

Concerning the true beginning of nuclear physics

Rutherford and Boltwood: Letters on Radioactivity.

Lawrence Badash, ed.

378 pp. Yale U.P., New Haven, Conn., 1969. \$12.50

Reviewed by Alfred Romer

The scientific paper is an interesting document because to some extent it tells the precise truth, and to some extent it manipulates the truth to its author's advantage. No serious paper will falsify the results it reports; neither will any serious paper reveal the process by which those results were obtained. The tedious wandering from puzzle to enigma is rearranged in print to a brief and orderly progress in which every stage leads compellingly to the next. There is no dishonesty in this; we all accept the convention that the scientific paper need satisfy only our scientific curiosity by setting forth persuasively its scientific conclusions.

Curiosity comes in many varieties (each equally indefensible to those who do not possess it), and the curiosity of the historian is to know what really happened. That is usually obscure. Every historian learns to be skeptical of any account he reads, but the historian of science is peculiarly frustrated. His primary documents are the research papers of the published literature, which are completely untrustworthy as historical narratives. That is why he noses so eagerly for any scrap of extra information.

That is also why the Rutherford-Boltwood correspondence is enormously important. It tells what two leaders in the field of radioactivity were doing and thinking in the period between 1904 and 1912; beyond that, it tells also how they appraised their own work and that of others. Radioactivity might have been considered as an esoteric field of study because it was then limited to the few who possessed ample quantities of radioactive material and to the few others who could make do with meager amounts. Nevertheless it was generally regarded as important, because of the strangeness of the penetrating rays involved, the mystery of a spontaneous and seemingly perpetual emission of energy, and the view it presented of

elements in evolution (if one could believe so novel a proposition). It was also in modern terms the true beginning of nuclear physics.

When they first met in 1904, Ernest Rutherford was 32 and Bertram B. Boltwood a year older. Rutherford was Macdonald Professor of Physics at McGill University, a Fellow of the Royal Society, well known as a leading investigator of radioactivity. Boltwood was an analytical chemist in private practice in New Haven. Despite this difference in their status, the two men were intellectual equals, and of such congenial temperament that their scientific acquaintance soon ripened into personal friendship. The result was a correspondence that, although primarily scientific (until its later years), was informally frank in speculation and in expressions of opinion.

The problems they found of joint interest dealt principally with the elements of the uranium-radium series.

Rutherford's share of the work lay mostly with the succession products of radium, Boltwood's in establishing by indirect means the genetic connection between radium and uranium. This latter culminated in 1908 when Boltwood isolated and identified the immediate parent of radium, a long-lived intermediate product that he named (as a new element) "ionium" but which is better identified today (as an isotope) by the symbol Th^{230} .

Although their detailed scientific content makes these letters important chiefly to the historians of the period (for whom indeed they are indispensable), others will find them worth leafing through for the pungent comments they sometimes contain. Quite early in the correspondence, for example, when the two men were still on formal terms, Boltwood wrote:

"I got a very interesting letter from Bumstead [a Yale physicist and a

AIP MEGGERS GALLERY OF NOBEL LAUREATES



Ernest Rutherford, whose correspondence with Bertram B. Boltwood is discussed in the book reviewed on this page.

common friend] a few days ago. He was in Paris and had just been to call on M. Curie at his laboratory. Bumstead described wild scientific orgies in which 280 MILLIGRAMS OF PURE RADIUM BROMIDE figured conspicuously, and appeared to have had altogether a very interesting and amusing time of it."

