

Comments on early space controversies

David Cummings and Louis Lanzerotti's feature "Early debates in space science" (PHYSICS TODAY, February 2025, page 38) provides fascinating accounts of observations and proposals pertaining to the solar wind and the heliosphere from the 1950s onward. I was disappointed that the study of auroras was not included in those accounts because our understanding of them is also connected to the solar wind.

Kristian Birkeland, between 1895 and 1916, published many accounts of his theories of the aurora in scientific papers and books. His concept was that they are generated by charged particles emitted by the Sun and captured by Earth's magnetic fields. He commented that the particles (electrons) and ions coming from the Sun

that are not captured are swept away from Earth and continue through the solar system, and he elaborated on this concept in the 1913 edition of his book *The Norwegian Aurora Polaris Expedition 1902–1903*. He thus connected the aurora with what we now call the solar and stellar winds, although he did not use those modern terms.

Birkeland's work generated much debate and was vigorously opposed by geophysicist Sydney Chapman. A very readable account of Birkeland, his work, the controversy it generated, and his tragic life is available in the 2001 book *The Northern Lights* by Lucy Jago.

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David Cummings and Louis Lanzerotti's article "Early debates in space science" (PHYSICS TODAY, February 2025, page 38) tells the stories of five early questions in astrophysics. One of those big questions was about the nature of gamma-ray bursts: whether they come from within the Milky Way or beyond it. As the authors discuss, a great debate on the subject was held in 1995. The debate papers were contained in a special issue¹ of *Publications of the Astronomical Society of the Pacific*, for which I was managing editor.

The resolution of the issue came two years later, but not quite in the way that Cummings and Lanzerotti describe. A



THE AURORA BOREALIS in 2013. (Photo from LCDR Gary Boone, NOAA.)