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Herbert E. Scarf

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PERSONAL

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EDUCATION

A.B. 1951 Temple University
M.A. 1952 Princeton University
Ph.D. 1954 Princeton University, in Mathematics

POSITIONS

1954-57 The Rand Corporation, Santa Monica, California
1957-63 Assistant and Associate Professor, Department of Statistics,
Stanford University, Stanford, California
1959-60 Visiting Associate Professor, Cowles Foundation, Yale University
1962-63 Fellow, Center for Advanced Study in the Behavioral Sciences, Stanford,
California
1963-70 Professor of Economics, Yale University
1970-78 Stanley Resor Professor of Economics, Yale University
1979- Sterling Professor of Economics, Yale University
1967-71 Director, Cowles Foundation for Research in Economics, Yale University
1981-84 Director, Cowles Foundation for Research in Economics, Yale University
1971-72 Director, Division of Social Sciences, Yale University
1973-74 Director, Division of Social Sciences, Yale University
1977-78 Visiting Professor, Stanford University, Stanford, CA
1983 President, Econometric Society
1986 Research Scholar, Mathematical Sciences Research Institute, Berkeley, California
1991-94 Chairman, Section of Economic Sciences, National Academy of Sciences

AWARDS, FELLOWSHIPS, MEMBERSHIPS

- 1947 First Place, Temple University Mathematics Tournament
(Pennsylvania statewide tournament for high school students)
- 1950 In first 10, Putnam Mathematics Tournament
- 1952 J. S. K. Fellow, Princeton University
- 1952-53 Fellow, National Science Foundation, Princeton University
- 1953 Proctor Fellow, Princeton University
- 1963 Fellow, Econometric Society
- 1969-70 Senior Faculty Fellowship, Ford Foundation
- 1971 Fellow, American Academy of Arts and Sciences
- 1974 Lanchester Prize, Operations Research Society of America
- 1976 Member, National Academy of Sciences
- 1978 L.H.D., honoris causa, University of Chicago
- 1983 von Neumann Medal, Operations Research Society of America
- 1991 Distinguished Fellow, American Economic Association
- 1993 Member, American Philosophical Society

PUBLICATIONS

"Group Invariant Integration and the Fundamental Theorem of Algebra." In Proceedings, National Academy of Sciences, May, 1952.

"Shaped Sources for Teletherapy Units," (with W. Pollard), *Nucleonics*, February, 1953.

"On Differential Games with Survival Payoffs," and "Games with Partial Information," (with L. Shapley). In Volume III, Contributions to the Theory of Games, eds. M. Dresher, A.W. Tucker and P. Wolfe, in the series Annals of Mathematical Studies, eds. E. Artin and M. Morse. Princeton University Press, 1957.

"The Nature and Structure of Inventory Problems," (with K.J. Arrow and S. Karlin); "Summaries," (with K.J. Arrow and S. Karlin); "Inventory Models of the Arrow-Harris-Marschak Type with Time Lag," (with S. Karlin); "A Min-Max Solution of an Inventory Problem;" "Stationary Operating Characteristics of an Inventory Model with Time Lag;" and "Inventory Models and Related Stochastic Processes" (with S. Karlin). In Studies in the Mathematical Theory of Inventory and Production, eds. K.J. Arrow, S. Karlin and H.E. Scarf. Stanford University Press, 1958.

"A Dynamic Theory of Consumers' Preferences," Technical Report, Statistics Department, Stanford University, 1958.

"Bayes Solutions of the Statistical Inventory Problem," *Annals of Mathematical Statistics*, Vol. 30, No. 2, 1959.

"Some Examples of Global Instability of the Competitive Equilibrium," *International Economic Review*, Vol. 1, 1960.

"The Optimality of (S, s) Policies in the Dynamic Inventory Problem." In Mathematical Methods in the Social Sciences 1959. Proceedings of the First Stanford Symposium. Stanford University Press, 1959. Also in Optimal Pricing, Inflation, and the Cost of Price Adjustment, eds., E. Sheshinski and Y. Weiss. Cambridge, MA: MIT Press, 1993.

"Optimal Policies for a Multi-echelon Inventory Problem," (with A. J. Clark), *Management Science*, Vol. 6, No. 4, 1960.

"Approximate Solutions to a Simple Multi-Echelon Inventory Problem" (with A.J. Clark). In Studies in Applied Probability and Management Science, eds. K.J. Arrow, S. Karlin, and H. E. Scarf. Stanford University Press, 1962.

"An Analysis of Markets with a Large Number of Participants." Princeton University Conference Paper. In Recent Advances in Game Theory. Philadelphia: The Ivy Curtis Press, 1962.

