

## Popular Science, A Useful and Productive Category after All

BY SIGRID SCHMALZER\*

PETER J. BOWLER. *Science for All: The Popularization of Science in Early Twentieth-Century Britain*. Chicago: University of Chicago Press, 2009. x + 339 pp., illus., app., bibl., index. ISBN 978-0-226-06863-3. \$45.00 (cloth).

SALLY GREGORY KOHLSTEDT. *Teaching Children Science: Hands-On Nature Study in North America, 1890–1930*. Chicago: University of Chicago Press, 2010. xv + 363 pp., illus., apps., bibl., index. ISBN 978-0-226-44990-6. \$45.00 (cloth).

NIKOLAI KREMENTSOV. *A Martian Stranded on Earth: Alexander Bogdanov, Blood Transfusions, and Proletarian Science*. Chicago: University of Chicago Press, 2011. xvi + 192 pp., illus., bibl., index. ISBN 978-0-226-45412-2. \$35.00 (cloth).

ASIF A. SIDDIQI. *The Red Rockets' Glare: Spaceflight and the Soviet Imagination, 1857–1957*. New York: Cambridge University Press, 2010. xiv + 402 pp., illus., tables, index. ISBN 978-0-521-89760-0. \$85.00 (cloth).

It seems no longer possible to write a review essay on contributions to the history of popular science without first explaining the use of the term. Scholars have complained that as an analytical category, “popular science” is too unclear (does it mean science for the people, science by the people, science in popular culture, or what?) and that it carries excessive historical baggage as an unworthy “other” to science itself. These concerns so troubled Jonathan Topham, for example, that he opted in a recent contribution to *Isis* to enclose every instance

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of the term in quotation marks.<sup>1</sup> Here, Topham was following James Secord's call for historians to jettison popular science as an analytical category and embrace instead a study of "knowledge in transit" more generally.<sup>2</sup> This has a usefully broadening effect, allowing us to see exchanges between professionals and laypeople as but one form that the movement of knowledge takes. And yet for many purposes it is *too* broad: historians of popular science are interested in not just any exchanges, but specifically exchanges, variously configured, between recognized authorities and people outside that privileged circle.

On the other hand, efforts to frame the category more narrowly limit possibilities of comparison: "public science," "citizen science," and other terms are more loaded than "popular science" when we move into, say, the Soviet Union or Mao-era China (my own field), where "public" and "citizen" are framed differently, and challenges to elite authority and the class character of scientific knowledge had far more purchase than they have in liberal-capitalist contexts.<sup>3</sup> Indeed, scholars of non-Western and subaltern histories are accustomed to the idea that analytical categories are inherently problematic—they are always "from" somewhere, and so always imperfectly map onto local actors' categories. Without believing in its coherence, we may still profitably adopt popular science as an "umbrella label" that brings into relation the diverse ways in which historical actors have constructed and confronted lay/expert boundaries.<sup>4</sup> "Popular science" is thus broad enough to encompass a rich set of scholarly interests and the diverse activities of historical actors in a wide variety of cultural, social, political, and national contexts.

These four worthy books vary widely in subject and approach, but are productively read together in a study of the history of popular science. Bowler's *Science for All* expands our knowledge of British popular science into the early twentieth century and offers a good example of the benefits and limits of a specific focus on the history of elite efforts to bring science to a general audience. Through a detailed examination of the nature study movement in the

1. Jonathan R. Topham, "Introduction" (Focus: Historicizing "Popular Science"), *Isis* 100, no. 2 (2009): 310–18.

2. James A. Secord, "Knowledge in Transit," *Isis* 95, no. 4 (2004): 654–72.

3. However, see Fa-ti Fan's interesting discussion of Mao-era earthquake monitoring as "citizen science" in his "'Collective Monitoring, Collective Defense': Science, Earthquakes and Politics in Communist China," *Science in Context* 25, no. 1 (2012): 127–54.

