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An engraving depicting an early meeting of the Royal Society.

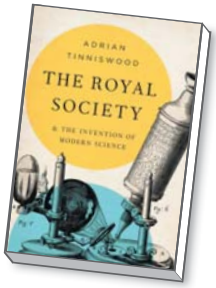
The legacies of the Royal Society of London

Writing a balanced, accurate, and broadly positive history of the Royal Society of London is a difficult task. The society figures in virtually all accounts of early modern experimental science, but the true extent of its influence is notoriously hard to assess. Early members of the society include some of the most renowned names in 17th-century science—Robert Boyle, Christopher Wren, Robert Hooke, Isaac Newton, Giovanni Domenico Cassini, Christiaan Huygens—but the Royal Society itself is not the primary reason for their fame. Furthermore, popular writing about the society unhelpfully tends to seize upon methods and practices from the 17th century that vaguely resemble modern science, and to treat those methods and practices as if the Royal Society immediately established them as permanent features of science. Historically nuanced accounts often try to clear away misguided overclaiming before they set to work, but they can seem grudging or disparaging as a result.

With *The Royal Society and the Invention of Modern Science*, author Adrian Tinniswood has made a respectable compromise between the constraints of academic history, the power of the origin myths of modern science, and the need to keep readers entertained. The book's most contentious claim is implied in its title—that the Royal Society was principally responsible for inventing modern science. That is a huge stretch, one made barely deniable by the slightly evasive "and." In practice, however, the book makes no real attempt to defend it.

Instead, Tinniswood offers a brisk institutional history slanted heavily toward the Royal Society's foundation in 1660 and its early years. A series of thematic chapters highlights key phases in the society's development and the most important areas of its activity—notably its early commitment to experiments and the emergence of *Philosophical Transactions*, the world's first scientific periodical, which contributed significantly to the society's wider reputation and to its burgeoning role as a hub of scientific communication.

The significance of *Philosophical Transactions* is emblematic of a more general historical insight about the society—that it mattered more as a constructor and promoter of scientific communities than as a primary producer of experimental knowledge about nature. *The Royal Society and the Invention of Modern Science* is careful to keep that distinction in view. Tinniswood's previous books, including *The Polite Tourist: Four Centuries of Country House Visiting* (1999) and *Behind the Throne: A Domestic History of the British Royal Household* (2018), reflect his abiding preoccupation with English social elites. That preoccupation serves him well when he writes about the society's first members. He recognizes the society's tendency to consider rank as a qualification for membership and is able to view titled members with interest without making undue claims about their actual scientific achievements.



The Royal Society and the Invention of Modern Science
Adrian Tinniswood
Basic Books, 2019.
$26.00

In fact, many members of the Royal Society were ambivalent about the virtues of a self-selecting association sustained entirely by voluntary labor and about the preponderance of gentlemen amateurs in the membership. Tinniswood devotes a chapter to the important reformist critiques of the 1830s, which were articulated by mathematician Charles Babbage, among others. Babbage and his allies argued passionately in favor of making scientific expertise a formal criterion for both the election of fellows and the evaluation of research.

And the critiques didn't just come from within. An organization that dedicated its time to transfusing the blood of a sheep into a young man, or to investigating the luminescence produced by putrid meat, or to discussing the possibility of a civilization on the Moon, always ran the risk of being lampooned as a gang of crackpots and fantasists. Jonathan Swift and Henry Fielding were merely the most prominent of those taking satirical aim at the society during the first 80-odd years of its existence.

Mockery might have upset the fellows of the Royal Society but, as Tinniswood observes, it did little to deter them. The society's prestige and its involvement with scientific projects at a state level increased as the 18th century wore on. The society oversaw major expeditions

such as Charles Mason and Jeremiah Dixon's surveying work in North America and James Cook's voyage to the South Pacific in 1769. Joseph Banks, a gentleman botanist from Lincolnshire who took part in Cook's voyage as a naturalist, became an instant celebrity on his return and was elected president of the Royal Society in 1778; he served until 1820. It was Banks, more than anyone, who helped to develop the society's role in public life and the advisory functions it still exercises today.

Tinniswood's account of the society's history from about 1800 to the present, including Banks's transformative presidency, is rather perfunctory, focusing on a couple of episodes only. He offers a useful retelling of the society's drawn-out efforts to exclude women until the election of Kathleen Lonsdale and Marjory Stephenson as the first women fellows in 1945, but his account of the debates in the 1930s about the social responsibilities of science and scientists could have been extended. Within the constraints imposed by brevity, however, Tinniswood's book is an entertaining and remarkably balanced account of a fascinating institution.

