

A singular scientist

Einstein: The Life and Times

R. W. Clark

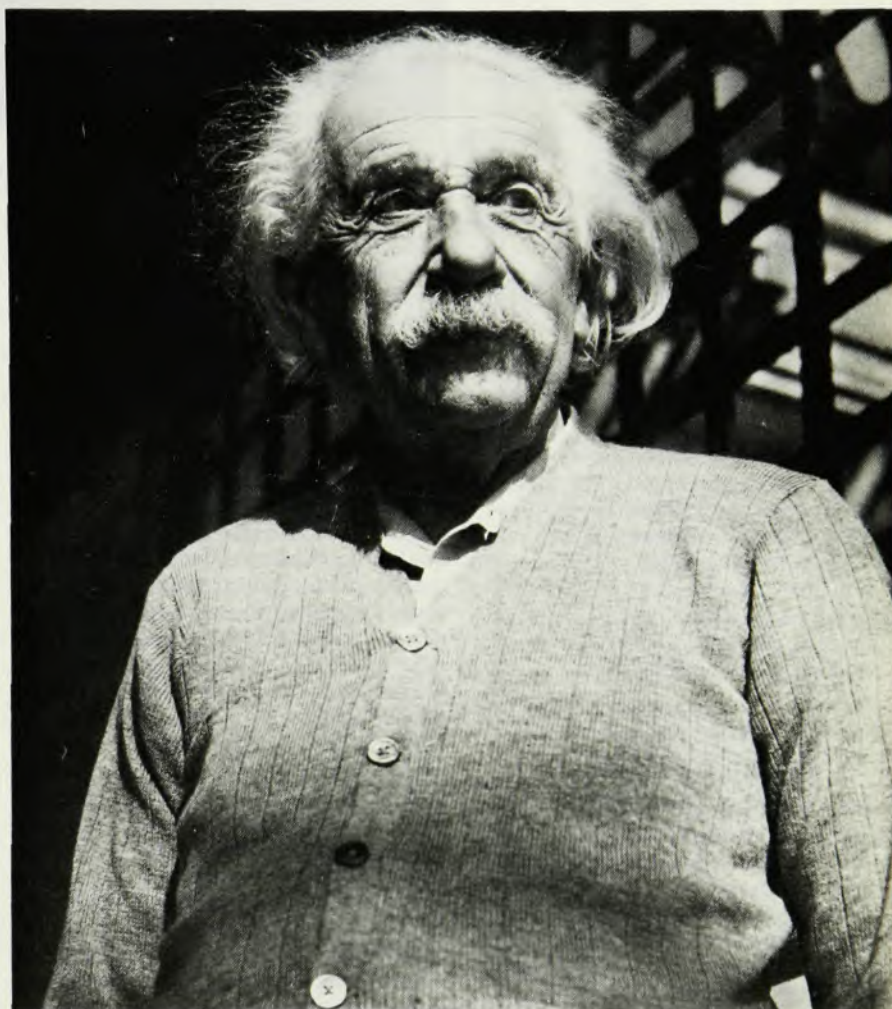
718 pp. World Publishing,
New York, 1971. \$15.00

Reviewed by Nandor Balazs

How can one describe the life and work of a great composer without playing the music, or reading about it without listening? How can one find and appreciate those features of his personality which, given that he was a genius, enhanced his art and were simultaneously present in his usual activities? Perhaps one can do this only in a novel and not in a biography. Franz Werfel succeeded with his (fictionalised) Verdi, Romain Rolland with Jean Christoph, and Thomas Mann with Adrian Leverkühn.

One faces the same problem in a biography of a scientist, in particular if this scientist be Einstein. Among scientists he occupies a singular position. Without any doubt he is one of the greatest scientists history has known; at the same time he also captured the imagination and approval of the general public, which in turn made him a public figure. On the importance of his contributions to physics everybody agrees; the uniqueness of this contribution some physicists question. At times this takes the form of priority discussions with respect to the special theory of relativity (Poincaré), or the general theory of relativity (Hilbert). At other times it manifests itself by raising questions as: "How would you have ranked Einstein among scientists if he had died before the advent of general relativity?" "Would general relativity have been discovered if Einstein had failed to do it?"

