

# Preface

Both Kaiser's admirable *Drawing Theories Apart* [8] and Schweber's masterful *QED and the Men Who Made It* [7] refer frequently to the famous lectures on quantum electrodynamics given by Freeman Dyson at Cornell University in 1951. Two generations ago, graduate students (and their professors) wishing to learn the new techniques of QED passed around copies of Dyson's Cornell lecture notes, then the best and fullest treatment available. Textbooks appeared a few years later, e.g. by Jauch & Rohrlich [25] and Schweber [6], but interest in Dyson's notes has never fallen to zero. Here is what the noted theorist E. T. Jaynes wrote in an unpublished article [26] on Dyson's autobiographical *Disturbing the Universe*, 1984:

But Dyson's 1951 Cornell course notes on Quantum Electrodynamics were the original basis of the teaching I have done since. For a generation of physicists they were the happy medium: clearer and better motivated than Feynman, and getting to the point faster than Schwinger. All the textbooks that have appeared since have not made them obsolete. Of course, this is to be expected since Dyson is probably, to this day, best known among the physicists as the man who first explained the unity of the Schwinger and Feynman approaches.

As a graduate student in Nicholas Kemmer's department of theoretical physics (Edinburgh, Scotland) I had heard vaguely about Dyson's lectures (either from Kemmer or from my advisor, Peter Higgs) and had read his classic papers [27], [28] in Schwinger's collection [4]. It never occurred to me to ask Kemmer for a copy of Dyson's lectures which he almost certainly had.

My interest in the legendary notes was revived thirty years later by the Kaiser and Schweber books. Within a few minutes Google led to scans of the notes [29] at the Dibner Archive (History of Recent Science & Technology) at MIT, maintained by Karl Hall, a historian at the Central European University in Budapest, Hungary. He had gotten permission from Dyson to post scanned images of the Cornell notes. Through the efforts of Hall, Schweber and Babak Ashrafi these were uploaded to the Dibner Archive. To obtain a paper copy would require downloading almost two hundred images, expensive in time and storage. Was there a text version? Had anyone retyped the notes? Hall did not know, nor did further searching turn anything up. I volunteered to do the job. Hall thought this a worthwhile project, as did Dyson, who sent me a copy of the second edition, edited by Michael J. Moravcsik. (This copy had originally belonged to Sam Schweber.) Dyson suggested that the second edition be retyped, not the first. Nearly all of the differences between the two editions are Moravcsik's glosses on many calculations; there is essentially no difference in text, and (*modulo* typos) all the labeled equations are identical.

Between this typed version and Moravcsik's second edition there are few differences; all are described in the added notes. (I have also added references and an index.) About half are corrections of typographical errors. Missing words or sentences have been restored by comparison with the first edition; very infrequently a word or phrase has been deleted. A few changes have been made in notation. Intermediate steps in two calculations have been corrected but change nothing. Some notes point to articles or books. No doubt new errors have been introduced. Corrections will be welcomed! The young physicists will want familiar terms and notation, occasionally changed from 1951; the historians want *no* alterations. It was not easy to find the middle ground.

I scarcely knew  $\text{\LaTeX}$  before beginning this project. My friend (and Princeton '74 classmate) Robert Jantzen was enormously helpful, very generous with his time and his extensive knowledge of  $\text{\LaTeX}$ . Thanks, Bob. Thanks, too, to Richard Koch, Gerben Wierda and their colleagues, who have made  $\text{\LaTeX}$  so easy on a Macintosh. George Grätzer's textbook *Math into  $\text{\LaTeX}$*  was never far from the keyboard. No one who types technical material should be ignorant of  $\text{\LaTeX}$ .

This project would never have been undertaken without the approval of Prof. Dyson and the efforts of Profs. Hall, Schweber and Ashrafi, who made the notes accessible. I thank Prof. Hall for his steady encouragement

through the many hours of typing. I thank Prof. Dyson both for friendly assistance and for allowing his wonderful lectures to become easier to obtain, to be read with pleasure and with profit for many years to come.

Originally, the typed version was meant to serve as an adjunct to Karl Hall's scanned images at the Dibner site. Bob Jantzen, a relativist active in research, insisted that it also go up at the electronic physics preprint site arXiv.org, and after a substantial amount of work by him, this was arranged. A few weeks later the alert and hardworking team at World Scientific<sup>1</sup> got in touch with Prof. Dyson, to ask if he would allow them to publish his notes. He was agreeable, but told them to talk to me. I was delighted, but did not see how I could in good conscience profit from Prof. Dyson's work, and suggested that my share be donated to the New Orleans Public Library, now struggling to reopen after the disaster of Hurricane Katrina. Prof. Dyson agreed at once to this proposal. I am very grateful to him for his contribution to the restoration of my home town.

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