Understanding Science, Naturally

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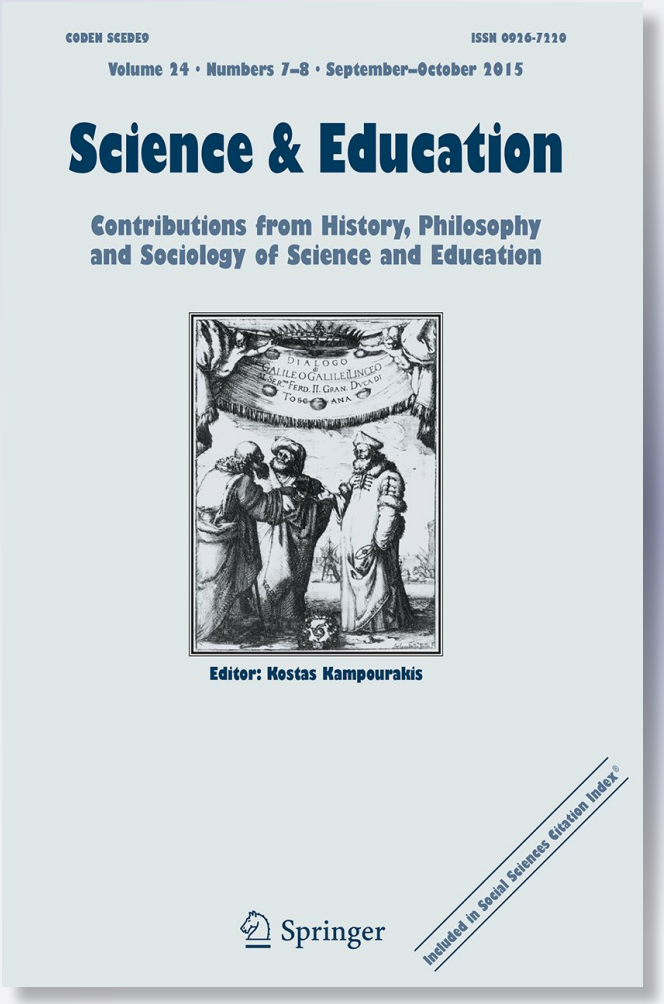

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BOOK REVIEW

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Joseph Rouse (2015) Articulating the World: Conceptual Understanding and the Scientific Image. The University of Chicago Press, Chicago and London. ISBN: 978-0-226-29384-4, 423 Pages, Price: $35.00 (Paperback).

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1 Introduction

Naturalism is the philosophical tradition that aims at explaining and understanding the world without taking recourse to supernatural causes. Unsurprisingly, science plays an important part in this tradition as it provides us with the most accurate knowledge possible in exclusively naturalistic terms. However, naturalism can only be a comprehensive view of the world if it also includes a naturalistic understanding of science itself. Providing such an understanding is exactly the aim of Joseph Rouse and his book *Articulating the World*: *Conceptual Understanding and the Scientific Image*. As the subtitle suggests, the book consists of two parts. After a substantial introduction that lays out the issues and problems that will be targeted in the book, the four chapters in part 1 deal with the nature of conceptual understanding: what is conceptual understanding, how did it evolve, how does it relate to other cognitive capacities in us and other animals, and what is the role of language? The next five chapters explain the role that conceptual articulation plays in science with special attention devoted to scientific practices such as the development of laws and experiments, and the nature of the scientific image. A conclusion provides a welcome overview of the main insights of the book.

2 The Space of Reasons

By taking a naturalistic perspective, the author departs from the classic epistemological approach that treats science as a set of propositions that needs to meet specific criteria. Rouse rejects this normative approach which, in the words of the philosopher John McDowell,

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merely results in a "frictionless spinning in a void," without any connection to the real world. Instead, he urges us to understand science as how it actually unfolds. What we need to grasp is that humans are biological creatures that evolved cognitive capacities that were selected because they served our survival and reproductive interests. These capacities do not merely enable us to form more or less accurate representations of the world, but to actively interact with the world around us, thus also construing a version of the world that is the most relevant to our survival. As such, we are no different from other animals. However, in contrast to other animals, we have evolved the capacity to take a distance from our immediate experience of the world, form concepts, and reflect upon them. As such, our conceptual understanding, in contrast to other evolved abilities, is a capacity subjected to a dual normativity. As any other evolved capacity, it is shaped and constrained by the norms set by survival and reproduction that determine whether some evolved feature functions properly or not. Sometimes, evolved abilities can misfire or lead to maladaptive behavior. However, it would be a real stretch to claim that organisms that behave on the basis of these capacities are wrong. Right and wrong are the terms reserved for the evaluation of the output of our evolved capacity of conceptual understanding by which we entered the "space of reasons." We are the only species on this planet that is capable of providing arguments and justifications for our thoughts and behavior, leaving it to others to evaluate whether our reasoning makes any sense. This is the second type of normativity to which only the output of our conceptual understanding is accountable.

3 From the Manifest to the Scientific Image: Science as Niche Construction

The title of the first part, "Conceptual understanding as discursive niche construction," summarizes how Rouse conceives of the evolutionary origins of the capacity for conceptual understanding. Without getting embroiled in the specifics, he argues that conceptual understanding probably emerged from our talents for symbolic displacement and language. At first, both faculties originated in a primitive form, but this was sufficient to start the gradual construction of a special niche, unique to humans, within and through which the conceptual understanding and articulation of the world gradually developed. In other words, by thinking and talking, humans created an entirely new environment in response to which the human species then further adapted. Once individuals exchange thoughts by means of a (proto-) language, they create a new environment in which newborns will develop. As a result, these individuals do not have to start from scratch, which consequently allows them to enlarge their conceptual and linguistic repertoire. Repeated with each new generation, this results in a cumulative or ratcheting process through which the conceptual understanding and articulation of the world take shape and the space of reasons expands.

