

BOOKSHELF

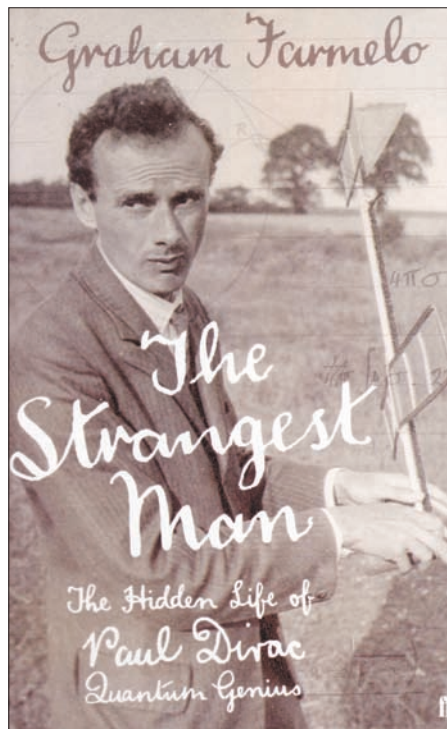
The Strangest Man: The Hidden Life of Paul Dirac, Quantum Genius by Graham Farmelo, Faber. Hardback ISBN 9780571222780, £22.50.

On 13 November 1995 the president of the Royal Society, Sir Michael Atiyah, unveiled a plaque in the nave of Westminster Abbey in London commemorating the life of Paul Dirac. Speaking at the ceremony, Stephen Hawking summed up Dirac's life: "Dirac has done more than anyone this century, with the exception of Einstein, to advance physics and change our picture of the universe." The plaque depicted Dirac's equation in a compact relativistic form and the man himself would no doubt have appreciated its terse style. At the time of his passing in 1984 Dirac ranked among the greatest physicists of all time. With the publication of Graham Farmelo's book *The Strangest Man*, we have an account of Dirac's life that is a *tour de force*.

Dirac's Swiss father, Charles, taught French at the Merchant Venturers' Technical College in Bristol and married Florence Holten in 1899. They had three children, Beatrice, Reginald (who committed suicide in 1924) and Paul, who was born on 8 August 1902 – the same year that Einstein started work at the patent office in Bern and Planck initiated the quantum theory of matter and light. This was the start of the modern era in which classical physics was revolutionized by two great advances – special relativity and quantum mechanics.

Dirac's early years were overshadowed by his domineering father and a browbeaten, needy mother. "I never knew love nor affection when I was a child," Dirac once remarked. Certainly, his difficult childhood seems to have deeply influenced the development of his "strange" character. Farmelo also explores another explanation for Dirac's introversion, literalism, rigid behaviour patterns and egocentricity: perhaps Dirac, like his father, was autistic. Nonetheless, in his thirties, Dirac met and married Manci Balázs, an extroverted and passionate woman – his "antiparticle". Farmelo's candid and sympathetic account of the couple's improbable life together makes compelling reading. Yet, according to Farmelo, Dirac only cried once in his life, and that was when Einstein died.

Dirac's seminal contribution to physics was the unification of Heisenberg and Schrödinger's quantum mechanics with



Einstein's special relativity, which allowed him to write down a relativistic equation for the electron – the famous Dirac equation. With it he revealed the concept of spin and predicted the existence of antiparticles, subsequently discovered in studies of cosmic rays. In 1933, aged 31, he shared the Nobel prize with Schrödinger.

Dirac was also the creator of quantum electrodynamics and one of the chief architects of quantum-field theory. For him, the beauty of mathematical reasoning and physical argument were instruments for discovery that, if used fearlessly, would lead to unexpected but valid conclusions. Perhaps the single contribution that best illustrates Dirac's courage is his work on the magnetic monopole, the existence of which would explain the quantization of electric charge. The monopole's story is still far from complete and more revelations could be forthcoming.

Farmelo succeeds brilliantly in unifying all of the shadowy and contradictory perspectives of Dirac's character with his life as a scientific genius, and creates a complete picture of the man who played a leading role in the growth of modern physics. The book reveals how Dirac, although aloof and unworldly, was deeply affected by the turbulent and troubled history of the 20th century. *James Pinfold, University of Alberta.*

Lust am Forschen: Lebensweg und Begegnungen by Walter Thirring, Seifert Verlag. Hardback ISBN 9783902406583, €22.90.

This biography of a physicist not only covers his life but reflects many interesting aspects of European history during the 20th century. Walter Thirring grew up in the tumultuous 1930s when Austria was united with Germany and when his father – also a well known physicist – had to leave the university because of his opposition to the Nazis. During the war Thirring, aged only 16, was called to the air-defence troops as part of the last reserve (*Flakhelfer*). He describes in an objective but moving way the cruelties of war by including the experiences of his brother and the difficult time after the war with hunger and hard work. I was really moved when I read this historical part because it awoke many experiences of my own life; I wonder how much the current generation can learn from this terrible past experience.

Thirring studied at Innsbruck under difficult conditions and received his PhD in 1949 at Vienna. He later worked with Schrödinger at Dublin, with Heisenberg at Göttingen, with Einstein at Princeton and met many other founders of modern physics and interesting personalities, who he describes vividly in humorous anecdotes.

