(For *Advances in the Dempster-Shafer Theory of Evidence*, edited by Yager, Kacprzyk, and Fedrizzi.)

Foreword, by Glenn Shafer

It is with great pleasure that I welcome this collection of diverse and stimulating contributions to the Dempster-Shafer theory of belief functions. These contributions demonstrate the vigor and fruitfulness of current research on belief functions, and their publication as a unit can serve to make that research even more vigorous. During the past decade, research on belief functions has suffered from fragmentation; the researchers involved have been spread over so many different disciplines, meetings, and journals that they have often been unaware of each other's work. By bringing together so many of the leading workers in the field, the editors of this volume have begun to create a new research community.

Though belief-function ideas can be found in the eighteenth-century literature on the probability of testimony, the modern theory has its origins in work by A.P. Dempster in the 1960s. Dempster was inspired by R.A. Fisher's “fiducial” method—a brilliant but unsatisfactory method for computing probabilities for statistical parameters from observations. Dempster's generalization of Fisher's method produced non-additive probabilities, which combined by a general rule that I later called “Dempster's rule of combination.”

I added to Dempster's theory in various ways in the 1970s, but in retrospect, my most influential contributions were simplifications rather than elaborations. My 1976 book, *A Mathematical Theory of Evidence*, began as an article on non-Bayesian weights of evidence. In order to explain why these weights of evidence were important, I first had to explain belief functions, which took up more pages than I had expected; what had started as an article evolved into a book. Since the general theory of belief functions was aside from my main point, I kept the exposition as simple as possible—I considered, for example, only finite frames of discernment. As it turned out, it was this simple exposition that caught people's imaginations. To my dismay, I still find it difficult to interest people in weights of evidence.

Though Dempster's work predated mine by ten years and included all the basic ideas of belief functions, the theory is now usually called the “Dempster-Shafer theory.” I am proud to be associated with Dempster in this appellation. I have always been inspired by the quality of his work, and his personal support has always been invaluable to me.

The name “Dempster-Shafer theory” was coined by J.A. Barnett in 1981, in an article that marked the entry of the belief functions into the literature on artificial intelligence. It is appropriate that the theory should have been given a new name at that time. Dempster had pointed out in his foreword to my 1976 book that I was breaking his theory free from the narrow confines of Fisher's statistical problem. But in retrospect, the autonomy that I was able to gain for the theory in the 1970s seems very limited. It was not until the adventurous and can-do spirit of artificial intelligence took hold of belief functions that they were fully freed from the mindset of statistics, where numerical degrees of belief had to be either frequencies or betting rates.

Today belief functions sit in the middle of an exciting discussion in artificial intelligence. They provide a bridge, in a sense, between fuzzy reasoning, which has been remarkably successful in applications, and probability, which has been less widely useful but still seems to have stronger normative claims. During the 1980s, I came to agree with Piero Bonissone's view that managing uncertainty in artificial intelligence means choosing, on a case-by-case basis, between different formalisms and different ways of using these formalisms. Since belief functions sit in the middle, better understanding of how and when to use belief functions will contribute significantly to our understanding of uncertainty management using other formalisms. Thus this volume has a significance beyond the Dempster-Shafer theory itself; it is an important contribution to our general understanding of probability and uncertainty.