

geological relics. As Chapter 5 explores, field research in central India also dislocated the origins of human evolution from Europe to an Indo-African landmass that geologists named “Gondwana” in 1880s. Gondwana, a term adopted from precolonial Mughal texts for the vast forests of central India, became incorporated into the international lexicon of geology as a georacial category that united landmasses of the Southern Hemisphere—including South America, Australia, Africa, and Antarctica—or the colonized world. These penultimate chapters masterfully detail how certain landscapes, such as Gondwana, became metonyms for ancient forms of human and nonhuman life. Scholars have debunked many of the fallacies about race and the earth’s history inscribed in these categories. But the historical imagination of Gondwana remains a potent category in contemporary India, as marginalized forest-dwelling groups utilize it for political organizing.

Another core strength of the book is the comparative lens Chakrabarti brings to each chapter. He details how debates in India over the antiquity of the earth and its inhabitants both departed from and fed into contemporaneous research on evolution and earth history in Europe, on one hand, and from geological and ethnographic research unfolding in Australia and South Africa, on the other hand. The result is a deft account of how European encounters with new rock formations and “tribal” societies in their overseas colonies shaped the theories and methods of geology as it became professionalized as a discipline in the nineteenth century. These comparisons also raise questions that scholars of the earth sciences elsewhere on the globe might fruitfully engage. Were geological concepts forged in colonial Latin America and Africa shaped by the ideologies or textual traditions of specific ethnolinguistic or religious groups? Did members of these groups use geological research to buttress claims to autochthony in the face of colonial encroachment on land and other natural resources?

Written in clear and engaging prose, *Inscriptions of Nature* will become mandatory reading for scholars and the broader public interested in how the field sciences shaped notions of race and racism, planetary geography, and deep time that persist in the present day.

Robyn d’Avignon

Robyn d’Avignon is Assistant Professor of History at New York University. She is the author of A Ritual Geology: Gold and Subterranean Knowledge in Savannah West Africa, forthcoming with Duke University Press.

David Trippett; Benjamin Walton (Editors). *Nineteenth-Century Opera and the Scientific Imagination*. xv + 381 pp., figs., tables, bibl., index. Cambridge: Cambridge University Press, 2019. £90 (cloth); ISBN 9781316275863. Paper and e-book available.

The cultural historian Celia Applegate recently observed that historians and musicologists currently work in a “Schengen zone of scholarship” (Applegate, “Music among Historians,” *German History*, 2012, 8:329–349, p. 329). Just like in Central Europe, where border checkpoints are a thing of the past, many scholars in the humanities today cross disciplinary frontiers effortlessly. Without ignoring or sacrificing their “regional” differences in language, traditions, knowledge, and methods, they follow joint interests in particular cultural objects. The cross-border traffic between musicology and the history of science exemplifies that process. Both disciplines have been producing groundbreaking work on the history of psychophysics, acoustics, sound, psychology, and instrument-making in the nineteenth century for over a decade now. Differences in approaches remain, but the objects of scholarly interest are rarely used to defend a particular discipline or secure its disciplinary identity. The object of this collection—the relationship between opera and science in the nineteenth century—demonstrates the fruitfulness of that development, and many of the book’s contributors have helped to shape the research field themselves.

The editors, Cambridge music historians David Trippett and Benjamin Walton, define the goal of their undertaking from an intrinsically historical viewpoint. It is only retrospectively, they argue, that opera and science appear as “naturally” separate, even opposed, fields. Historicizing the relationship between those fields since the eighteenth century and the process of disciplinary fragmentation, the editors follow the contemporary actors in thinking about opera not just within a scientific context, but in direct interaction with science. Scientists and musicians (in the broadest sense, including composers, critics, stage managers, instrumentalists, and singers) shared a universe of values and ideals. They were connected through a common bourgeois background, but they also actively constituted each other’s practices and discourses. In the words of the editors, the volume studies this “complex reciprocity, in which operatic production and performance is transformed and reframed by its contact with a variety of scientific (and pseudo-scientific) thought, and where different branches of science are informed and shaped by their contact with opera” (p. 5). The publication exemplifies an epistemological shift from text to sound, and from music to listening and the “agentic capacities” (p. 18) of instruments themselves, both musical and scientific.

Within this theoretical framework, the volume brings together fourteen case studies, ranging from the eighteenth-century Italian and German “science operas” in Italy to the *fin-de-siècle* premieres of Richard Strauss’s *Salome* in Western Europe and North America. It is thematically divided into four sections. The first, “Voices,” explores how science and technology shaped the art of operatic singing and how, conversely, the operatic voice became part of scientific research. For example, Benjamin Steege discusses the adoption of the laryngoscope and self-observation for vocal operatic training, and Céline Frigau Manning asks how hypnosis opened up connections between voice and gesture in late nineteenth-century Paris. The second section, “Ears,” shifts attention to hearing or listening and composing. As the case of Hector Berlioz shows, scientific theories of perception became part of compositional technique and made the stage into an experimental space for hearing (Julia Kursell). Also in this section, David Trippett’s study of the nineteenth-century comparisons between the ear and the Aeolian harp in theories of auditory mechanisms by Hermann von Helmholtz and others reveals a growing interest in “automatic audition” (p. 144). The third section focuses on the role of technologies, presenting examples of opera’s fascination with lunar astronomy and balloon flights in the eighteenth century (Deirdre Loughridge) and the difficulties of introducing technological innovation in the case of Garnier’s new Paris Opéra shows (Benjamin Walton). The final section deals with the effects of opera experience on bodies—for example, fears about the neurasthenic effects of experiencing Wagner’s operas, associated with a danger of losing control (James Kennaway).