One is tempted to speculate on the lucky chances that created this correspondence and preserved it so far beyond the lifetimes of the correspondents. There is more point however in focusing both our pleasure and our gratitude on the editor, Lawrence Badash, whose scholarly persistence has made it available to us. Badash, who is assistant professor of the history of science at the University of California at Santa Barbara, uncovered the Rutherford letters at Yale, the Boltwood letters at Cambridge, and prepared them for publication. Even if one did not know his previous studies in radioactivity, the work itself gives ample proof of his qualifications to undertake it. He has seen to the transcription and chronological arrangement of the letters and has provided an introduction containing a brief overview of radioactivity together with biographical sketches of both Rutherford and Boltwood. What particularly deserves our thanks, however, is the meticulous series of footnotes with which he has clarified the individual letters. Every paper referred to is given its title and journal citation. Every person mentioned is identified with pertinent biographical information. Obscure references to events, apparatus, and materials are explained in detail. One could not ask for more.

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The reviewer is professor of physics at St Lawrence University, a student of radioactivity and the editor of selected readings in its source literature.

Hilbert

By Constance Reid

290 pp. Springer-Verlag, New York, 1970. \$8.80

When it became known in 1967 that Constance Reid, a Californian mother, housewife and nonmathematician, was writing a biography of David Hilbert, the profoundest mathematician of the early part of this century, friends and pupils of Hilbert were shocked. How could an unexperienced biographer and nonmathematician dare appraise the originality of Hilbert's personality and fathom the depth of his work? Was it not impossible to convey to the layman the importance and beauty of the creations of Hilbert's mind? Richard Courant (Hilbert's intimate friend, pupil

and coworker) felt very dubious about the possibility of success, and Max Born flatly refused to lend his hand to this undertaking. Then came a period in the spring of the same year when Mrs Reid visited and interviewed those of Hilbert's friends whom she could trace as living in the eastern US. It was remarkable to observe how this student of Hilbert's life understood not only Hilbert's personality but also those of his colleagues, such as Felix Klein and Hermann Minkowski, and the general atmosphere of the charming little town of Göttingen and its famous university. Extending her safari in search of "Hilbertiana" to Germany, Switzerland and Poland and collecting further oral reports, her picture of Hilbert and his times became further intensified.

Up to this point, Mrs Reid's job may be said to have been that a reporter—a reporter of unusual sensitivity, memory and gift of combination. The truly creative writing began with the merging of the personal data with the description of the scientific work. This critical problem of how to organize her book was solved by the author in an admirable fashion. She roughly followed the sequence of Hilbert's interests: from algebra to number theory, foundations of geometry, then to analysis and calculus of variations, next to integral equations, an excursion to physics and a return to the clarification of the foundations of mathematics and logic. As Hermann Weyl remarks in his appreciation of Hilbert's work, an abbreviated version of which forms the last 37 pages of the text, the historical order seems obvious because Hilbert,

in the main, took up one subject after the other and rarely returned to subjects in which he had already satisfied his urge for a more fundamental approach.

Otto Blumenthal, one of Hilbert's first pupils, to whose memory the author piously dedicates her book, wrote a 41-page appreciation of Hilbert on the occasion of Hilbert's 70th birthday and included it in the collected works of his teacher and friend, which he edited. Both this and Weyl's appreciation are written by mathematicians and for mathematicians. Mrs Reid's book aims at a wider public. Indeed, Courant ends his short foreword with the sentence: "I trust that the book will fascinate not only the mathematicians but everybody who is interested in the mystery of the origin of great scientists in our society." The book does more than that by showing how three truly great mathematicians—Klein, Hilbert and Minkowski—each with a very outspoken personality of his own, joined their talents in a single faculty and, attracting a great number of young mathematicians, created a school of extraordinary fecundity and lasting influence. From the human side, Hilbert, the purest in mathematics and maybe the purest at heart, was the most lovable teacher and example. His deep lifelong friendship with Minkowski appears in the many letters of his friend, which are quoted and form a beautiful document. (Hilbert's own part of the correspondence unfortunately appears to be lost.) The book is full of sidelines on other great mathematicians of the period whose names are inscribed over

SPRINGER-VERLAG



David Hilbert
in 1912 when he was
professor of
mathematics at Georg
August Universität
in Göttingen.