"A Survey of Analytic Techniques in Inventory Theory." In Multistage Inventory Models and Techniques, eds. H.E. Scarf, D. M. Gilford and M. W. Shelley. Stanford University Press, 1963.

"A Limit Theorem on the Core of an Economy," (with G. Debreu), *International Economic Review*, Vol. 4, No. 3, 1963. Reprinted in Classics in Game Theory, ed. H. Kuhn. Princeton University Press, 1997. Reprinted in Economic Games, Bargaining and Solutions, ed. O.F. Hamouda and J.C.R. Rowley, Foundations of Probability, Econometrics and Economic Games series, series no. 3, Edward Elgar Publishing, 1997.

"An Algorithm for a Class of Nonconvex Programming Problems," Cowles Foundation Discussion Paper, No. 211, July, 1966.

"The Core of an N-Person Game," *Econometrica*, Vol. 35, No. 1, 1967. Reprinted in Classics in Game Theory, ed. H. Kuhn. Princeton University Press, 1997. Reprinted in Economic Games, Bargaining and Solutions, ed. O.F. Hamouda and J.C. R. Rowley, Foundations of Probability Econometrics and Economic Games series, series no. 3, Edward Elgar Publishing, 1997.

"The Approximation of Fixed Points of a Continuous Mapping," *SIAM Journal of Applied Mathematics*, Vol. 15, No. 5, 1967.

"On the Computation of Equilibrium Prices." In Ten Economic Studies in the Tradition of Irving Fisher. New York: John Wiley & Sons, 1967.

"On the Existence of Cooperative Solutions to a Class of N-Person Games." In Indirect Measurement of Utility, U.S. Arms Control and Disarmament Agency (ACDA), November 1968. Also in Game-Theoretic Models of Cooperation & Conflict, eds. J.P. Mayberry, et al. Underground Classics in Economics Series. Boulder, CO: Westview Press, 1992.

"An Example of an Algorithm for Calculating General Equilibrium Prices," *The American Economic Review*, Vol. 59, No. 4, 1969.

"On the Application of a Recent Combinatorial Algorithm," (with T. Hansen), Cowles Foundation Discussion Paper, No. 272, April, 1969

"On the Existence of a Cooperative Solution for a General Class of N-Person Games," *Journal of Economic Theory*, Vol. 3, No. 2, 1971.

"The Limit of the Core of an Economy" (with G. Debreu). In Decision and Organization, Amsterdam: North-Holland, 1972.

The Computation of Economic Equilibria (with collaboration of T. Hansen), Cowles Foundation Monograph No. 24. New Haven: Yale University Press, 1973.

"On Cores and Indivisibility," (with L. Shapley), *Journal of Mathematical Economics*, Vol. 1, No. 1, 1974. Also in Studies in Mathematics, eds. G. B. Dantzig and B. C. Eaves. The Mathematical Association of America, Vol. 10, 1974.

"The 1975 Nobel Prize in Economics: Resource Allocation," *Science Magazine*, Vol. 190, November, 1975.

"The Solution of Systems of Piecewise Linear Equations," (with B. C. Eaves), *Mathematics of Operations Research*, Vol. 1, No. 1, 1976.

"An Observation on the Structure of Production Sets with Indivisibilities," Proceedings, National Academy of Sciences, Vol. 74, No. 9, 1977.

"Production Sets with Indivisibilities, Part I: Generalities," *Econometrica*, Vol. 49, No. 1, 1981.

"Production Sets with Indivisibilities, Part II: The Case of Two Activities," *Econometrica*, Vol. 49, No. 2, 1981.

"Comment on: 'On the Stability of Competitive Equilibrium and the Patterns of Initial Holdings: An Example,'" *International Economic Review*, Vol. 22, No. 2, 1981.

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"Integral Polyhedra in Three Space," *Mathematics of Operations Research*, Vol. 10, No. 3, 1985.

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"Mathematical Programming and Economic Theory," *Operations Research*, Vol. 38, No. 3, 1990.

"Economic Equilibrium and Soviet Economic Reform," *Cowles Foundation Discussion Paper*, No. 969, February, 1991.

"The Origins of Fixed Point Methods." In *History of Mathematical Programming, A Collection of Personal Reminiscences*, eds. J.K. Lenstra, A.H.G. Rinnooy Kan and A. Schrijver. Amsterdam: North-Holland, 1991.

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"The Frobenius Problem and Maximal Lattice Free Bodies," (with D.F. Shallcross), *Mathematics of Operations Research*, Vol. 18, No. 3, 1993.

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"How to Compute Equilibrium Prices in 1891", (with William C. Brainard), CFDP #1272, August 2000.