

# Honoring Michael H. Rothkopf's Legacy of Rigor and Relevance in Auction Theory: From the Editors

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**H**onoring Michael H. Rothkopf's contributions to decision analysis and operations research, the papers in this special issue in memory of Michael H. Rothkopf focus on auction theory, field data, and experiments. The contributors to this issue include Shachat and Swarthout; Chen, Xu, and Whinston; Cramton and Sujarittanonta; Hoffman and Menon; Harstad; Boatwright, Borle, and Kadane; Haruvy and Popkowski Leszczyc; Oum and Oren; Abbas and Hann; and Jia, Harstad, and (posthumously) Rothkopf.

*Key words:* auction design; auction theory; auctions; behavioral economics; bidding; clock auctions; common values; competitive electricity markets; contingent contracts; decision analysis; duration; energy risk; exchanges; experiment; field experiments; frenzy; games-group decisions; bidding-auctions; incomplete markets; jump bids; private values; profit; market design; Michael H. Rothkopf; order statistics; persistent competition; private information; procurement auctions; product differentiation; revenue; revenue comparisons; rights-to-choose auctions; second prices; scoring rules; spectrum auctions; stochastic orderings; telecommunications; volumetric hedging; editorial

*For bidders in standard sealed bid auctions, I believe that decision theory dominates game theory. Even in the design of auctions, decision theory competes well with game theory.*

Michael H. Rothkopf (2007)

This is the Michael H. Rothkopf Memorial Special Issue on Auctions, edited by guest editors Robert F. Bordley and Elena Katok.<sup>1</sup> As planning for this special issue began following Mike's death in 2008, many felt that a special memorial issue in an INFORMS journal would be very fitting, since INFORMS was Mike's professional home, and he had served as President in 2004. We read again Rothkopf's recent paper in *Decision Analysis*, where Rothkopf (2007) argued that decision analysis is the right tool for auctions. Our editorial board decided that the special issue would

be in *Decision Analysis* and should be on auctions, with the special issue editors being Robert Bordley and Elena Katok. Dr. Bordley is a member of the *Decision Analysis* Editorial Board and contributed to the journal previously on "Combining the Opinions of Experts Who Partition Events Differently" in Bordley (2009). Dr. Katok, who was Rothkopf's Pennsylvania State University colleague, contributed previously to *Decision Analysis* in Engelbrecht-Wiggans and Katok (2009) on "A Direct Test of Risk Aversion and Regret in First Price Sealed-Bid Auctions."

Consistent with the late Professor Rothkopf's research interests, this special issue is on auctions (and, more generally, market design), as well as their application to energy and related public policy issues. This continues the tradition of papers on auctions in our journal, which includes Gerchak (2008) on knockout auctions in addition to Rothkopf (2007) and

<sup>1</sup> See the Call for Papers for this special issue in Bordley and Katok (2009).



**Michael H. Rothkopf**

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Engelbrecht-Wiggans and Katok (2009). This special issue aspires to continue Mike's legacy by publishing work integrating the concerns of decision analysis with the methods of game theory.<sup>2</sup>

The hallmark of decision analysis is a strong emphasis on both theoretical rigor and practical relevance. This emphasis is epitomized in one of the great founders of the field, John von Neumann. As a theoretician, von Neumann formalized the foundations of quantum mechanics, decision theory, and game theory. As a practitioner, von Neumann codeveloped the single-memory computer architecture, the atom bomb, and America's Cold War strategy of mutually assured destruction.

von Neumann (along with Oskar Morgenstern)<sup>3</sup> viewed both decision analysis and game theory as games (the former against nature and the latter

against rational individuals). Despite these similarities, the two fields have drifted apart in recent decades—with game theory historically being more closely associated with economics and political science, and decision analysis more closely associated with business schools, management science, operations research, and statistics.

Michael H. Rothkopf, with his work on auctions, played a critical role in integrating game theory and decision analysis, and ensuring that both remain useful management science tools. Like John von Neumann, Mike was an accomplished theoretician and practitioner. His practical work on the U.S. Federal Communications Commission spectrum auctions—that guided handling of discrete bidding increments (Rothkopf and Harstad 1994) and of withdrawable bids (Harstad and Rothkopf 1995) in the first large FCC auction and later resulted in the development of a new design based on the hierarchical package structure (Rothkopf et al. 1998)—highlighted the remarkable value of using game theory and decision analysis to tackle difficult problems in market design. Mike's theoretical work extended our understanding of the strengths and limitations of game theory, as applied to practical problems (see, for example, Rothkopf et al. (1990) on "Why Are Vickrey Auctions Rare?"). Despite the pressures to sacrifice rigor for the sake of application or to sacrifice relevance for the sake of a theory, Mike remained a role model to several generations of scholars in showing how both rigor and relevance can and must remain integrated in order for decision analysis and game theory to remain vibrant and useful analytical tools.