The process of conceptualization and articulation results in what philosopher David Sellars called the manifest image, an understanding by which man becomes aware of himself and his place in the world. But how do we get from the manifest to the scientific image, which is a more systematic understanding of the world? According to Rouse, there is no difference in kind, as they both rely on and result from similar processes. Both images are not self-contained representations of the world but emerge from the discursive interactions of people with one another, interactions in which both the focus on what is, as the author often repeats, "at issue and at stake," and the norms by which we evaluate our understanding are continuously reassessed and evaluated, and thus changing. This also means that science should not be understood as providing and constituting an objective picture of the world as seen through the

eyes of an all-knowing God, but as consisting of practices that are geared to solving the problems at hand at a particular moment in time. What these practices are, what norms they abide by, and the problems at hand are all a matter of constant negotiations. These negotiations continuously alter the space of reasons and thus contribute to the construction of an ever-changing and growing niche that is both the result and the domain of our scientific understanding and articulation. By thus fusing the manifest and the scientific image as forms of niche construction, Rouse deeply anchors our scientific understanding in our evolved cognitive abilities and thus realizes the naturalistic understanding of science that he aims for.

4 The Role of Practices

The book is not an easy read. Rouse engages in discussions with other philosophers such as Wilfrid Sellars, John Haugeland, Hubert Dreyfus, and John McDowell who have concerned themselves with similar issues. As a result, the book contains much technical jargon and demands quite a bit of background knowledge, so it is not intended for the philosophically inexperienced. However, those who are willing to make the effort will encounter many ideas and insights that are worthwhile for both philosophers and science educators. For instance, I sympathize with Rouse's naturalistic approach to science and scientific understanding. Indeed, today, naturalistic philosophers tend to agree that science does not constitute a special realm of knowledge delineated by the application of a formal scientific method. Instead, science proceeds through the interaction of biologically and cognitively limited human creatures with their peers and the environment. Scientists have no special powers but rely on ordinary mental abilities that are set to work through practices, norms, and institutions that allow for the expansion of the space of reasons.

This important role of practices in the development of science is of particular interest to science educators. Rouse beautifully illustrates the impact of practices by discussing the role of experiments in the articulation of the concept "gene." He convincingly argues that empirical studies are not simply registrations of natural events, but that they create "laboratory micro-worlds" and "fictions" that put light on previously hidden aspects of the world and that they thus help to open up new conceptual space. In the case of the development of the gene concept, scientists first only thought of genes as vague but helpful theoretical assumptions. Experiments such as those by Thomas Morgan and his group on fruit flies, however, allowed scientists to gain new insights about the gene, for instance that a gene is a material thing that could be manipulated. Understanding that science proceeds through such experimental and other practices including communication and institutionalization highlights the importance of teaching science not as a static body of knowledge, but as a dynamic, on-going process in which humans endeavor to discover new insights about themselves and the world they live in.

5 Niche Construction?

Although I fully agree that our understanding of science should be integrated into our understanding of our cognitive capacities in general, I am not entirely convinced that niche construction is the way forward. Not that the idea of a niche is completely unhelpful to understand our extraordinary cognitive capacities. For instance, Steven Pinker argued that we as humans have entered and adapted to the cognitive niche, in which the handling of

information plays a pivotal role. However, the notion of niche construction in evolutionary biology is highly controversial and should therefore be treated with care. Opponents do not deny that niche construction occurs, but they reject the contention that the concept elucidates crucial processes that have been previously overlooked or ignored by more traditional approaches. In other words, they argue that proponents of niche construction have taken the notion too far. One problem with niche construction is that it is notoriously vague and ambiguous as it denotes any change an organism makes in its environment, whether or not it is ecologically or environmentally consequential, or whether it has a negative or positive impact on the organism and/or its surroundings. As such, niche construction refers to the evolutionary process by which organisms change their environment and subsequently adapt to the new circumstances, or to the mere fact that organisms alter their ecologies. Rouse relies on exactly this equivalence to bridge the distinction between conceptual and scientific understanding.

In doing so, however, he overlooks that the manifest and the scientific image are the results of two entirely different processes. The one arises from a biological, evolutionary process in which capacities adapt to an environment that these capacities themselves, or at least proto-versions, created in the first place. The other originates in a cultural process in which extant biological capacities (that might result from the former process) construct and are set to work in domains that they did not evolve to handle (or, at least, not to that extent). If we want to get a proper grasp of how science works and develops, it does not help to conflate these two processes under the term niche construction. Instead, I suggest that the development of scientific understanding is better understood as an instance of scaffolding, in which humans rely on all sorts of practices, methods, and tools to boost their biological capacities to acquire information about the world. The notion of niche construction fails to capture this important directional aspect of the scientific process.

6 Concluding Remarks

Now, wherever one stands with regard to niche construction, the vehement debates concerning this notion provide a wonderful example and illustration of the important role of the discursive practices in the development of scientific understanding that Rouse rightly brings to our attention. As such, educators can use these debates as a case study to help their students understand how science arises from the continuous interactions of limited and fallible human beings, not an idealized corpus of indisputable, god-like, objective knowledge. At the same time, students can learn that this does not undermine, but actually supports the epistemic superiority of science. By his naturalistic approach to scientific understanding, Rouse has made a valuable contribution to such a realistic, more powerful view on science.

Compliance with Ethical Standards

Conflict of Interest The author declares no conflict of interest.