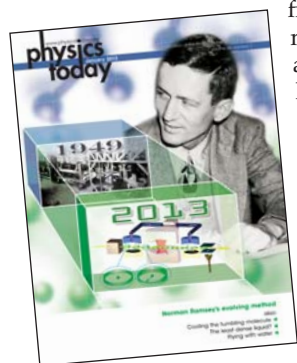


A Norman Ramsey cover story

The January 2013 issue of *PHYSICS TODAY* contained informative and enjoyable articles on Norman Ramsey's separated oscillatory field method and its continuing impact on precision spectroscopy research (pages 25, 27, and 36). However, a photo on the cover may be misleading. The molecular-beam apparatus labeled as "1949" was actually constructed by Tom Gallagher (now at the University of Virginia) and me as part of our thesis projects done under Norman's guidance at Harvard University in 1969–70.

Although originally designed for high-precision measurements of hyper-



fine structure in molecules, the apparatus was later used for a search for *P*- and *T*-violating effects in molecules.¹ After Norman closed down his Harvard laboratory in the 1980s, the apparatus was transported to St. Olaf College in Minnesota, where Jim Cederberg, another Ramsey graduate student, used it for undergraduate research projects for more than 25 years. During that time, according to Jim's website, more than 70 students worked with the apparatus to study the hyperfine structure of polar molecules; that work resulted in 16 published papers. A few years after Jim retired from St. Olaf, the apparatus was moved to Georgia's Southern Polytechnic State University; under the direction of Lu Kang, it will, I hope, inspire another generation of students in the joys of atomic and molecular spectroscopy.

Not only does Norman's intellectual legacy live on, but at least in this case, the physical apparatus itself continues to be productive after more than 40 years of active use.

Reference

1. D. A. Wilkening, N. F. Ramsey, D. J. Larson, *Phys. Rev. A* **29**, 425 (1984).

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Impressionism, Realism, and the aging of Ashcroft and Mermin

For many years I have been eagerly awaiting the second edition of Neil Ashcroft and David Mermin's *Solid State Physics* (Holt, Rinehart, and Winston, 1976). It is undoubtedly one of the best physics books ever written, but it is not aging well: An insensitive community keeps advancing the field with little respect for its prophets. However, after learning in *PHYSICS TODAY* (July 2012, page 8, and Mermin's response to letters, December 2012, page 12) that Mermin has become a QBist, I am afraid the sharp explanations in the first edition might become as blurred as Marcel Duchamp's *Nude Descending a Staircase* (No. 2). How are we supposed to understand statements such as "Filled Bands Are Inert," one of the book's subheadings, from a QBist perspective? What is the Bayesian account of an exciton? And how about effective masses? Are they the second derivative of a belief?

My only hope is that Neil Ashcroft remains, if not a full-blown Realist, at least an Impressionist whose motifs can be clearly identified by our aging eyes.

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■ **Mermin replies:** I am a realist. But my model of reality necessarily rests on what I have experienced, either directly, or indirectly through the reports of others. For all practical purposes (FAPP, John Bell's famous adverbial acronym), it doesn't matter if, like most physicists, I confer reality on such theoretical abstractions as quantum states or energy levels that enable me to calculate the likelihood of my subsequent experience. But for resolving obstinate conceptual conundrums (FROCC), such as "the quantum measurement problem" or "quantum nonlocality," it is crucial not to reify our intellectual tools. "Filled bands are inert" means

FROCC that "if the electronic state I assign to a crystal is an antisymmetrized product of Bloch levels, then, in calculating the odds on what I am likely to experience when I subject the crystal to a sufficiently weak intervention, I can ignore levels from bands entirely below the Fermi energy." I leave the FROCC view of electrons, crystals, Bloch levels, bands, Fermi energies, excitons, and effective masses as exercises for the reader.

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■ **Ashcroft replies:** Realist, and calibrated as full-blown? Given the subtleties of the notion of reality, I somehow doubt it. Impressionist? I delight in freely recorded broad-brush renditions of the observable physical world. But Marcel Duchamp's painting comes across more as a superimposition of rather sharp images. They seem to reflect quite lucidly a progression in time of a more developed form.

Over the years many readers have remarked that the initial edition of our book should "not be touched"; it is just right in its treatments of the fundamentals. But by all means augment it with a sequel, encompassing the many advances in condensed-matter physics that have occurred over the past 38 years. The view that it should not be touched seems to have been shared by those who translated our 1976 text into French, German, and Portuguese just within the past decade.

Letters and commentary are encouraged and should be sent by email to ptletters@aip.org (using your surname as the Subject line), or by standard mail to Letters, *PHYSICS TODAY*, American Center for Physics, One Physics Ellipse, College Park, MD 20740-3842. Please include your name, work affiliation, mailing address, email address, and daytime phone number on your letter and attachments. You can also contact us online at <http://contact.physicstoday.org>. We reserve the right to edit submissions.