4. Ralph O'Connor makes a similar point about the term as an "umbrella label" in "Reflections on Popular Science in Britain: Genres, Categories, and Historians," *Isis* 100, no. 2 (2009): 333–45.

early twentieth-century United States, Kohlstedt's *Teaching Children Science* demonstrates the value in bridging the fields of history of science and history of education. Kremontsov's *A Martian Stranded on Earth* touches only lightly on the process of bringing science from elites to the masses, focusing instead on the meaning of "proletarian culture" to an important Soviet figure whose work spanned politics, literature, and science. Finally, Siddiqi's *The Red Rockets' Glare* is an extraordinary social and cultural history of Soviet space science that opens new ways of thinking about popular science in communist contexts.

Scholarly literature on the history of science in Britain and the United States has suggested that by the turn of the twentieth century, professional and popular science had taken different tracks—no longer were the people most central to the production of scientific knowledge willing also to engage in efforts to bring that knowledge to the public. In *Science for All*, Peter J. Bowler seeks to overturn this commonly held notion through a systematic treatment of the popularizing activities of early twentieth-century British scientists. Bowler finds that writing for popular audiences did not threaten the scientists' professional reputations. Scientists made a distinction between "serious" works of popular science and the sensationalist press: the former (targeted at "a social class anxious for self-improvement," 4) was safe and even desirable territory, while the latter (including entertainment-oriented daily newspapers) represented terrain best avoided. Scientists such as Julian Huxley and J. B. S. Haldane who stepped over that line could expect professional consequences. Huxley, for example, gained a popular following with his work on hormones, which "seemed to confirm sensationalist stories about rejuvenation treatments" (222–23). Receiving ten guineas from the *Daily Mail* for a piece, "Secrets of Life," Huxley began actively seeking to stake out a career in popular science writing, including for newspapers and radio; he even resigned his chair at King's College to focus on his popular writing efforts. Bowler grants that this level of popularizing activity could hurt a scientist's career—in Huxley's case, it delayed his election to the Royal Society—but he shows that more measured and sophisticated engagement with popular audiences had no such damaging effects. Bowler further argues that the erroneous idea that scientists were disengaged from the public has arisen from a failure to treat with appropriate skepticism the claims of leftist scientists in the 1930s. These figures wanted to promote their own willingness to mobilize science for social and political transformation and so created a "self-serving myth" about more mainstream scientists' lack of public engagement (6–7). In fact, as Bowler shows, scientists from a wide variety of ideological

backgrounds contributed in important ways to the production of popular science literature.

Bowler further engages with the widely influential literature on the so-called “dominant model” of popularization, embraced by scientists, science popularizers, and (less and less) by historians, sociologists, and philosophers of science. As critiqued most effectively by Brian Wynne, Allen Irwin, and their collaborators, the dominant model assumes that scientific knowledge is produced by experts and then transmitted in simplified form to laypeople, who in turn either are enlightened by the knowledge or, because of their own intellectual shortcomings, misunderstand it.<sup>5</sup> While attractive to people seeking to identify and solve problems of scientific illiteracy, the dominant model fails to provide an analysis of the social construction of expertise, diversity of perspectives among recognized experts, “bottom-up” challenges to expert authority, and the agency of many different kinds of social actors (including government officials, workers, publishers, and the audience itself) in the production and dissemination of knowledge. As Stephen Hilgartner has demonstrated, the dominant model also supposes a false distinction between “pure” knowledge produced by scientists and the inevitably simplified and thus distorted “impure” knowledge transmitted to the public.<sup>6</sup> Yet Bowler argues that a top-down form of popular science in fact existed: challenges to expert authority had largely been marginalized in Britain by the 1920s, while lower-middle- and upper-working-class readers bent on “self-improvement” created a market for a popular science literature produced by recognized scientific authorities. Readers expected a top-down structure, and this is what publishers gave them by recruiting research scientists to produce “serious” popular science literature (77).

