



## IFORS' Operational Research Hall of Fame William W. Cooper

A researcher who has made a significant impact on the fields of operational research, accounting, marketing, human resource management, risk management and public policy.

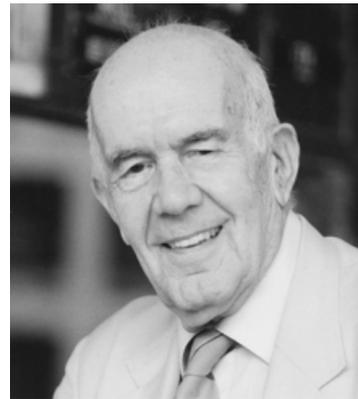
Born: 23 July 1914, Birmingham, AL, USA.

Education: B.A. in Economics (1938), University of Chicago; Graduate studies (1940–1942), Columbia University.

Currently: Foster Parker Centennial Professor Emeritus of Finance and Management, The University of Texas at Austin (1993–present).

Key positions: Tennessee Valley Authority (1938–1940); US Bureau of the Budget (1942–1944); University of Chicago (1944–1946); Carnegie-Mellon University (1945–1975); Harvard University (1975–1980); The University of Texas at Austin (1980–present): Economic Cooperation Administration – Marshall Plan (1949–1950); Educator-Consultant, US General Accounting Office (1969–1986).

Key OR roles: The Institute for Management Science (TIMS) founder member, and first President (1954); Associate Editor, *Operations Research* (1957–1968); Departmental Editor, *Management Science* (1968–1975); Member, *European Journal of Operational Research* (1990–present); Member, Editorial Board, *Omega* (1995–present).



Awards: Ford Foundation Faculty Fellow (1958–1959, 1962–1963); von Neumann Theory Prize of ORSA and TIMS (1982); US Comptroller General Award for Significant Contributions to the US General Accounting Office (1986); Fellow of ORSA (1956) and INFORMS (2002); Honorary degrees: M.A., Harvard University (1976), D.Sc., Ohio State University (1976), D.Sc., Carnegie-Mellon University (1982), D.H.C., University of Alicante, Spain (1995); Notable Contribution to Governmental Accounting Literature (1991); Elected to Accounting Hall of Fame (1995); Lifetime Contribution to Management Accounting Literature Award (2002); Fellow, Econometric Society (1956) and American Academy for the Advancement of Science (1963); Honorary Member, Omega Rho (1997); Gold Medal, International Society for Multi-Criteria Decision Making (2005).

Born in Birmingham in the deep south of the USA, Bill Cooper grew up in one of the roughest neighborhoods of Chicago. During the tumultuous times of the Great Depression, Bill's father lost his business and the responsibility for supporting his family fell on young Bill's shoulders. He dropped out of high school to earn \$25–\$35 a bout as a prizefighter, losing only three of his 63 professional bouts. He also worked as a pin-setter in a bowling alley and as a caddy at a golf course: quite an unlikely start to the career of someone who has left a deep impression on so many academic fields. His career as a prizefighter boxer, however, instilled in Bill the qualities of persistence and determination that have enabled him to accomplish many challenging objectives in his academic life. Hitching a ride to caddy at a golf course one day, Bill met Eric Kohler, an event that was to change his life. Kohler, a partner with Arthur Andersen & Co., was fascinated by this tough kid talking passionately about physiological psychology, a subject that had interested Bill as a boxer. Kohler encouraged Bill to pursue formal education at the University of Chicago, much against the wishes of Bill's family. His chance meeting with Kohler reflects the guiding principle that Bill has followed all his life: be prepared and take advantage of opportunities when they come.

Continuing on to graduate studies at Columbia University, Bill learned to settle arguments with incisive arguments rather than with his fists. Nevertheless, this writer waited nervously for his advisor to arrive for his dissertation defense at Harvard University in 1980. Bill was delayed because while walking to campus, he encountered a gang of teenagers accosting another individual. Rolling up his sleeves, Bill rushed to the rescue. Luckily, the fierce determination in his face was sufficient to scare the miscreants away, and the dissertation defense was completed on time.

Bill Cooper has been deservedly described as an “academic entrepreneur” and as a “catalyst for change.” Bill has been influential in the founding of new institutions and in the dissemination of path-breaking research in a number of different management disciplines. Bill introduced many innovative mathematical programming approaches to analyze static and dynamic problems in the design of organizations (Charnes et al., 1969). He developed large-scale optimization models to manage planning of human resources in the armed forces under the statutory requirements of equal employment opportunity and affirmative action (Charnes et al., 1972). In marketing, his research on new product marketing strategies developed innovative models optimizing resource allocation for alternative media advertising (Charnes and Cooper, 1954; Charnes et al., 1966, 1968a, 1985). Related work in capital budgeting with additional consideration of stochastically specified constraints for liquidity and payback requirements provided a different perspective on the trade-off between risk and return (Byrne et al., 1967, 1968). His more recent models for early predictions of the risk of insolvency of insuring firms were recognized with the Mehr Award of the American Risk and Insurance Association for research that “has best withstood the test of time” (Brockett et al., 1994). Bill's research in public policy issues ranges from managing and modeling of quality of life to the optimal trade-off of multiple social goals (Charnes et al., 1973a, b). His research in accounting has resulted in an award for Notable Contribution to Research on Governmental Accounting and recognition as an Outstanding Accounting Educator.