While towering figures of nineteenth-century operatic life are still center stage in this volume (Strauss, Wagner, Puccini, Berlioz), the essays chart new territory, covering a wide range of themes that are often enriched with dazzling historical detail. Despite the specificity of each case (to which I cannot do justice here), several of the fundamental questions of nineteenth-century intellectual life recur: Can audiovisual experience help to heal the body and soul? How dangerous is musical listening? How do we objectify perception, and is it automatized? What is the relationship of humans to machines? And how can artists “scientize” their craft? Behind these issues looms a larger concern, the relationship between art and science in society. Here, a mixture of utopian belief and apocalyptic fear emerges from these histories of breathing and neurasthenia, architecture and aeronautics, automata and hypnotism.

Although the volume already covers a very broad range, one wonders whether the role of the cultural or social sciences in this history might also have been of interest. We get a sense of that possible expansion in Alexander Rehding’s essay, the last in the book. Rehding looks at the first premiere of *Salome* with respect to the concept of “cultural degeneration,” which he traces back to the “unholy trinity” of “criminal pathology, evolutionary biology and social Darwinism” (p. 304). He shows that scientific or pseudoscientific claims were not just projected onto stage but were also made into cultural and historical knowledge when music historians established a model of evolutionary history. Strauss’s music became a powerful space of projection to order both past and present through the scientific and historical concept of degeneration—though audiences themselves tended to ignore music historians’ admonitions. Rehding’s approach points to the potential for further research in this area, for which the volume is an excellent starting point.

It may be anachronistic to label the reciprocity of opera and science in the nineteenth century, outlined so vividly in Trippett and Walton's book, as another "Schengen zone." But it is nevertheless tempting, since for nineteenth-century European contemporaries opera and science were not opposed territories, but two typical ways of thinking and listening, observing and reflecting, experimenting and experiencing.

Hansjakob Ziemer

Hansjakob Ziemer is a senior research scholar at the Max Planck Institute for the History of Science in Berlin. Most recently, he coedited the special issue "Sounds of Language—Languages of Sound" (History of Humanities, 2021, vol. 6, no. 1), with Julia Kursell and Viktoria Tkaczyk.

Elizabeth Reis. *Bodies in Doubt: An American History of Intersex.* (Second Edition.)

296 pp., photos, illus., notes, index. Baltimore: Johns Hopkins University Press, 2021.

\$30 (paper); ISBN 9781421441849. E-book available.

"Within the last decade, America has discovered intersex" (p. vii), writes historian Elizabeth Reis in the new preface for the second edition of *Bodies in Doubt*. Indeed, as she points out, since her American history of intersex was first published in 2009, the attention on intersex issues has risen dramatically, as is evident in the wealth of popular and scholarly writing on the subject. Debates about the ethical issues and the long-term consequences of the medicalization of sex are in fact closely linked (and one might say constitutive) to the emergence of historical writing on this subject in the 1990s. It is fitting then that the new edition of Reis's superb survey of medical, legal, and lay engagement with individuals whose sex was doubted or deemed "ambiguous" has two thoughtful new chapters that engage with the history of bioethics and the politics of naming and categorizing intersex, respectively.

The original five chapters remain the same, providing an engrossing and carefully researched overview of attitudes toward people with intersex traits from the colonial period to the present. Here Reis covers much ground, contextualizing medical practice within shifting cultural social contexts of American life: from colonial conceptualizations of "monstrous births" and the legal ramifications of sex, to the increasing medical authority over sex assignment in the nineteenth century, to the growing importance of psychological sex in the twentieth century. Reis's book convincingly straddles the idiosyncrasies in the conception and treatment of intersex in the United States, as well as pointing out the constants such as that the success of medical intervention was measured by social goals, particularly heterosexual marriage, which often trumped what physicians perceived as biological evidence of sex.

The new Chapter 6 focuses on the period after World War II and asks why the rise of bioethics and informed consent "only marginally affected the way physicians treated those born with intersex traits" (p. 153). Despite new international and national guidelines for the ethics of the medical profession, American physicians' slowly emerging commitment to seeking informed consent did not apply to the medical engagement with intersex patients. This, as Reis argues, has reasons specific to the history she lays out in her book: the highly influential protocols, which psychologist John Money and psychiatrists Joan and John Hampson developed at the Johns Hopkins Hospital in the 1950s, recommended medical and surgical intervention in infancy. Consequently, intersex care increasingly focused on infants rather than, as was previously the practice, adults who had more of a say about determining their gender. Physicians sought informed consent only from stressed parents who were often "desperate for 'normal' children with 'normal' gender identities" (p. 161) and thus deferred to medical authority rather than waiting until their children could express their wishes. While parents' medical decision making for their children is common practice, Reis interjects that genital surgeries in infancy have long-term consequences for a person's sexuality and gender identity and are not strictly "medical" but rather a response to a social need.

The question of perceived medical necessity informs the core of the conflict Reis discusses in her new Chapter 7, where she argues persuasively that understanding the politics of the naming and classification