Bowler is certainly not guilty of the sin for which he fears he will be criticized (11)—that is, subscribing to a simplistic version of the top-down model. He recognizes diversity of expert scientific knowledge, taking pains throughout the book to highlight the differences among different types of popularizers, including religious conservatives, leftists, and materialists not associated with the political left. Prominent paleoanthropologist Arthur Keith, for example, encouraged the public to embrace the materialist perspective that science made possible; Oliver Lodge countered that new developments in science ultimately

5. See, e.g., Alan Irwin and Brian Wynne, *Misunderstanding Science? The Public Reconstruction of Science and Technology* (Cambridge: Cambridge University Press, 1995).

6. Stephen Hilgartner, “The Dominant View of Popularization: Conceptual Problems, Political Uses,” *Social Studies of Science* 20, no. 3 (1990): 519–39.

supported a religious view of the world; meanwhile, Marxists like J. D. Bernal went beyond espousing materialism in their endorsement of a Soviet-style planned economy and structural change that made “the application of science to public affairs as a duty for every citizen” (31). Bowler also broadens his discussion past the scientists themselves to include the central role publishers played in shaping popular science literature: they not only recognized the potential market, but actively sought to create the audience by educating the public to appreciate serious scientific literature and by recruiting top scientists to write for their book series and magazines. And Bowler makes an effort to recognize the significance of the audience in driving the demand for certain types of popular science literature.

Nevertheless, Bowler ultimately uses his findings to assert the validity of the dominant, top-down model of science popularization. In doing so, he misses the point of the model’s critics: they would no doubt be interested in Bowler’s historical evidence of widespread enthusiasm for top-down popularization efforts, but they would continue to maintain that the top-down model provides insufficient analytical robustness to explain the complex social interactions involved in the popularization of scientific knowledge. Indeed, Bowler could have employed his evidence to argue that the dominant model was itself produced through the actions of diverse social actors, not the least important being the consumers themselves. This by no means proves the analytical worth of the dominant model, as Bowler suggests, but would supply historical context for engaging in further investigations of how it came to be so dominant. Moreover, this shift in focus would highlight the agency of laypeople in a way that the chief critics of the dominant model would be certain to appreciate.

Sally Kohlstedt’s *Teaching Children Science* turns our attention to the early twentieth-century U.S. K–12 classroom, where “nature study” proved a compelling cause for scientists, educators, and social reformers. Like Bowler, Kohlstedt is engaged in a revisionist history that calls into question commonly held notions about the respectability of popular science in the early twentieth century. She finds that histories of science and education alike have been far too dismissive of the nature study phenomenon, in large part because they have relied on the judgments of observers from the 1940s, when nature study had lost some ground and had become associated with an old-fashioned and overly feminine approach to science education. (Not only were many theorizers and teachers of nature study women, but the principles underlying it were easily characterized as “sentimental” since they sought to foster not just knowledge but love of nature.) But Kohlstedt has found plentiful and rich materials in

archives across the country testifying to the tremendous respect nature study commanded during the four decades spanning 1890 to 1930.

Kohlstedt shares with Bowler an attention to diversity among historical actors and purposes. She argues that nature study was flexible enough to accommodate a wide range of goals for scientists, teachers, administrators, textbook authors, local voluntary organizations, and other proponents of nature study. University professors anxious about the preparation of their students sought to use nature study to introduce science into school curricula. Progressive educators such as Wilbur Jackman saw in it a means of applying contemporary ideas about child psychology to promote experiential learning over rote memorization. Conservationists celebrated its potential to instill respect for nature in future generations and they linked nature study to campaigns to protect wild animals and conserve land—for example, mobilizing children in a campaign to stop killing birds for women's hats (139). And of course many progressives saw in nature study an instrument for civic reform: for example, in Worcester, Massachusetts, Clifton Hodge created curricula around the mosquito life cycle and so linked nature study to the urban sanitation project of eliminating stagnant water for mosquito control; in rural areas around the country, educators like Liberty Hyde Bailey and the husband-and-wife team John Henry and Anna Botsford Comstock linked nature study to agricultural rejuvenation; and reformers even found in nature study a vehicle for sex education, and vice versa—Bertha Chapman Cady and her husband Vernon Cady argued in their book *The Way Life Begins* that sex education could bring across “the deeper meaning of nature study” (141).

