

# BOOKSHELF

## The Genius of Science: A Portrait Gallery

by Abraham Pais, Oxford University Press, ISBN 0198506147, hbk £26.50.

*The Genius of Science* is the last of many books written by Abraham Pais, who died last year (*CERN Courier* October 2000 p46).

Pais was an eminent theoretical physicist who gradually became more and more interested in the history of science and produced the much acclaimed biographies of Einstein and Bohr. He was very interested in people and over the years accumulated a large number of friends, many of whom have made very important contributions to physics. Being an excellent speaker, Pais was often invited to address meetings organized in honour of his prestigious colleagues.

The extended versions of these talks make up most of the contents of this book, which Pais also calls *A portrait gallery of twentieth-century physicists*. Like all of Pais's books, it is very readable and describes in more or less detail the work and characters of 17 physicists who have left their mark on the development of physics – Niels Bohr, Max Born, Paul Dirac, Albert Einstein, Mitchell Feigenbaum, Res Jost, Oskar Klein, Hendrik Kramers, Tsung Dao Lee and Chen Ning Yang, Wolfgang Pauli, Isidor Rabi, Robert Serber, John von Neumann, Viktor Weisskopf, Eugene Wigner and George Uhlenbeck.

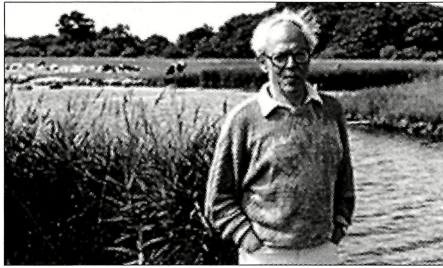
The book is well researched and contains countless interesting anecdotes. One sees clearly that the best work is done by young researchers, and that theoretical physicists can be classified as either “golfers or tennis players” – the former do their creative work alone, while the latter are most creative when they can exchange ideas with others. Luckily, Pais was a tennis man who with this book shares with us his love of physics and his deep interest in people.

*Don Cundy, CERN.*

## The Physics of Particle Accelerators

by Klaus Wille, Oxford University Press, ISBN 0198505493, pbk.

This book is the translation of Klaus Wille's original German edition entitled *Physik der Teilchenbeschleuniger und Synchrotronstrahlungsquellen* (B G Teubner, 1996 Stuttgart), which arose from his long experience with the design and operation of electron synchrotrons at DESY and from a special lecture course on particle accelerators that has been given since 1987 at the University of Dortmund.



*Abraham Pais – scientific tennis man.*

The book reflects Wille's background in lepton synchrotrons and is clearly tailored for those who are interested in the design and operation of synchrotron light sources. This is apparent in the original German title, which explicitly mentions the emphasis of synchrotron light sources.

Providing an impressive overview of the different accelerator physics concepts, ranging from the historical to the most common beam diagnostic devices in modern synchrotrons, the book emphasizes two main subjects: linear-beam optics and the theory of synchrotron light sources. All relevant equations are presented so that the reader can easily follow the individual steps in the derivations and can immediately apply the final equations to specific examples. However, at times an illustration of the underlying concepts is hidden beneath the mathematical descriptions or postponed to later sections.

The first main topic of the book provides a comprehensive and concise summary of linear-beam optics and discusses different possibilities for calculating the beam optics functions of an accelerator. This latter topic provides useful insights into the functionality of existing computer codes, which are widely used for the calculation of beam optics functions in large accelerators. It also provides a large set of examples for the transfer maps of the most common elements in a storage ring, allowing the reader to perform hands-on calculations of the beam optics functions for simple accelerator models. However, while the chapter presents a thorough discussion of local-orbit bumps, including specific working examples, it does not comment on tools for global-orbit correction that are at the heart of the day-to-day operation of a modern synchrotron light source.

The second main topic of the book – radiative effects – highlights all of the essential equations that are required for estimating the equilibrium beam sizes in the presence of

radiation damping and includes a treatment of special “low-emittance” lattices as they are used in modern synchrotron light sources. The book describes special insertion devices of synchrotron light sources and damping rings and it includes a discussion of free electron lasers, which play a central role in modern accelerator physics research, together with a presentation of fourth-generation synchrotron light sources.

