LETTERS

Another Visit with Wolfgang Pauli

Thanks for the Wolfgang Pauli article by Karl von Meyenn and Engelbert Schucking in the February issue of PHYSICS TODAY (page 43). I read it with enormous pleasure. It is a masterpiece in six pages. A true portrait, with a wealth of good quotes that I had not seen before.

I was especially impressed by the section "Staying out of the potato race," with the story of Pauli's lost letters to Heisenberg. To this I would only add the following: I have a clear memory of Pauli saying to me, "If I had not wasted so much time trying to make sense of five-dimensional relativity (the Kaluza–Klein theory and similar attempts), I might have discovered quantum mechanics myself." I believe he said that when he was in Princeton in 1954.

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Karl von Meyenn and Engelbert Schucking provided many interesting facts and anecdotes about Wolfgang Pauli, but their article is marred by negative and inaccurate remarks about P. A. M. Dirac.

The authors make the astonishing claim that Pauli and Werner Heisenberg dismissed Dirac as a mere formalist. I have no knowledge of Heisenberg's views, but as a close associate of Victor Weisskopf for 48 years, I often heard that Pauli was deeply impressed, even intimidated, by Dirac's powers. And Weisskopf was Pauli's assistant at the time when they were focused on understanding Dirac's successful prediction of antiparticles.

I yield to no one in my admiration for Pauli, but it is unacceptable to denigrate Dirac while celebrating Pauli's enormous contributions. The authors say that, in creating the relativistic wave equation, "Dirac repeated Pauli's trick" of doubling the number of components of the wavefunction to incorporate spin. The Pauli two-component equation was an elegant restatement of what was already known about incorporating spin, as can be seen in the earlier calculation of the hydrogen fine structure by Heisenberg and Pascual Jordan. The discovery of the Dirac equation was one of the greatest achievements in the history of physics.

The authors' attribution of Enrico Fermi's golden rule to Pauli is also miscast; it was Dirac who developed time-dependent perturbation theory, including this formula, to calculate radiative transitions with his other great invention, the quantized radiation field. More than 20 years later, Fermi, in his Chicago lectures, called the formula a golden rule, and many physicists, with their habitual disregard for history, have ever since attributed it to Fermi.

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The article on Wolfgang Pauli is very good, as one would expect from such a Pauli scholar as Karl von Meyenn. I have only minor comments.

The general relativity argument Niels Bohr used against Albert Einstein is from the 1930 Solvay conference, not from the one in 1927.

I don't think Pauli introduced vacuum degeneracy (the authors do not provide a reference). The concept appears elusively in Werner Heisenberg's unsuccessful attempt at a unified field theory of elementary particles (1953, 1958); Pauli collaborated on some stages of the theory. Vacuum degeneracy was not really understood until the advent of Goldstone's theorem in 1961.

P. A. M. Dirac's comment on explaining "much of physics and the whole of chemistry" does refer to quantum mechanics as a whole, not to Erwin Schrödinger's first paper on

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