

The amiable Einstein and Nordström

In his review of my book, *A Passion for Discovery* (PHYSICS TODAY, August 2008, page 56), Engelbert Schucking questions my decision to include a version from Subrahmanyan Chandrasekhar of a story about a strain in the early relationship between Finnish physicist Gunnar Nordström and Albert Einstein. As I recall, the story is based on a letter of Nordström's, which I, unlike Chandra, have never seen. Schucking says Chandra's story is "nonsense" to be doubted by "anybody familiar with the amiable young Einstein." I do not claim to be more familiar with Einstein than is the guy next door, but I doubt that I am less familiar. In fact, the story was briefly mentioned previously, with Chandra's explicit approval, even his urging, on page 10 of the book *Modern Kaluza-Klein Theories* (Addison-Wesley, 1987), which I co-edited with Tom Appelquist and Alan Chodos. Being familiar with the amiable and very careful Chandra, I believe that his version is not nonsense. It seems to be at odds with what I was told by Helsinki physicists and by Nordström's daughter Saga, who speak, as I mention in the book, of a harmonious early friendship of the two men. But the evidence they point to consists of letters exchanged years later. On the upside, what everybody can agree on is that later a friendly tone was established between Einstein and Nordström.

As I say in *A Passion for Discovery*, "human relations can and often do fluctuate," no matter how amiable and bril-

liant those involved. More importantly for physics, Chandra's version of that relationship throws some light on why it took so long for Nordström's important and extremely original idea of five-dimensional unification to gain recognition.

One final clarification: When I was able to leave Romania in 1959, contrary to Schucking's assertion, the odious Nicolae Ceaușescu was still bidding his time on the sidelines. He waited until 1965 to grab power, by which time he could be sure that I had been appointed to the University of Chicago faculty.

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Schucking replies: The uncharitable story that Albert Einstein refused to see physicist Gunnar Nordström, who had traveled from Finland to Zürich, Switzerland, to discuss his theory of gravitation, does not accord with the events as recounted by Paul Ehrenfest. For almost a month in June and July 1913, Ehrenfest stayed with Einstein in Zürich. In his diary for 13 June through 1 July of that year,¹ particularly in the entry for 29 June, Ehrenfest says that Einstein and Nordström discussed their gravitational theories during Nordström's visit. Based on those discussions, Nordström published an improved version of his theory, dated Zürich, July 1913, in which he thanked Einstein directly. In his September 1913 lecture in Vienna, Einstein extensively discussed Nordström's new version and made it clear that it was a viable alternative to his own then unfinished theory. The relationship between Einstein's and Nordström's theories is analyzed in *The Genesis of General Relativity*.² The volume also contains English translations of Nordström's papers.

References

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BCS-to-BEC evolution details

Again an article in PHYSICS TODAY (by Carlos Sá de Melo, October 2008, page 45) has incorrectly implied that Anthony Leggett was the first person to study the crossover from Bardeen-Cooper-Schrieffer to Bose-Einstein condensation. On page 47 of the article, it states that "a clear picture of the BCS-to-BEC evolution at zero temperature didn't emerge until 1980, when Anthony Leggett realized that the physics could be captured by a simple description in real space of paired fermions with opposite spins." Although the model I considered in my 1969 paper¹ is slightly different from Leggett's, figure 4 in my paper clearly shows regions where pairing without superconductivity occurs and where superconductivity is limited by the Bose-condensation temperature of pairs, and on page 458 I discuss a limit at which the diameter of pairs is small compared with the distance between them.

I also disagree with a statement in the box on page 47 of Sá de Melo's article that "the evolution from a Bardeen-Cooper-Schrieffer superfluid to a Bose-Einstein condensation superfluid cannot be studied in . . . superconductors." At least in ceramic samples of SrTiO₃ with 3% of the titanium replaced by zirconium, the transition has been studied by varying the carrier concentration via differing heat treatments to produce different concentrations of oxygen vacancies.² It is possible that such a transition may be found in other superconducting semiconductors when people start to search for suitable materials. However, in three dimensions the pairing strength has to be above some threshold value to obtain the possibility of reaching the Bose-gas regime. Also, many authors think that the BEC regime occurs in underdoped cuprates,^{3,4} while

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Newcomb monument in Nova Scotia

I enjoyed the article "Simon Newcomb, America's First Great Astronomer" by Bill Carter and Merri Sue Carter (PHYSICS TODAY, February 2009, page 46). The authors mentioned that Newcomb was Canadian born; more specifically, he was born in Wallace Bridge, Nova Scotia, only a few kilometers from Pugwash, the initial site of the well-known Pugwash Conferences. An official national monument to Newcomb (see photo of plaque) stands at the side of the road near his birthplace.¹ The last time I checked, the nearby community museum in Wallace had a corner devoted to Newcomb.

Unfortunately, Newcomb did not have fond memories of his early life in Nova Scotia; nonetheless, Canadians have honored him: With the annual Simon Newcomb Award, the Royal Astronomical Society of Canada recognizes members who excel in astronomy writing for the public.² When I received the award in 1986 for an article I wrote on inferior conjunctions of Venus,³ I was not then aware that Newcomb had been intimately involved with observing transits of Venus.

In 2008 Newcomb was inducted into the Hall of Fame of the Discovery Centre, Nova Scotia's hands-on science center. So, employing the broader sense of the word "American," Canadians join with their US colleagues in honoring Simon Newcomb, America's first great astronomer.

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the consensus is that overdoped samples are BCS-like.

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Sá de Melo replies: I thank D. M. Eagles for his comments. My statement concerning the evolution from Bardeen-Cooper-Schrieffer to Bose-

Einstein condensation superfluids was about clarity and not who was the first to propose the idea. Although I appreciate Eagles's work, I still think that Anthony Leggett's papers¹ are the clearest presentation on the topic up to 1980.

In his very interesting book written in 1964, John Blatt describes the BEC theory of superconductivity and its relation to the BCS theory.² As he recounts, the possibility of pairing without superconductivity and Bose condensation of electron pairs at a lower temperature was suggested as early as 1946 by Richard Ogg Jr. In 1954 and subsequent years, Max Schafroth developed a firm theoretical framework for such pairing, but it was not supported by experimental evidence: No pre-formed pairs were found, and the BEC

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