Throughout his career, Bill Cooper has espoused the need for problem-driven research. He recognized the need for management researchers to be closely connected with the problems faced by managers in contemporary organizations (Cooper, 1949, 1951, 1961). To Bill, this did not imply simply applying existing models to solve problems that fit those models. Rather, the

objective is to identify new and challenging problems that require original solutions, motivating new basic research and the development of new models to address these problems observed in the field. Such research not only results in improvements in existing management practice but it also substantially enriches intellectual inquiry with the introduction of new problems, models and solution methods to the research literature. A classic example of problem-driven research is Bill's work with Gulf Oil Corporation on optimal blending of aviation gasoline using shadow prices generated from a linear programming model (Charnes et al., 1952, 1954, 1955b). While this method was not immediately implemented at the research site, the publication of the research motivated most of the major integrated petroleum companies to develop and implement similar optimization models. Some of these early management science models motivated by industrial problems are collected in a book (Charnes and Cooper, 1961).

Bill's lifelong collaboration with Abraham Charnes led to the development of many innovative optimization models and important advances in operational research theory. Many of these have become commonplace in our portfolio of operational research methods, and have motivated considerable new research to build on Bill's early work. Research on executive compensation at General Electric Corporation led to the development of least absolute value (LAV) regression models with constraints (Charnes et al., 1955a). Analysis of the problem of optimal manufacturing and distributing of heating oil led to the development of chance constrained programming (Charnes et al., 1958, 1964; Charnes and Cooper, 1959, 1962b). Fractional programming (Charnes and Cooper, 1962a) and semi-infinite programming (Charnes et al., 1963) followed similar needs to address new problems identified in management practice or policy analysis. Optimal resource planning under organizational goals that could not all be achieved fully led to the development of goal programming (Charnes et al., 1968b, 1976).

Perhaps the most influential of Bill's research in the past 30 years has been the development of Data Envelopment Analysis (DEA) to address the problem of evaluating the efficiency of similar organizations that consume multiple inputs to produce multiple outputs (Charnes et al., 1978). This initial article was selected as one of the 30 most influential papers published in the first 30 years of the *European Journal of Operational Research*. A subsequent article that connected technical and scale efficiency evaluation models rigorously to the estimation of production frontiers (Banker et al., 1984) is one of the five most highly cited papers in the 50-year history of *Management Science*. There is now a vast research literature comprising over 4000 studies in a variety of different organizational contexts that builds on Bill's pioneering work on DEA.

Bill's entrepreneurial spirit is also reflected in his involvement in the founding and development of several institutions. Bringing together quantitative researchers in academia who were interested in management problems with those in corporations like General Electric, IBM and Hughes Aircraft, he helped establish and served as the founding president of TIMS. Under the guidance of his wife, Ruth, a successful attorney in Pittsburgh, Bill drafted the articles to set up the new institute and to charter its new research journal, *Management Science*. With Nobel laureate Herbert Simon and others, Bill also led the development of the business school at Carnegie Mellon University, and positioned it at the forefront of the revolution in business education spawned by the criticism by the Ford Foundation Commission that it lacked a rigorous academic foundation. What Bill started in the 1950s at Carnegie Mellon has now become the core of the business curriculum around the world. Bill was also the founding dean of the new school of public policy and management started at Carnegie Mellon in 1968, which is now recognized as one of the

leading schools of public management. Bill also nurtured the new journal *Auditing: Theory and Practice* as its founding editor. The importance of his contribution was recognized by a special award of the American Accounting Association.

If academia has been Bill's home, his doctoral students and colleagues have been his family. The personal interest and care that he endows on each of them is legendary and exemplary. He continues to be supportive of his students' progress years after their graduation. Many international scholars, ranging from Egon Balas, who escaped a totalitarian regime to make path-breaking contributions to operations research, to a long line of doctoral students who traveled overseas to the USA for their graduate studies, have benefited enormously from Bill's munificence manifested in his personal attention and initiative in not taking no for an answer and sometimes making the impossible possible.

Recognized in multiple management disciplines for his seminal contributions during his 65-year academic career, the induction of Bill Cooper to the International Operational Research Hall of Fame is richly deserved.

