addressing these is the principal mechanism for changes in knowledge systems. The history of knowledge on this view is contingent, path-dependent, and layered, but proceeds via discernable patterns.

As should now be evident, the book's argument unfolds in a technical idiolect that becomes tractable only with some effort. For example, the eighteen-page glossary provided to support that effort (which is unhelpfully broken into thematic sections rather than presented as a single, alphabetized list) defines *scientific knowledge* as "knowledge resulting from the exploration of the potentials inherent in the material or symbolic culture of a society within a knowledge economy specifically dedicated to the generation of such knowledge, allowing for its corrigibility and involving appropriate to control procedures" (430). That definition begins to make sense somewhere around chapter 10, but the understanding is hard won.

Part 3, of which chapter 10 comprises the larger part, describes and exemplifies "knowledge economies." These are the distributed (sometimes global) networks arranged to preserve, distribute, and employ external representations of knowledge. Institutions, as integral components

of knowledge economies, have assumptions and values built into them that both guide and constrain the evolution of knowledge and its enactment.

Although the specific observations about how knowledge moves at these institutional scales are edifying, the metaphor of the knowledge economy itself is problematic. As Renn himself observes, the cultural resources at our disposal shape how we craft the external representations of our abstract concepts. The cultural resources of our age are increasingly those of the market. That places troublesome constraints on our thinking. Renn, in his conclusion, worries about "new ways of accessing scientific information [being] blocked by its transformation into a commodity" (416). It would be thus be preferable to have a representation of institution-level knowledge processes that did not invite us to think of knowledge as a measurable economic resource, encoding value, to be exchanged and hoarded as capital.

Knowledge on the global scale is the subject of part 4. We are now accustomed to hearing about global processes, but Renn is careful not to miscast global knowledge as distinctive of our time. Global transit of knowledge has been among its characteristic features almost since it was worthy of the name; our globalized knowledge practices are not a novel legacy of modernity, but part of the layered history of knowledge going back millennia. This is critical because that history informs the features of our global knowledge system, including the constraints that produce some of the Anthropocene's challenges.

Those challenges, and how to address them, feature in part 5. Renn shows tremendous faith in the power of concepts to do useful work. Despite the problems with the Anthropocene as a concept, he defends its potential to "integrate knowledge from all the disciplines concerned" (383) to address human disruption of the systems stabilizing the biosphere. Doing so, per Renn, requires unshackling ourselves from the constraints of legacy knowledge systems, such as those disciplines impose, which inhibit the coordination of diverse bodies of knowledge relevant to concrete problems. His proposed recategorization of knowledge into system knowledge, transformation knowledge, and orientation knowledge—roughly, the understanding of Earth's natural systems, of human processes and their interaction with it, and of human values—is presented with the goal of overcoming intellectual territorialism and fostering the coordinated mobilization of knowledge on many scales toward well-defined ends.

This is an abstract proposal, indicative of abstract exposition. Renn's characteristic approach, dubbed *historical epistemology*, is one he and his co-editors of *The Genesis of General Relativity* (2007) aptly termed "the plate tectonics of knowledge." Although littered with historical examples, the breadth of subject matter in the book under review means these are necessarily cursory. As a result, it is often challenging to envision how the processes discussed manifest through human agency, and, correspondingly, how the solutions proffered to the challenges of the Anthropocene can translate into concrete policy. Nevertheless, this book presents a powerful system within which to reason not just about the history of knowledge but about its future. And that is reason enough read it twice.

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