The present biography exhibits these difficulties. The size of the book, the diligence and the erudition of the author are impressive. Ronald Clark is a professional biographer of scientists (J.B.S. Haldane, Henry Tizard, the Huxleys), immersed thoroughly in the general history of the period that acts as the background to Einstein's life and ac-



Einstein's favorite photograph of himself. Einstein told Alan Richards, who took this photograph of the physicist in Princeton, N.J. on March 14, 1949, his seventieth birthday, that it was the picture he liked best of any ever taken of him in his life.

tivities. He is completely familiar with the existing Einstein literature; in addition, he also unearthed a great deal of new material. However, the amount of knowledge accumulated brought its own dangers. Knowing much one is loathe to omit information; on the other hand the relevance of the information depends also on the potential reader. This book seems to be aimed both at the general public, resulting in being a Book of the Month Club selection, and at the more informed scientific reader. To

gratify both the book had to be enormous (733 pages, about ten pages per year of lifetime), and the information scattered. The organization of the book is historical, with interludes that provide temporary summaries of special topics. This structure implies repetition. The author often copes with that by indicating where facts alluded to in summary can be found in the text later. This is good enough for facts but not for opinions and value judgments, which thus tend to be repeated. What impres-

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With Paul Ehrenfest and Ehrenfest's young son, Paul, in Leiden around 1919. This photograph was taken by Willem Jacob Luyten while he was doing graduate work there.

sion do we get from the accumulation of details about Einstein's personality, his work in physics, about the ancillary figures in the panorama?

There were perhaps two main reasons why Einstein captured the public imagination: (a) everyone is a *soi disant* expert in "Space" and "Time"; (b) before the recent image of the scientist as a satanic schemer bent on destroying mankind while gratifying his relentless quest, the public imagination endowed the scientist with traits that could be easily attached to Einstein's public persona, even though in reality he himself was rather different. One of the achievements of this biography lies in the popular image of Einstein. It shows a more abrasive and purposeful personality, which sometimes bordered on ruthlessness in the pursuit of his work. Every aspiring graduate student should read about Einstein's efforts to gain ever-improving employment. One finds the blaming of the establishment (Heinrich Weber at the Eidenössische Technische Hochschule in Zurich,); wire pulling, through a friend's father, to help at the Patent Office in Bern; the switching to ever-improving positions, the negotiations with Prague, with Berlin, with Cal Tech, culminating with the justly stiff letter to Robert Millikan. The compulsory compromises are a sad reflection on the times and places. He is forced to accept and advocate a compromise to secure decent working conditions; hence the suggestion to Paul Ehrenfest to camouflage his convictions in order to get a professorship. "I am frankly annoyed that you have this caprice of being without religious affiliations; give it up for your children's sake."

If possible, he was jealously guarding his time for scientific work. Clark suggests that this might be the explanation

of his ultimate separation from his first wife during the final developments of general relativity in 1914. It also might explain his ambivalence and repeated resignations from the International Committee on Intellectual Cooperation; it was during this period that he first worked on a unified field theory. His intransigence, bordering on stubbornness, is well exhibited by the Hebrew University controversy.

Clarke discusses at great length Einstein's ideas on pacifism and comments with implied disfavor on his changing views and on his role in the Manhattan project. The situation is perhaps rather more simple. Einstein was against World War I, which to him represented the Prussian spirit at its worst. However, when he finally came to the conclusion that a unilateral renunciation of force leaves one exposed to bullies, or worse, he advocated self-defense. This is evident from the copious quotations in the book. Clark quotes Linus Pauling that in 1954 Einstein considered a great mistake his having signed in 1939 Leo Szilard's letter to Roosevelt which eventually lead to the Manhattan project. He must have changed his mind within a year, since in 1953 he said to me that he would do it again. I find the comparison between Bertrand Russell's and Einstein's attitudes during World War I unfair, especially in view of Einstein's (and George Nicolai's) "Manifesto to Europeans" quoted on page 181.

Chapter 20 deals with the Manhattan project and Einstein's role in it. In addition to Szilard's short memoir on this subject the author also uses a great deal of extra information. This shows, for example, how and why Einstein was kept intentionally out of the project, though eventually doing some consulting work for the Navy. Einstein's own opinions on the role of scientists in poli-

tics is quoted here on pages 596-97.