In her analysis of the reasons for nature study's decline, Kohlstedt reinscribes the very notion that Bowler seeks to overturn: the early twentieth-century retreat of professional scientists from public engagement. However, Kohlstedt and Bowler's arguments are not entirely at odds. Both see scientists as enthusiastically spreading scientific knowledge but selective about the activities they would undertake. Bowler finds scientists willing to write “serious” books about science for general audiences but unwilling to risk their professional credibility by appearing in newspapers or other venues tainted with sensationalism. And Kohlstedt shows that scientists increasingly rejected nature study because they favored a more rigorous, systematic approach to studying science in its own right, rather than integrated with the humanities in a curriculum centered on progressive notions of child psychology and development.

Given the wide range and sheer number of different nature study proponents that Kohlstedt charts, it seems unfair to highlight absences in her

narrative. Still, given the possibilities that emerge as we juxtapose Kohlstedt's book with the others considered here, it is unfortunate that we see nothing of the interest nature study held for U.S. socialists. As Julia Mickenberg notes, even these "hard-headed materialists" found inspiration in the way that nature study writings communicated moral lessons. In books for children, socialist writers used lessons from nature to critique capitalism and inspire struggle against injustice.<sup>7</sup> Kohlstedt's account does, however, make clear how closely intertwined popular science was with progressive politics in the early twentieth-century United States, and in the process uncovers a central tension in nature study that should be of interest to historians of popular science. On the one hand, an emphasis on experiential learning encouraged self-expression and other progressive values in education; on the other, the elitism of those same progressive reformers could produce a surprisingly "didactic and patronizing" nature study curriculum. In particular, Kohlstedt shows that where it was introduced in schools serving African American and Native American children, nature study often degenerated into vocational training in agriculture and industry (108). The relationship between class (and here, racial) politics and popular science is a critical—though to my mind still understudied—theme in the historical literature; when we turn to the cases of socialist countries like Mao-era China and the Soviet Union, the question of the class character of scientific knowledge becomes a much more obvious—though still, as we will see, not always defining—theme.

Nikolai Kremmentsov's intriguing *A Martian Stranded on Earth* offers a very different approach to the study of popular science from either of the two books examined thus far. Rather than attempt a systematic charting of an entire genre or field, his slim volume focuses on one figure, Alexander Bogdanov, who gained fame separately in the realms of politics, literature, and science. For Kremmentsov, Bogdanov's concept of "proletarian science" is what binds these three facets of Bogdanov's life together (5). In the first decade of the twentieth century, before his fateful clash with Lenin (the two vied for leadership of the Bolshevik party, leading Lenin to target Bogdanov in his canonical 1909 work *Materialism and Empirio-criticism: Critical Comments on a Reactionary Philosophy*), Bogdanov enjoyed a reputation as the leading theorist of the Bolshevik party. Out of his philosophy of empiriomonism, Bogdanov developed a critique of the overly specialized and fragmented approach to science

7. Julia L. Mickenberg, *Learning from the Left: Children's Literature, the Cold War, and Radical Politics in the United States* (Oxford: Oxford University Press, 2006), 183–87.

