

FREDERICK W. GIBBS\*

## Riding the Bicycle of Kuhn's *Structure*

To say something is “like riding a bike” suggests intuitive learning and the acquisition of lasting, tacit knowledge. Any task that may be thus described remains difficult to teach explicitly, though some instruction may dampen the learning curve. There is a definitive moment of realization: no training wheels, no hand on your seat; you are on your own! Yet, after experiencing some success, you might struggle to explain exactly what you’ve learned. It’s not just about steering, pedaling, or balancing, but some fuzzy and virtually inexpressible connection between a few crucial forces. Both the process and product of such learning can be remarkably transformative and empowering. The same should be said for learning about Thomas Kuhn’s *The Structure of Scientific Revolutions*.

The students in my graduate seminar on early modern science and the so-called Scientific Revolution predominantly study American history. For most of them, my course will likely be their first and only exposure to the history of science. To make the course useful to these students, who have widely varying backgrounds and generally no intention of pursuing academic careers, broad and accessible themes must take priority over the most recent specialized scholarship. When I first describe such priorities and the contours of the course, virtually every colleague makes some comment or query about *Structure*. I hear over and over again: “Oh, Thomas Kuhn!” Some simply assume that no course on the topic could be complete without Kuhn’s text—perhaps a tight-fisted clutching of an outdated prelim reading list. Others inquire with a morbid curiosity about whether it would appear on the syllabus—as if I were

---

\*Department of History and Art History, 4400 University Drive 3G1, George Mason University, Fairfax, VA, 22030; fgibbs@gmu.edu.

**Acknowledgments** I wish to thank Erika Milam and Michael Gordin for the invitation to indulge my bicycle fantasies; their perceptive feedback produced a much clearer essay. I must also thank Shannon Withycombe for serving as an indefatigable soundboard and for encouraging me to keep my hands dirty.

---

*Historical Studies in the Natural Sciences*, Vol. 42, Number 5, pps. 510–513. ISSN 1939-1811, electronic ISSN 1939-182X. © 2012 by the Regents of the University of California. All rights reserved. Please direct all requests for permission to photocopy or reproduce article content through the University of California Press’s Rights and Permissions website, <http://www.ucpress-journals.com/reprintinfo.asp>. DOI: 10.1525/hsns.2012.42.5.510.

indoctrinating a coven of necromancers with an injunction to brew toad stew on the Sabbath.

Although historians of science rarely engage in such infamous (if unfounded) Paracelsian bombasts as burning the historiographical canon to make a point, both the premise of *Structure* and its role in history (of science) education continues to encourage a plurality of polarized opinions. Considering that *Structure* has already been the subject of countless refutations and revisions, one might be forgiven for believing there is nothing else to say about *Structure*'s fundamental premise other than it's wrong and we should simply move on. What use could there possibly be in teaching outdated and outmoded scholarship?

Even fifty years later, *Structure* is hardly academic pedantry. The basic premise of the book is something novice history graduate students already know about, many of whom assume the veracity of scientific "paradigm shifts" whether they've heard of Kuhn or not. Like the many fictitious scientific "revolutions" that have been convincingly but unevenly dispelled (though still occasionally held up as straw men), Kuhn's ideas, if not the text itself, remain entrenched in popular, if not in specialist, discourse. Such persistence demands, at least for now, a pedagogical responsibility to engage with *Structure* and its legacy.

Historical selectivity and superficiality aside, Kuhn effectively and convincingly outlines the (a)historical appeal of puzzle-solving normal science and, at least when we've adopted an incorrect or inappropriate paradigm, the inevitable outliers that drive paradigm revision and eventual abandonment. One can hardly fault Kuhn for his effort: even the most cynical historians take some delight in explaining complex processes with straightforward models, even when accompanied by reductionist unease. For better or worse, I try in my course to explore both the historical and historiographical constructions of the Scientific Revolution by starting with traditional assumptions and thematically deconstructing them. *Structure* and the discussion (and research) it provoked have proved most effective partners in this regard. As historians and sociologists of science have teased apart the subtleties of Kuhn's thesis, the ensuing debates over the nature of scientific revolutions have themselves become unusually interesting and educational.