Chapter 14 deals with Einstein's fluctuating views on Zionism culminating in an interesting account of his refusal to become President of Israel in 1952.

A relatively small fraction of the book deals explicitly with Einstein's work in physics. These sections consist of historical discussions and a summary of the theories. These summaries are very good and deal with thermodynamics, statistical mechanics, photons and quantum theory including a poor discussion of the Einstein-Podolsky-Rosen paradox. Two chapters deal with relativity (4 and 8), ending with a description of unified field theories.

In these parts of the book we encounter the other important figures in physics. Niels Bohr, Max Born, Luis de Broglie, P.A.M. Dirac, Paul Ehrenfest, Werner Heisenberg, Konrad Lorentz, Ernest Schrödinger and many others appear on the pages, often with copious quotations. Their roles and personalities is fairly assessed on the whole, although Dirac deserves much more than a passing mention of his name in connection with the probabilistic interpretation of quantum mechanics! Max von Laue's attitude in the Nazi days is misinterpreted and so is W. Lenz's priority discussion on special relativity, which is also factually incorrect.

The illustrations in the book are delightful, including a photo of a blackboard used by Einstein, with Descartes' name misspelled. The early family pictures and the genealogical table (going back to 1737!) are of great added interest.

The referencing and the index is an irritating feature. In the text quotations occur for which not only the source but often the name of the person quoted is only given in the notes at the end of the book. Since the value of the remark is a function of the source, this results in constant shuffling of pages. The notes and the index are incomplete in the sense that some names mentioned in the text are not listed in the index, and some quotations have no source.

I consider this book an important contribution. It, however, requires a careful and repeated reading in order to compose a coherent picture of Einstein and his life from a wealth of detail. Perhaps the author would consider to publish a shorter version, the same as was done for Churchill's great work on Marlborough.

* * *

Nandor L. Balazs became interested in the history of physics, in particular that of relativity while working with Schrödinger and Einstein. He wrote articles on Einstein and on relativity in the Encyclopaedia Britannica and in the Dictionary of Scientific Bibliography. He is presently at the Department of Astrophysics, University Observatory, Oxford.

The Theory of Optical Activity

D. J. Caldwell, H. Eyring

244 pp. Interscience,
New York, 1971. \$14.95

It is well known that optical activity is a powerful means of studying the configuration and conformation of organic and inorganic molecules. Optical rotatory dispersion and circular dichroism in absorption regions especially have been very useful, supplementing ultraviolet and infrared spectroscopy. This book is the first single source for all the necessary background material in the development of optical activity theory.

Starting from basic electromagnetic and quantum theory, the authors present the fundamentals of optical activity theory, both classical and semi-quantal—in the same sense that the radiation field is not quantized. (Quantum field-theoretic formulations are given in H. F. Hammett, *Advanced Quantum Chemistry*, Addison-Wesley, Reading, Mass., 1965, chapter 12, and P. W. Atkins and L. D. Barron, *Proc. Roy. Soc. A304*; 303, 1968). Then some specific applications of the theory are given, and special topics are discussed, including vibronic theory, exciton effects, the Faraday and Kerr effects.

This book is well written in general and has relatively few errors. The very complete development of all the fundamentals of semi-quantal optical activity theory presented in this book is not found in other sources. For the details of rotational strengths, the authors emphasize the approximate summation method (which may be called a generalized Unsöld approximation). This method appears to be useful when interpreting experimental data with relatively few parameters, as demonstrated by some examples in chapter 5. (However, some care must be taken for the use of the results developed in chapter 4. Since the authors use the unnormalized incomplete perturbed wavefunctions, the general terms of rotational strengths, higher than the first order in the perturbation V , should be modified. Practically this does not appear to give any problems, since one is usually interested in the lowest-order nonvanishing terms.) Although the approximate summation method provides useful semiempirical relations, the authors seem to overemphasize the method—other models and semiempirical calculations (for example, those of A. J. Moscowitz and co-workers) are not fairly represented. The systematic perturbation-variation approach to the calculation of rotational strength and the optical rotatory parameter (also the Faraday, Kerr, and Cotton-Mouton effects) is also available, but it is not discussed in the book.

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