fostered under capitalism; a properly “proletarian science” would be rooted in “labor practice,” would focus on “general principles,” and would be free of the specialized jargon that prevented ordinary people from comprehending scientific writings. At the same time, Bogdanov began writing science fiction. His first novel, *Red Star* (1908), depicted a Martian utopia, where collectivism organized and gave meaning to life. *Red Star* presented all the expected elements of a socialist utopia, but with an unusual addition: the collectivization of biological life through blood transfusion, or as a Martian doctor put it, “the comradely exchange of life not only in the ideal but also in physical existence” (45). It was not until 1922, after a chance discovery of a British work on blood transfusion, that Bogdanov began earnestly pursuing actual research on blood transfusion as a means of rejuvenating life through “physiological collectivism.” He and a close circle of friends secretly started transfusing their blood in 1924. By 1925 their work had come to the attention of Stalin, who had become increasingly concerned about debilitating exhaustion suffered by many party leaders; with Stalin’s support, Bogdanov became the director of the new Institute of Blood Transfusion in 1926.

Bogdanov’s history speaks to key questions in the history of popular science, though Kremontsov does not engage with the literature on popular science (not even James Andrews’s seminal work on the Soviet Union, *Science for the Masses*).<sup>8</sup> As elsewhere in the early twentieth century, sensational science news had a prominent place in Soviet society. Even as Bogdanov was beginning his clandestine experiments with blood transfusion, foreign efforts to “rejuvenate” the body through gland transplants had reached the public via radio, film, public lectures, and many articles in popular newspapers and magazines. Bogdanov rode this wave to place several articles in key newspapers and to secure a very positive review of his book on blood transfusion theory. However, he was far less successful among physicians and scientists. Kremontsov suggests this was partly because his political commitment to proletarian science led him to eschew disciplinary conventions, and his book as a result could not convince scientific professionals. This was one way in which Kremontsov seeks to demonstrate his introductory supposition that proletarian science “predetermined the ultimate failure of [Bogdanov’s] research program” (5).

Kremontsov also offers an interesting critique of the contradictions inherent in Bogdanov’s own understanding of proletarian science. Despite his

8. James Andrews, *Science for the Masses: The Bolshevik State, Public Science, and the Popular Imagination in Soviet Russia, 1917–1934* (College Station: Texas A&M University Press, 2003).

valorization of “labor practice,” Bogdanov’s writings were highly theoretical and neglected an analysis of “science as a ‘labor process’ that involves not simply *reasoning* about, but actually *doing*, certain things” (117). Nevertheless, it is far from clear that such contradictions explain Kremmentsov’s own obvious disdain for proletarian science. Rather, the book’s penultimate paragraph summons Lysenkoism<sup>9</sup> in a way that suggests this enduring symbol of Soviet science perhaps predetermined the frame with which Kremmentsov was bound to evaluate Bogdanov. And so Kremmentsov raises, and leaves open, the question of how Soviet medicine “was able to ‘outgrow’ Bogdanov’s own proletarian science ... while Soviet biology ... succumbed to Lysenko’s proletarian agrobiology” (126).

This use of Lysenkoism as the key reference point for the history of science in the Soviet Union is a pattern Asif Siddiqi successfully ruptures in his brilliant *The Red Rockets’ Glare: Spaceflight and the Soviet Imagination, 1857–1957*. This is by no means the first history to challenge the reduction of Soviet science to Lysenkoism, but it may well be the most compelling. Siddiqi follows Kojevnikov and others in showing that the Soviet state’s role in science was not merely “ideological interference.” But he goes further by bridging history of science and technology with the history of society and culture to argue for a “science from below,” in which actors outside the state apparatus profoundly influenced the direction of science and technology. Thus, he concludes, “Sputnik was not a triumph of Soviet science” (363): while the state played an obvious and important role in this landmark event of space flight, it had to be nudged there by “space activists” who emerged out of a long history of popular fascination with space exploration.

