

Book Reviews

A Somewhat Forgotten Physicist

Ferdinand Braun. A Life of the Nobel Prize-winner and Inventor of the Cathode-Ray Oscilloscope. FRIEDRICH KURYLO and CHARLES SUSSKIND. Translation and revision of the German edition (Munich, 1965). MIT Press, Cambridge, Mass., 1981. xviii, 290 pp., illus. \$29.95.

Ferdinand Braun is not a very famous name in the annals of modern science, and in that fact itself is a story worth telling. Braun's accomplishments were certainly noteworthy, including as they did the discovery of the rectifier effect that is the basis of the "cat's whisker" diode; the formulation of the thermodynamic concept of free energy; the invention of the cathode-ray oscilloscope (as a result of which he is arguably one of the many fathers of television); and the creation of the indirectly coupled, tuned, directive system of wireless telegraphy. He was sufficiently recognized in his own day to share the Nobel Prize for Physics and to be offered such prestigious positions as the physics chairs at the universities of Leipzig and Berlin. The relative obscurity of Braun's name, even in his native Germany, thus presents a challenge, and the challenge is confronted head on by this first full-scale biography.

The rescue of reputations can be a tricky business, lending itself to hyperbole and over-enthusiastic efforts to compensate for past neglect. This biography largely avoids these pitfalls, for Friedrich Kurylo's 15-year-old work, hitherto available only in the original German, has found, in Charles Susskind, a translator and adaptor with perfect scholarly credentials for the task. The result is not only good biography but also a contribution to our understanding of the German scientific establishment in its heyday and of its enormously productive relationship with industry.

The physicist Braun was the product of the 19th century's most awesome academic apparatus, the German university system. Trained at the universities of Marburg and Berlin, he received his doctorate under Hermann von Helmholtz in 1872. The next decade he spent after the fashion of the typical young German scientist engaged in the slow progress

through the academic ranks, until, in 1882, he was appointed to the physics chair at the Technical University of Karlsruhe. The chronicle of Braun's career provides a fascinating look at the combination of politics and persistence that was necessary for success in the German educational system.

Braun worked well and without controversy in that system, and this was a major reason he was offered in 1895 the politically sensitive chair at the German University of Strasbourg. It was here that Braun, working in the well-financed and well-attended Physics Institute of the university, made his best-known contributions, creating a school for studies in high-frequency physics as well as producing the cathode-ray oscilloscope and his important radio circuits.

The two decades of experimentation and innovation that followed Heinrich Hertz's 1888 demonstration of how radio waves could be generated and detected produced a tangle of technological and commercial efforts that have made it difficult to delineate clearly the origins of modern wireless communication. Recent scholarship has done much to give us a

better grasp of what was going on in this lively and fruitful period, when men like Oliver Lodge, Guglielmo Marconi, and Alexander Popov were laying the technical foundations for a new industry. Though no worthwhile history of radio would totally neglect Ferdinand Braun's work, it is typically treated as being of secondary importance (Hugh G. J. Aitken's excellent *Syntony and Spark*, for example, devotes only a single paragraph to a description of Braun's circuits). This biography brings to the English-reading audience a fuller picture of the German contributions to practical radio technology. Braun was not the only worker in the field to recognize the utility of inductive coupling for improving the performance of wireless transmitters, but there is substantial reason for recognizing him as the one who, thoroughly grounded in the physics of high-frequency oscillators, made the clearest demonstration of the advantages of such coupling. The importance of this to radio technology was recognized in 1909 when the Nobel Prize for Physics was shared by Marconi and the much less famous Braun.

As depicted by Kurylo and Susskind, Braun's career illustrates not only the increasingly productive cooperation between university scientists and the technical and business communities for which Germany was already famous at the turn of the century but also the tensions that such cooperation could create. As other scientists discovered in the pioneering days of radio, the exigencies

12. Ueber ein Verfahren zur Demonstration und zum Studium des zeitlichen Verlaufes variabler Ströme; von Ferdinand Braun.

1. Die im Folgenden beschriebene Methode benutzt die Ablenkbarkeit der Kathodenstrahlen durch magnetische Kräfte. Diese Strahlen wurden in Röhren erzeugt, von deren einer ich die Maasse angebe, da mir diese die im allgemeinen günstigsten zu sein scheinen (Fig. 1). *K* ist die Kathode aus Aluminiumblech, *A* Anode, *C* ein Aluminiumdiaphragma; Oeffnung des Loches = 2 mm. *D* ein mit phosphorescirender Farbe überzogener Glimmerschirm. Die Glaswand *E* muss möglichst gleichmässig und ohne Knoten, der phosphorescirende Schirm

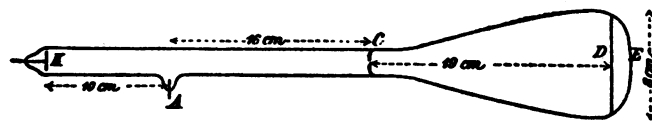


Fig. 1.

Title, descriptive paragraph, and drawing from Braun's paper describing the cathode-ray oscilloscope, published in *Annalen der Physik und Chemie* (series 3, vol. 60), 15 February 1897. [From *Ferdinand Braun*]

of commercial competition were often not compatible with the customary free and critical exchange of ideas crucial to academic science. It was with some relief, then, that Braun acceded to the merger of all German radio concerns in 1903, including his own, to form one of the giants of the world radio industry, Telefunken.