He devotes a large part of the book to his scientific work, much of which now carries his name, e.g. the Thirring model and the Lieb-Thirring inequality. Being a mathematical theorist, his topics are unavoidably abstract and although he goes to great pains in trying to explain his work to the non-scientist, it will not be easy going for the general reader. (The more difficult parts are relegated to special boxes, which can be skipped.) The most fascinating chapters are those where he describes the highs and lows in the mental struggle that a theorist has in converting a rough idea into an acceptable theory. The ultimate reward is the feeling of happiness to have discovered something that nobody knew before – this is "the pleasure of research".

After his stay in the US, Thirring returned to Europe in 1958 and finally to Vienna where he followed his father as professor of physics and director of the Institute for Theoretical Physics. He accepted this offer after long negotiations, having decided that physics had gone through a positive transition in Europe, thanks mainly to the foundation of

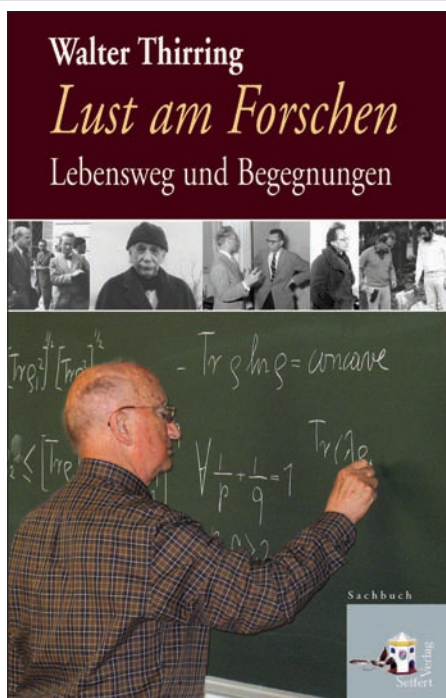
CERN. However, the working conditions at the institute were dreadful and Thirring had to become a manager to improve the situation. The building had to be renovated (including the provision of toilet paper), additional funds had to be found to employ scientists and the courses in theoretical physics had to be organized and updated. These beginnings resulted in a renowned institute.

Following in the Austrian tradition, Thirring in the 1970s started establishing contacts with colleagues in eastern Europe. This led to the foundation of the Erwin Schrödinger Institute in 1993, where scientists from eastern Europe are invited to meet and collaborate with colleagues from western Europe. More than 100 scientific visitors a year now benefit from this institution.

It is unavoidable that errors crept into the narrative, some of which I mention for historical accuracy. Thirring says that the Nobel prize was awarded to Wu, Yang and Lee for parity violation; while theorists Lee and Yang received it, regrettably C S Wu, who led the experiment that proved their idea correct, was not included. During Thirring's time in the CERN directorate in the early 1970s, the next big accelerator that was planned and approved was not LEP, but the SPS. He also gives the impression that Heisenberg was against the construction of the ISR, the first proton collider to be built; in discussions with me, Heisenberg explained that he was all in favour of this epoch-making facility, but against the more conventional SPS.

Thirring's second life was music. Had his elder brother not been killed in the war, Walter would probably have become a musician. He studied music with Anton Webern and also composed. The book comes with a CD with recordings of a few pieces of his chamber music, which sound astonishingly harmonious for modern music and pleasing to the ear.

For non-physicists the scientific elaborations might be difficult to digest, but this book provides a marvellous insight into the motivations, satisfaction and disappointments of being a scientist. Written in "Austrian



German", it has a poetic and eloquent style; a translation into other languages would probably spoil most of its charm.
Herwig Schopper, CERN.

Books received

Quantum Aspects of Life edited by Derek Abbott, Paul C W Davies and Arun K Pati, Imperial College Press. Hardback ISBN 9781848162532, £61 (\$104). Paperback ISBN 9781848162679, £35 (\$58).

Does quantum mechanics play a non-trivial role in biology? The burgeoning fields of nanotechnology, biotechnology, quantum technology and quantum information processing are now converging. The living cell is an information-replicating and processing system replete with naturally evolved nanomachines, which at some level require a quantum-mechanical description. As quantum engineering and nanotechnology meet, increasing use will be made of biological structures – or hybrids of biological and fabricated systems – for producing

novel devices for information storage and processing and other tasks. An understanding of these systems at a quantum mechanical level will be indispensable. This volume sets out a timely quantum-biology agenda.

Lectures on Quantum Field Theory by

Ashok Das, World Scientific. Hardback ISBN 9789812832856, £61 (\$104). Paperback ISBN 9789812832863, £43 (\$72).

These lectures for a two-semester course on quantum-field theory are presented in an informal and personal manner. They start with relativistic one-particle systems and go on to develop the basics of quantum field theory. Later lectures cover canonical quantization, covariant quantization of gauge theories, the Higgs phenomenon and the Standard Model of electroweak interactions. Regularization, (BPHZ) renormalization of field theories and gauge theories are all discussed in detail. This book will suit graduate students and researchers in theoretical physics.

Mesons and Baryons: Systematization and Methods of Analysis

by A V Anisovich, V V Anisovich, M A Matveev, V A Nikonov, J Nyiri and A V Saransev, World Scientific. Hardback ISBN 9789812818256, £86 (\$146).

This book is devoted to the investigation of strongly interacting hadrons – to a quark model operating with effective colour particles, constituent quarks, massive effective gluons and diquarks. The study of strong interactions based on effective constituent particles requires a solid ground of experimental data, which now exists. In this volume the authors rely on experiment and restore the effective Hamiltonian on the basis of QCD on the one hand and of the spectral integral method on the other. Baryon-baryon and antibaryon-baryon interactions are investigated with the purpose of unambiguous applications of the formulae to the interpretation of experimental data – the observation of new meson and baryon resonances.

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