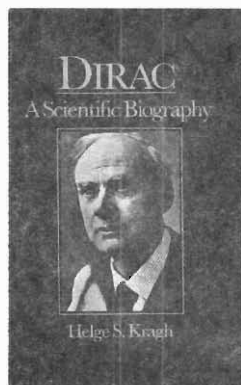


An Inspiring Biography

Vasant Natarajan



Dirac – A Scientific Biography
H S Kragh
Cambridge University Press
p.389, 1990, Price: £35/-

The book by Kragh is an inspiring biography of one of the greatest physicists of the twentieth century, P A M Dirac. As the title indicates, this is a scientific biography, aimed at a scientific audience. However, there is a lot for the non-specialist too, and this is particularly important because Dirac is not a name that many outside physics have heard of. Dirac may rightly be considered in the league of great physicists such as Newton and Einstein. Indeed, for most of his life, Dirac occupied the Lucasian Chair of Mathematics at Cambridge, a prestigious Chair once held by Newton.

The book starts with Dirac's early life as a student of electrical engineering – yes, he was an engineer by training! – and his introduction to theoretical physics, especially to the then new relativity and quantum theories. Within a few years he was making fundamental contributions to the new formulation of

quantum mechanics. The first few chapters cover different aspects of these contributions in great detail. They are somewhat technical but contain a wealth of information about the evolution of modern quantum mechanics. This is very useful for the practicing physicist since one of the best ways to understand a subject is to look at its development in its historical context. Thus, one gets to see many of the blind alleys as the subject is developed, and not just the final results that make their way into textbooks.

Dirac, like all great scientists, had an unerring instinct about his subject. He compiled his ideas on quantum mechanics into a textbook *Principles of Quantum Mechanics*, which remains a classic to this day. As Kragh writes, Dirac's book was the only pre-1957 book on quantum mechanics that did not assume parity conservation in physical laws. It was only in 1957 that the weak force was shown to violate parity. Much earlier in 1949, Dirac wrote,

“A transformation of the type [an inhomogeneous Lorentz transformation] may involve a reflection of the coordinate system in the three spacial dimensions and it may involve a time reflection ... I do not believe there is any need for physical laws to be invariant under these reflections, although all the exact laws of nature so far known do have this invariance.”

This expression of the instinctive nature of Dirac's genius is particularly fascinating to me because I am involved in experiments

measuring violations of parity and time-reversal symmetry in atomic systems.

The latter parts of the book are much less technical and will appeal to philosophers and lovers of science alike. Using a well-chosen mix of anecdotes and excerpts from Dirac's correspondence, most of it previously unpublished, Kragh brings to life the character of Dirac. The result is the story of a shy, reticent genius who spoke sparingly, but when he did the words were chosen carefully and had the utmost meaning. On one occasion when he was asked to give his opinion on a discussion about science and society, he said, "There are always more people willing to speak, than willing to listen." Wise words that I wish more of us would follow! Another anecdote that I particularly enjoyed reading was his interview with a columnist from the *Wisconsin State Journal* during a visit to the University of Wisconsin. The column (reproduced verbatim in the book) is written hilariously and reveals the essential features of Dirac's personality – he spoke all of 17 words during the entire interview!

But the book is also poignant, in some ways reminding me of Hardy's autobiography *A Mathematician's Apology*. As the story presents details of Dirac's successes and failures, we find that the failures appear more frequently in his later years, an indication perhaps that the creative instincts of geniuses are often at

their best when they are relatively young. Indeed, after finishing the book one is left with a lingering feeling that Dirac could have contributed much more if he had not drifted away from mainstream physics, much like Einstein did in the latter part of his life. By the fifties, Dirac had lost complete faith in the renormalization approach to quantum electrodynamics. Again, like Einstein, he felt that true progress in theoretical physics would come by looking for a somewhat ill-defined notion of 'beauty' in mathematics.

In the end, it is hard to say if great scientists such as Einstein and Dirac were misled in their dream of seeking mathematical 'beauty' in the laws of nature. Our best example of a natural law today is the modern version of quantum electrodynamics. However, I think most physicists today would agree that, while the renormalization approach to quantum electrodynamics has led to unprecedented success in explaining natural phenomena, it remains an 'ugly' theory. Perhaps Dirac was right after all in looking for an alternate theory with more beauty and simplicity. Perhaps a young reader, inspired by reading Dirac's story, will carry on his dream and bring it to fruition!

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