

# This Week's Citation Classic®

Kabat E. A. & Mayer M. M. *Experimental immunochemistry*. Springfield, IL: Thomas, 1948. 567 p.; and Kabat E. A. *Kabat and Mayer's experimental immunochemistry*. Springfield, IL: Thomas, 1961. 905 p. [Coll. Physicians and Surgeons, Columbia Univ.; Medical Serv., Neurological Inst., Presbyterian Hosp., New York, NY; and Sch. Hygiene and Public Health, Johns Hopkins Univ., Baltimore, MD]

The book was the earliest to present a comprehensive view of quantitative immunochemical principles, together with explicit methods for work in the laboratory and for preparation of substances needed for research in immunochemistry. [The *SCI*® indicates that the several editions of these books have been cited in over 2,500 distinct publications.]

## The First Book on Quantitative Immunochemistry Principles and Methods

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In early 1942 I was Research Associate in Biochemistry at the College of Physicians and Surgeons of Columbia University. I had been Michael Heidelberger's first graduate student from 1933 to 1937 when I received my PhD. After a Rockefeller Foundation Fellowship in 1937-1938 with Professors The Svedberg and Arne Tiselius and three years with Jacob Furth in the Department of Pathology at Cornell University Medical School, I had returned to Columbia in June 1941. At that time Manfred M. Mayer had been a graduate student with Michael since 1938 and was staying on to work with him on vaccination against malaria during World War II. We were very close friends, and he was completing and extending work that I had not finished.

Michael had pioneered in the development and application of the quantitative precipitin methods for measuring antibodies, antigens, and complement, and it was clear to us that the future of immunology and immunochemistry would depend heavily on the use of such analytical chemical methods. Yet 16 years had passed since the first paper of Heidelberger and F.E. Kendall,<sup>1</sup> and it seemed that almost everyone who was using these methods properly had learned them by working with Michael himself or from someone who had spent time in his laboratory.

Manfred and I decided that a book outlining the detailed experimental methodology of quantitative immunochemistry was needed. Michael agreed. We called it *Experimental Immunochemistry* and drew up an outline of chapters. Since many of the antigens and other substances were not available commercially, we included preparation of many of the working materials and descriptions of the methods of quantitative immunochemistry.

John Wiley made a survey based on our outline and said it would never sell 1,000 copies. Michael spoke to Charles C. Thomas, who agreed to publish it. Michael would write a preface.

We set to work with enthusiasm, divided up the chapters, and spent the weekends reading every word aloud to one another. Our wives were left to entertain one another as best they could. The first edition was finished in 1945, but because of shortages of paper in the immediate postwar years, it did not appear until 1948; we were, however, allowed to make extensive changes in the proofs so it was up-to-date. It apparently filled an important need because it was well received and favorably reviewed and went through three printings. Some universities even set up laboratory courses teaching many of the methods.

By 1957 it became clear that a second edition would be needed. For various reasons, Manfred was not able to do more than write the complement chapter and revise the Kjeldahl nitrogen chapter; and I undertook to write the other 62 chapters, compared to 53 in the first edition. The title of the book was changed to reflect this as well as to recognize Manfred's contribution to the first edition. I spent the summer of 1958 writing in the Marine Biological Laboratory's library at Woods Hole and completed the second edition in Paris during my sabbatical in 1959-1960. The book had tripled in size and the manuscript contained about 4,000 references that were checked directly from the journals by two of my sons, Jonathan and Geoffrey, in the libraries at Woods Hole, at the Pasteur Institute, and at the College of Physicians and Surgeons. My wife, Sally, read the manuscript and proof of the 905 double-column pages aloud to me four times, and many colleagues, notably Donald M. Marcus and Stuart F. Schlossman, read and checked large sections of the book.

The second edition was even more widely used than the first and went through four large printings, the last being exhausted in September 1982. Its widespread use was essentially because Manfred and I each had personal experience with almost all the methods and had been involved in developing many of the methods, so that we were able to provide notes and hints throughout the book that would assist the beginning user and save many trips to the library. The second edition was translated into Russian, Czech, and Spanish.

By 1966 the experimental methodology was still usable, but many more micromodifications had been developed and there had been a substantial revolution in immunochemical theory. Amino acid sequencing of proteins and of antibodies and X-ray crystallographic studies of Fab fragments and Bence Jones proteins opened the way to an understanding of the three-dimensional structure of antibodies. I undertook to outline this approach in *Structural Concepts in Immunology and Immunochemistry*, written while I was on sabbatical (1966-1967), again at the Pasteur Institute, in Pierre Grabar's laboratory. The second edition<sup>2</sup> was prepared while I was a Fogarty Scholar at the NIH during 1974-1975 and was also favorably reviewed.

1. Heidelberger M & Kendall F E. A quantitative study of the precipitin reaction between type III pneumococcus polysaccharide and purified homologous antibody. *J. Exp. Med.* 50:809-33, 1929. (Cited 200 times since 1945.)
2. Kabat E. A. *Structural concepts in immunology and immunochemistry*. New York: Holt, Rinehart and Winston, (1968) 1976. 547 p. (Cited 340 times.)