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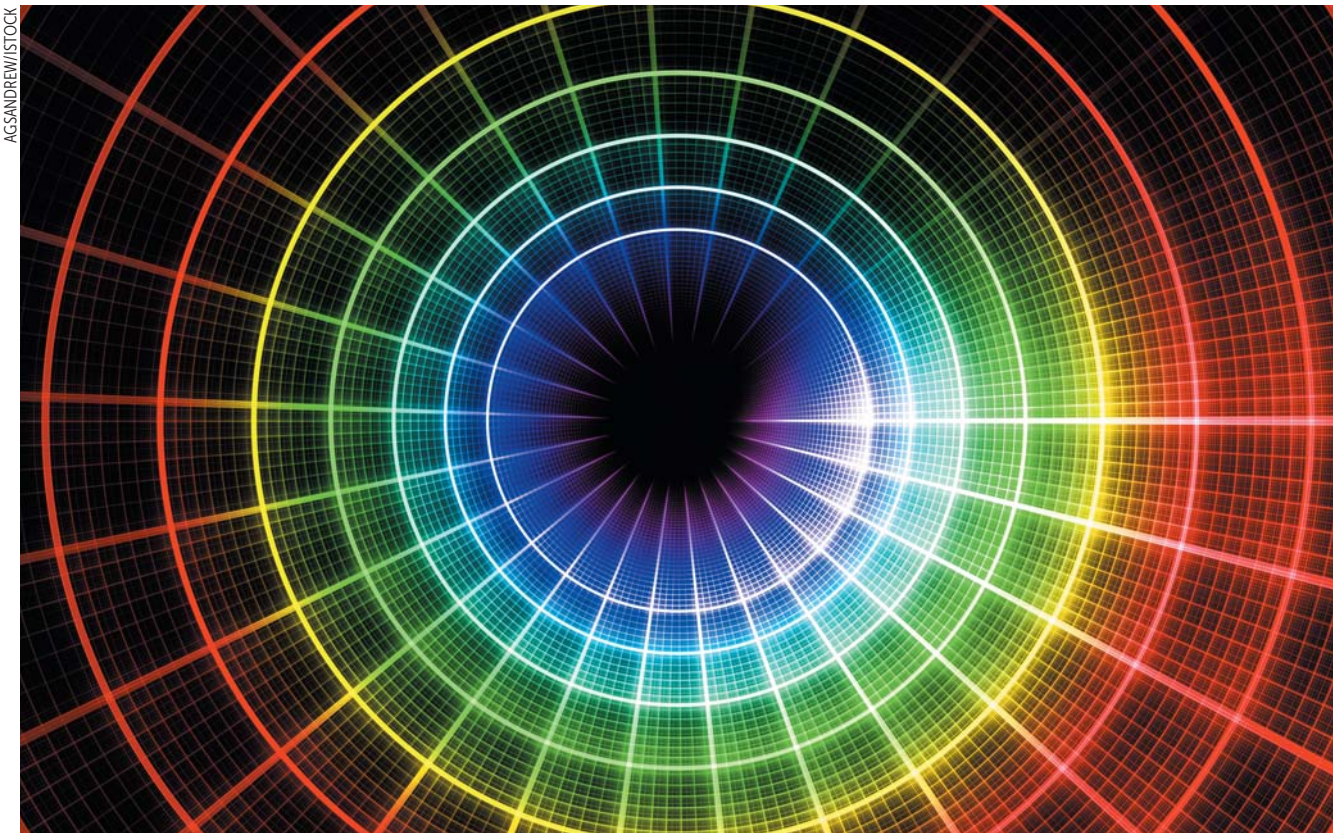

The mathematics and physics of electronic structure theory

The theory of electric polarization underwent a genuine revolution in the early 1990s. In the wake of that revolution, some long-established views about other observables have been superseded, the most notable being orbital magnetization. The geometry of the electronic ground state provides the formal mathematical expression for those observables, and the archetype for all of them is the geometric phase in quantum mechanics, discovered by Michael Berry in 1984.

Berry Phases in Electronic Structure Theory: Electric Polarization, Orbital Magnetization and Topological Insulators provides a comprehensive pedagogical account of several breakthrough developments in electronic structure theory associated with geometric phases. Its author, Rutgers University physicist David Vanderbilt, is eminently qualified for the task: He is the senior author of a large part of the research at the book's core. That literature is now fundamental knowledge for any scientist working on modern electronic structure. Some of the methods

Berry Phases in Electronic Structure Theory
Electric Polarization, Orbital Magnetization and Topological Insulators

David Vanderbilt
Cambridge U. Press, 2018. $79.99