I am occasionally panicked by grave doubts about assigning what is arguably a defunct text, especially when most of the course is, at least indirectly, devoted to complicating and/or invalidating it. Am I trying to teach my students to ride an antiquated, iron-tired Boneshaker? Ultimately (and thankfully) the students reassure me that they appreciate and in fact need its organizing

function. One could say that *Structure* occupies the heart of the course. But, with a course more proximately concerned with early modern science in general, perhaps it is more accurate to say that it functions—and performs admirably well—as a base of operations. It provides easily accessible points of departure for various underlying themes that repeatedly surface across many topical discussions about early modern science, such as assumptions and perceptions of theory choice, disciplinary differences across various scientific fields, and the (in)utility of generalizing about motive forces of scientific “progress.” Needless to say, these are lessons that could be learned from a variety of sources. But for a more or less introductory course on the history of science, it remains inordinately effective and efficient. And this is perhaps the principal reason why *Structure* itself (paired with a supporting cast of dissenters)—as opposed to more recent books on the scientific revolution or scientific change that aren’t nearly as ambitious—remains an indispensable tool in the classroom.

Of course, even once the basic premise of riding a bicycle is internalized, cycling experiences vary wildly. The briefest experience jetting around on a 2012 titanium racing kit could hardly be more dissimilar from cruising along on a 1974 steel Schwinn *Collegiate*. It is almost unfair to conflate them as the same activity. *Structure*, too, offers a rare variety of experiences for diverse student interests. For example, Kuhn deliberately challenges the boundaries of history, philosophy, and sociology—with each camp seemingly crying foul in response—an important case study for those who intend to cultivate a cross-disciplinary identity in their careers. Yet Kuhn also turns repeatedly to science education to explain the persistence of scientific models, an oft-neglected component of the scientific enterprise that has appealed to my students who intend to pursue careers in education. For an entirely different audience, Kuhn’s big-picture view of scientific change provides an indispensable historical perspective for analysis of any particular episode (like the Scientific Revolution), as well as the broader terms and categories that can fruitfully (or not) frame such analysis. What students take away from *Structure* thus varies, but the text functions as a remarkably versatile platform and organizing principle, much like a first bicycle ride.

Larger lessons from *Structure* extend far beyond scientific revolutions; they also reflect profitably on the processes of historical change. As Kuhn’s respondents have demonstrated, the notion of a paradigm shift—which could be applied to a variety of vocational or intellectual phenomena—is historically visible at only certain scales and under unfairly controlled conditions. Even if ephemeral, it remains heuristically useful. I recently participated in a Library of Congress workshop on archiving online science content where one

participant wondered whether archivists now faced a “paradigm shift” to cope with new kinds of materials and collecting processes. Everyone in the vocationally varied audience understood the question and its implications to be a essentially a question of “out with the old, in with the new.” But of course it’s not that simple. Examining *Structure* and the responses to it cultivates a finer eye for continuity and discontinuity in times of ostensibly revolutionary change, as well as a more sensitive awareness of the implications of speaking in terms of paradigms and intellectual adaptation.

In the broadest possible sense, assigning *Structure* facilitates exemplary engagement with a “classic” and influential text—including its reception and criticism—that ought to remain a crucial aspect of higher education. If there is one thing that *Structure* did, it was to generate conversations that remain salient. My students have savored engagement with a culturally relevant text, even if it is no longer academically *en vogue*. More specific to my own use of it, *Structure* provides a case study in how historical studies of science are produced under certain intellectual, social, and ideological conditions that reflect instructively on the history of science itself. Of course all texts are produced under various conditions that inform them, but *Structure*’s preface and postscript (in the third edition) reveal an unusually clear meta-level of historiographical context. These considerations, coupled with the way Kuhn makes an explicit argument for the importance of understanding the history of science and knowledge production, can then be easily applied to contemporary reflections on scientific practice—an indispensable goal for my history of science courses.

By the end of the course, the process of analyzing *Structure*—the text, its relationship to the history of science, and its legacy—indeed compares favorably to learning to ride a bike. Students struggle to articulate exactly what they have learned; I can count on wide disagreement as to the definition of a scientific revolution, the extent to which it is a useful construct, and whether such a thing is even possible. Yet, the students insist that they’ve learned something empowering if not transformative. Most importantly, they are able to peddle out on their own, each on their preferred kind of bike. They perhaps ride away from *Structure* itself, but (as they usually indicate) they happily steer toward further reflection on the nature of knowledge production. They acquire an intuition about how different communities—whether scientific or historical—identify and solve problems in their field, as well as gain new perspectives about their own role in that process. Sure, they’ll crash from time to time. But I have a feeling they’ll keep riding.