### **Rajiv D. Banker**

#### **Selected original works**

- Banker, R., Charnes, A., Cooper, W.W., 1984. Models for estimating technical and returns to scale efficiencies. *Management Science* 30, 1078–1092.
- Brockett, P.L., Charnes, A., Cooper, W.W., Golden, L., Pitaktong, U., 1994. A neural network method for obtaining early warnings of insurer insolvency. *Journal of Risk and Insurance* 61, 402–424.
- Byrne, R., Charnes, A., Cooper, W.W., Kortanek, K., 1967. A chance-constrained approach to capital budgeting with portfolio type payback and liquidity constraints and horizon type posture controls. *Journal of Financial and Quantitative Analysis* II, 339–364.
- Byrne, R., Charnes, A., Cooper, W.W., Kortanek, K., 1968. Some new approaches to risk. *The Accounting Review* 43, 18–37.
- Charnes, A., Colantoni, C., Cooper, W.W., Kortanek, K.O., 1973a. A model to study revenue sharing and account for regionalized economic activity and social goals. *Management Science* 19, 1189–1208.
- Charnes, A., Cooper, W.W., 1954. A constrained game formulation of advertising strategies. *Econometrica* 22, 511.
- Charnes, A., Cooper, W.W., 1959. Chance constrained programming. *Management Science* 6, 73–79.
- Charnes, A., Cooper, W.W., 1961. *Management Models and Industrial Applications of Linear Programming*. Wiley & Sons, New York.
- Charnes, A., Cooper, W.W., 1962a. Programming with linear fractional functionals. *Naval Research Logistics Quarterly* 9, 181–186.
- Charnes, A., Cooper, W.W., 1962b. Normal deviates and chance constraints. *Journal of the American Statistical Association* 57, 134–148.
- Charnes, A., Cooper, W.W., DeVoe, J.K., Learner, D.B., 1966. DEMON: decision mapping via optimum Go-No networks: a model for marketing new products. *Management Science* 12, 865–887.
- Charnes, A., Cooper, W.W., DeVoe, J.K., Learner, D.B., 1968a. DEMON, Mark II: an extremal equations approach to new product marketing. *Management Science* 14, 513–524.
- Charnes, A., Cooper, W.W., DeVoe, J.K., Learner, D.B., Reinecke, W., 1968b. A goal programming model for media planning. *Management Science* 14, B423–B430.
- Charnes, A., Cooper, W.W., Ferguson, R.O., 1955a. Optimal estimation of executive compensation by linear programming. *Management Science* 1, 138–151.

- Charnes, A., Cooper, W.W., Klingman, D., Niehaus, R.J., 1976. Explicit solutions in convex goal programming. *Management Science* 22, 438–448.
- Charnes, A., Cooper, W.W., Kortanek, K.O., 1963. Duality in semi-infinite programs and some works of Haar and Caratheodory. *Management Science* 9, 209–228.
- Charnes, A., Cooper, W.W., Kozmetsky, G., 1973b. Measuring, monitoring and modelling quality of life. *Management Science* 19, 1172–1188.
- Charnes, A., Cooper, W.W., Learner, D.B., Phillips, F.Y., 1985. Management science and marketing management. *Journal of Marketing* 49, 93–105.
- Charnes, A., Cooper, W.W., Mellon, B., 1952. Blending aviation gasolines – a study in programming interdependent activities. *Econometrica* 20, 135–159.
- Charnes, A., Cooper, W.W., Mellon, B., 1954. Programming and sensitivity analysis in an integrated oil company. *Econometrica* 22, 193–217.
- Charnes, A., Cooper, W.W., Mellon, B., 1955b. A model for optimizing production by reference to cost surrogates. *Econometrica* 23, 193–217.
- Charnes, A., Cooper, W.W., Niehaus, R.J., 1972. *Studies in Manpower Planning*. U.S. Navy, Office of Civilian Manpower Management, Washington, DC.
- Charnes, A., Cooper, W.W., Niehaus, R.J., Stedry, A., 1969. Static and dynamic assignment models with some observations on organization design. *Management Science* 15, B365–B376.
- Charnes, A., Cooper, W.W., Rhodes, E., 1978. Measuring the efficiency of decision making units. *European Journal of Operational Research* 2, 429–444.
- Charnes, A., Cooper, W.W., Symonds, G.H., 1958. Cost horizons and certainty equivalents: An approach to stochastic programming of heating oil by the horizon method. *Management Science* 4, 235–263.
- Charnes, A., Cooper, W.W., Thompson, G.L., 1964. Critical path analysis via chance constrained and stochastic programming. *Operations Research* 12, 460–470.
- Cooper, W.W., 1949. Theory of the firm: some suggestions for revision. *American Economic Review* XXXIX, 1204–1222.
- Cooper, W.W., 1951. A proposal for extending the theory of the firm. *Quarterly Journal of Economics* LXV, 87–109.
- Cooper, W.W., 1961. Some implications of the newer analytic approaches to management. *California Management Review* IV, 51–64.

## Biographical material

- Cooper, W.W., 2002. Abraham Charnes and W.W. Cooper (et al.): a brief history of a long collaboration in developing industrial uses of linear programming. *Operations Research* 50, 35–41.