We begin with Mike's poem (Rothkopf 2010, 1980) on decision trees—which remain one of the central and unifying problem-structuring tools in both decision analysis and game theory.

Then, in the spirit of Mike's stress on relevance and rigor, the first two papers focus on procurement auctions, which is an area of great practical importance that presents serious theoretical challenges. Jason Shachat and J. Todd Swarthout examine "Procurement Auctions for Differentiated Goods," and Jianqing Chen, Lizhen Xu, and Andrew Whinston (a coauthor of Rothkopf's) investigate "Managing Project Failure Risk Through Contingent Contracts in Procurement Auctions." Most practitioners know

<sup>2</sup> Some of these papers were presented at a conference in memory of Michael H. Rothkopf held at Pennsylvania State University on June 1–3, 2009. See <http://www.smeal.psu.edu/rothkopf-conference/in-memorium-michael-h-rothkopf> for a list of Rothkopf's publications.

<sup>3</sup> See von Neumann and Morgenstern (1947) and Leonard (1995).



**Friends of Mike and Laura Rothkopf wearing Mike's ties (from left, Terry Harrison, Ronald M. Harstad, Peter Popkowski Leszczyc, Laura Rothkopf, Natalia Santamaría, Shmuel S. Oren, and Valery Pavlov)**

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that a buyer who only seeks the lowest possible bid potentially obtains a low quality supplier. Shachat and Swarthout (2010) and Chen et al. (2010) show how practitioners can successfully obtain both lower prices and higher quality through ingenious innovations in the design of procurement auctions.

The next two papers, by Peter Cramton and Pacharasut Sujarittanonta and by Karla Hoffman and Dinesh Menon, also focus on relevance by analyzing the uses of the clock auction design for spectrum auctions. Cramton and Sujarittanonta (2010) investigate the "Pricing Rule in a Clock Auction," and Hoffman and Menon (2010) discuss "A Practical Combinatorial Clock Exchange for Spectrum Licenses." Next is Ronald M. Harstad's (a coauthor of Rothkopf's) paper on "Auctioning the Right to Choose When Competition Persists." Harstad (2010) analyzes bidder behavior in auctions in which heterogeneous items are sold simultaneously and bidders compete for the right to choose. It is a novel area for applying auction theory to an important and difficult problem.

Consistent with Mike's willingness to challenge established thinking, in "Common Value vs. Private Value Categories in Online Auctions: A Distinction Without a Difference?" Peter Boatwright, Sharad

Borle, and Joseph B. Kadane (2010) question the traditional distinction between common-value and private-value auctions. (Kadane's prior contribution to *Decision Analysis* was on probability scoring rules in Schervish et al. (2009).) The next paper, by Ernan Haruvy and Peter T. L. Popkowski Leszczyc (a coauthor of Rothkopf's), is "The Impact of Online Auction Duration." Haruvy and Popkowski Leszczyc (2010) use a carefully controlled field experiment to study an important and practical, but often overlooked, aspect of auctions: the effect of auction duration on the number of participants.

In the spirit of decision analysis's concern with risk, the paper by Yumi Oum and Shmuel S. Oren (a coauthor of Rothkopf's) on "Optimal Static Hedging of Volumetric Risk in a Competitive Wholesale Electricity Market" studies another topic that Mike considered to be of great importance—electricity markets. Oum and Oren (2010) analyze the optimal hedging strategy in markets with uncertain load. The paper on "Measuring Risk Aversion in a Name-Your-Own-Price Channel" by Ali E. Abbas and Il-Horn Hann (2010) focuses on using auction information to assess risk preferences (in a decision analytic style). Abbas, who is an associate editor of *Decision Analysis*, published previously

in *Decision Analysis* on probability assessment (Abbas et al. 2008), pooling expert judgments (Abbas 2009), and utility (Abbas and Howard 2005, Abbas 2007).

We close the special issue with a note by Mike himself along with two colleagues, Justin Jia and Ronald M. Harstad, on "Information Variability Impacts in Auctions." Jia et al. (2010) address how variability in the bidder's costs or valuations affects bidder profits and bid-taker revenues in auctions.

To continue Mike's legacy of making auctions an important topic in decision analysis, we hope this issue will encourage the submission of more papers on auctions to *Decision Analysis*. We thank all of the authors for their excellent contributions. We strongly encourage all readers to consider submitting their work on auctions (as well as other decision analysis-related topics) to *Decision Analysis*.

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