In summary, the book provides a vast amount of material and a thorough introduction to the general concepts of particle accelerators. It offers a rich collection of useful equations that are essential for the operation of a storage ring. It clearly emphasizes a discussion of synchrotron light sources and is therefore highly recommended to anybody interested in this field. However, special aspects of other types of accelerator are somewhat neglected or entirely missing. Anybody primarily interested in other machines might not find all of the information that they are looking for. For example, the problem of collective instabilities, which provides fundamental limitations to the beam intensities, is lacking, and the discussion of the normalized beam emittance and luminosity limitations addresses only the limits of lepton storage rings.

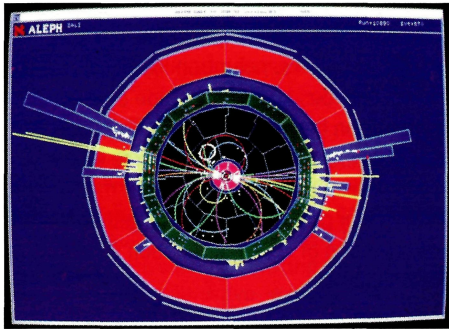
*Oliver Bruening, CERN.*

## Au Coeur de la Matière

by Maurice Jacob, Editions Odile Jacob, ISBN 2738109802.

In this topical book, CERN theorist Maurice Jacob glibly traces the evolution of our understanding of the underlying structure of matter, from atoms to quarks – and its implications for cosmology. While the subject is not easy, the author manages to attain a remarkably deep level of insight without writing any equations. The many difficult concepts encountered *en route* are not glossed over or paraphrased (even though some of them could be). The presentation of the “Schödinger's cat” enigma is well done. A few explanations, like parity violation, would have benefited from an explanatory diagram. However, event displays from CERN's LEP collider provide vivid examples of basic types of interaction.

An introduction manages to bring into the very first paragraph the enigma of quarks – unlike all other constituents of nature, quarks resist being isolated. The meat of the book goes on to trace in detail the mechanisms of the microworld, to climax on the one hand ▶



Event displays from CERN's LEP collider provide vivid examples of particle interactions.

with the Standard Model and the state of particle physics today and on the other its implications for the Big Bang and the birth of the universe, which was initially just a big particle physics experiment.

Then comes a series of essays examining basic questions – the baffling concept of time, antimatter and the structure of the vacuum. Two more chapters look at the sociology of particle physics – how post-Second World War

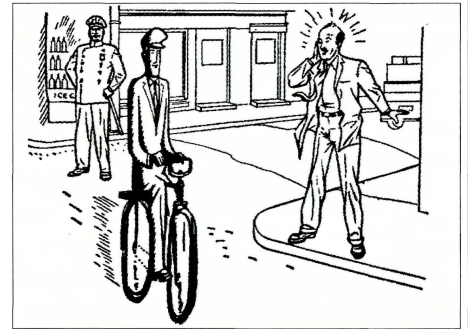
collaboration between scientists has catalysed new international understanding and helped overcome political barriers once perceived as insurmountable, and how this collaboration has attained a truly planetary level for the construction of the new LHC collider at CERN.

The final chapter examines the value of particle physics and its contributions to other branches of science – imaging for medicine and other applications, high-performance detectors, new techniques for data handling and parallel computing and underlines the value of research in education and training.

The book always uses CERN as its focus and reflects the vision of the organization's spiritual fathers like Louis de Broglie who first saw the need for large-scale international scientific collaboration amid the ruins of post-war Europe.

**The New World of Mr Tompkins** by George Gamov and Russell Stannard, Cambridge University Press, ISBN 0521639921, pbk £10.95/\$16.95.

Mr Tompkins is a dreamy, bemused charac-



Mr Tompkins encounters physics.

ter who blunders his way through the intricacies of modern physics.

Russell Stannard's update of George Gamov's famous portrayal appeared in 1999 (*CERN Courier* November 1999 p43). At that time, Gamov's 1965 "science fantasy" anthology was also reissued in paperback. Now the wheel has turned full circle with a paperback version of the new edition. Gamov's original "Mr Tompkins in Wonderland" story appeared in 1940. Clearly there is still a lot of mileage left in Tompkins.

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