As deeply involved as he might be in scientific or technical matters, Braun maintained a careful equilibrium in his own life-style. He was notable as a teacher and a popularizer of science and was widely liked. It is particularly poignant, therefore, to read of the collapse of his life and career in the turmoil of the First World War. Not only did Strasbourg's proximity to the Front thoroughly disrupt university life, strategic concerns caused Braun to be sent in late 1914 to the United States to defend Ger-

man radio interests. The war prevented his return home, and he died in April 1918, at age 67, in Brooklyn, New York.

The lonely circumstances of Braun's death brings us back to the question posed by the diminution of his reputation over the years. In a particularly thoughtful epilogue, the authors ponder the sources of scientific fame. Braun's death far from home brought little of the recognition that normally attends the passing of great scientists. The demise of the German university at Strasbourg left no institution to perpetuate his name. And the simple lack of a biographer for a half-century after his death left Braun without a champion in the lists of scholarship or journalism. This last problem, at least, now has been successfully remedied.

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Intelligence and Some of Its Testers

The Mismeasure of Man. STEPHEN JAY GOULD. Norton, New York, 1981. 352 pp., illus. \$14.95.

Commenting on the controversy over IQ tests, especially on the exchange of barbs between Walter Lippmann and Lewis Terman in the *New Republic*, Terman's publisher wrote him in late 1922 that the publicity was probably good for the business. Publishers still seem to think so. Since its revival in 1969, the "IQ controversy" has given rise to a steady stream of books, if not an industry. Most of these books have been authored by outsiders to psychometrics, like Herrnstein, Kamin, Eysenck, even Jensen before the '60's. Outsiders have been important; their attacks on the testers' hereditarianism started the first row. In the recent battle, Kamin and the British journalist Oliver Gillie played a crucial part by forcing into the open the Burt affair, which left hereditarians in disarray. Often, however, old arguments have outnumbered new ideas in such books.

Nonetheless, several new volumes have appeared recently, one of them *The Mismeasure of Man* by Stephen Jay Gould, Harvard paleobiologist and well-known author of several books on evolution. Aimed at demolishing biological determinism as a "theory of limits," it tells the story of craniometry in the 19th century and, at greater length, of intelligence testing in the 20th.

Gould's story contains some intriguing details: a fascinating Agassiz letter describing the emotions aroused by his first

encounter with blacks; S. G. Morton "finagling" with his skull measurements; H. H. Goddard tampering with photographs of the "feeble-minded" Kallikaks; Catherine Cox throwing out some ratings of the IQ's of the eminent dead; Gould's Harvard class taking the old Army Beta test; and so on. Behind such specifics Gould discovers the twin fallacies of "reification" of intelligence and scientific obsession with (numerical) rankings. The book ends with a declaration of faith in human flexibility and potentiality, in the face of pessimistic, politically oppressive doctrines of determinism. Clearly, Gould is on the side of the angels; several positive reviews have appeared to prove it. In fact, the book has won a National Book Critics Circle Award.

But if the book is taken seriously as history of science, not just as another popular exposé of scientific racism, a careful reading brings some problems to light, problems on three levels: of the historical account, of the conceptual analysis, and of the wider context.

The historical account covers fairly well traversed ground. Lombroso (who does not seem to belong in this book on intelligence) and the Kallikaks have been used for decades by psychology texts as boogymen of "bad science." C. C. Brigham's *Study of American Intelligence* (1923) has been a handy source for quotes illustrating misguided or virulent scientism-racism at least since John Higham's *Strangers in the Land* (1955). Gould's history of the IQ parallels Ka-

min's: the open-minded Binet, distorted by the hereditarian dogmatists Goddard and Terman; Yerkes, Brigham, and the Army intelligence tests; their impact on immigration restriction.

In fact, though, Brigham's book was taken to task soon after publication in at least three reviews by psychologists, among them E. G. Boring writing in the *New Republic*. To say, as Gould does, that the Army tests "led to the Immigration Restriction Act of 1924" (p. 157) unfortunately repeats the gross overestimation some authors have made of the influence of the testers' efforts. It is based on no more evidence than a post hoc, propter hoc, supplemented by a (self-serving) quote or two from the hard-line eugenicists around Madison Grant and C. B. Davenport. But neither Yerkes nor Brigham nor any other psychologist ever testified before Congress—though some biologists did. The three reports of the House Committee on Immigration did not mention intelligence tests once. And though the congressional debate did include occasional references to the test data, they played no major role in it. Other arguments and "data" were loose in the land.

Gould's brief discussion of the other "major political triumph" of the testers also overstates their impact. Britain's notorious "11+ examination" was not a creation of the psychometricians led by Cyril Burt; it developed slowly out of the "free place examination" for grammar school scholarships, instituted before any IQ tests existed. The testers' growing influence produced the eventual inclusion of an IQ test in and a new rationale for 11+, but not the examination itself or its social functions.

Most of this has been said before. But Gould has also done some homework (though unfortunately not in archival sources) and has dug up additional and interesting material. He noticed the crudely retouched faces in Goddard's book on the Kallikaks—although one wishes for some evidence showing that this was indeed Goddard's doing; after all, publishers have been known to make "improvements" on their own. He rediscovered Cox's tour de force of attempting to match IQ's to the recorded, and clearly incomplete, biographical "data" on the childhood of eminent historical figures. I am a bit baffled by Gould's sarcasm about the basic idea, though. I would have thought that paleobiologists might have more sympathy with guesses based on fragmentary data. And Cox's summary of her conclusions (not mentioned by Gould) turns out to be more bland, or, rather, catholic, than Gould



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