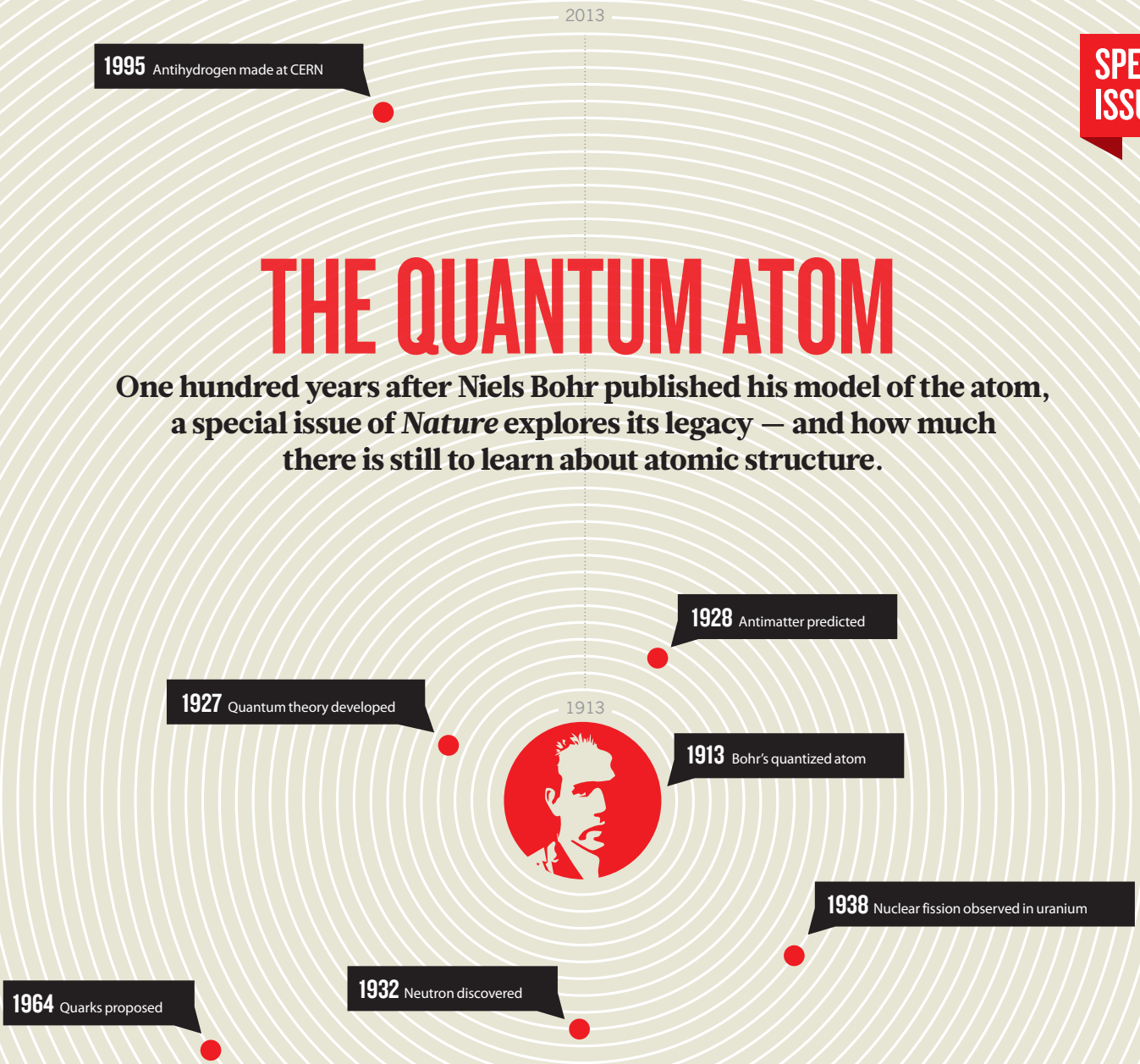
SPECIAL ISSUE

THE QUANTUM ATOM

One hundred years after Niels Bohr published his model of the atom, a special issue of *Nature* explores its legacy — and how much there is still to learn about atomic structure.



July 1913 saw Danish physicist Niels Bohr publish the first of three papers setting out a radical new view of the nuclear atom. His idea — a positively charged nucleus ringed by electrons in orbits of discrete energies — explained the frequencies of light emitted by hydrogen as electrons made leaps between orbits. Quantum rules determined the electrons' energies, preventing the instabilities that had plagued previous mechanical models of atoms.

This special issue of *Nature* explores the origin and legacy of Bohr's quantum atom, a model that has resonated ever since. In 1911, Bohr began a postdoctoral year in England that planted the seeds of his thinking. In a Comment on page 27, historian John Heilbron relates how letters from Bohr to his brother Harald and to his fiancée, Margrethe Nørlund, published this year, chart the dauntless physicist's work with J. J. Thomson and Ernest Rutherford, and his study of the papers of John William Nicholson, which presaged his breakthrough.

The kaleidoscopic nature of the electron is illuminated by physicist Frank Wilczek in a second Comment (page 31). For most practical purposes, electrons behave like simple point particles — but at high energies, they reveal their constituents in showers of quarks, gluons and neutrinos. Physicists are still striving to understand puzzling manifestations of electrons such as coupled states in superconductors and fragments with fractional charges.

Other researchers are testing the limits of the Bohr model by, for example, using powerful X-ray lasers to blast away inner electrons and create 'hollow' atoms. A News Feature explores these and other extreme atoms, including giant, superheavy and antimatter forms (page 22). Such explorations may hit limits on atomic and nuclear size, as two physicists discuss in a News and Views Forum on page 40. Wildly courageous and at ease with ambiguity, even Bohr would have struggled to anticipate the impacts of his vision. ■

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