Like Kohlstedt and Kremmentsov, Siddiqi does not explicitly engage the secondary literature on popular science. He uses the term “popular science” to mean literature aimed at bringing scientific knowledge to general audiences—the kind of literature that Bowler discusses so thoroughly for early twentieth-century Britain. However, he weaves this strand together with several other popular phenomena to paint a portrait of “science from below.” He begins with the story of Konstantin Tsiolkovskii, a story strikingly reminiscent of

9. Trofim Lysenko (1898–1976) was a Soviet agronomist who opposed Mendelian genetics and promoted plant-breeding practices based on a theory that organisms could inherit the acquired characteristics of their parents. Lysenko’s rise accompanied the persecution of geneticists and the stifling of research in genetics. Though very worthy of study, this episode has dominated the professional and popular literatures in a manner that weakens our understanding of the rich and complex history of Soviet science as a whole. Useful discussions of Lysenkoism include Nils Roll-Hansen, *The Lysenko Effect: The Politics of Science* (Amherst, NY: Humanity Books, 2005).

Bogdanov's. Here again we see a man who used both science fiction and scientific theorizing to explore utopian dreams. While Bogdanov sought in his Martian novels to portray "proletarian science," Tsiolkovskii was no revolutionary: his novels, penned in the imperial era, foregrounded the technical questions involved in imagining spaceflight. Nor was he a professional scientist, but rather a schoolteacher and self-taught space enthusiast. After 1917, the new society inherited a "new kind of science" that had emerged from the intersections of popular science literature, science fiction, and amateur theorizing that Tsiolkovskii represented.

The Soviet state was largely indifferent to or even disapproving of the 1920s "space fad," which attracted visionaries of many stripes, from Bolsheviks projecting revolution onto Mars *à la* Bogdanov, to "Cosmists" who celebrated "immortalism and interplanetarianism." The space fad nonetheless paved the way for amateur space enthusiasts in the 1930s to pursue rocket engineering; contrary to the notion of a centralized state authority over science, it was the success of these "rocketeers" that convinced the state to support further research into spaceflight. (If Siddiqi were to bring Kremmentsov's study of Bogdanov into the picture, he might see Bogdanov's unofficial "organization of physiological collectivism" as demonstrating a similar agency on the part of non-state actors.) The dynamic relationship between state and social forces continued into the Cold War era: the ICBM was conceived by people who had grown up dreaming of spaceflight; missile designers then formed alliances with popular science writers to promote space exploration as a national cause. This was the road to Sputnik.

Siddiqi's account stands in striking contrast to Kremmentsov's. Siddiqi does not merely de-center Lysenkoism, he leaves "proletarian science" almost entirely out of the picture. Especially in the chapter on mass voluntary associations and rocket engineering—which features a team of low-level workers from airplane factories who designed rockets in their spare time—I expected to read about ideas (like Bogdanov's) on the relationship between labor and scientific knowledge. But very little discussion of Marxist ideology appeared, and though I have to say I missed it (not only for its undeniable historical influence, but also because of the fertile ground it lays for comparison with my own area of socialist China), its absence is in many ways Siddiqi's key contribution. Siddiqi's "science from below" is different from "proletarian science": it represents not a revolutionary vision devised by a party theoretician, but a diverse set of actual practices on the part of people inside and outside the state apparatus; not a class-based challenge to bourgeois science, but a more broadly social challenge

to (and sometimes collaboration with) state science. Siddiqi has shown that it is possible to write a history of popular science in the Soviet Union that is neither about state-directed efforts to disseminate scientific knowledge, nor about ideologically based celebrations of “worker innovations,” but rather about a broad social and cultural phenomenon—in this case, the pursuit of space exploration—that transcends boundaries of class, ideology, and state-society.

The opportunity to highlight such boundary crossings—found in various forms and to various degrees in all four books considered here—is perhaps the most intellectually compelling reason to study the history of popular science. Just as the authors themselves position their work as bridging fields, the very clustering of these four books is itself a form of boundary crossing. Continuing to employ the category “popular science” makes it easier to think across diverse historical contexts and aids us in our key task of making visible the differing ways boundaries between scientists and laypeople, science and culture, state and society have been constructed and transgressed.