Michel L. Balinski

Michel Louis Balinski (born 6 October 1933) is an applied mathematician, economist, operations research analyst and political scientist. American, educated in the United States, he has lived and worked primarily in the United States and France. He is known for his work in optimization (combinatorial, linear, nonlinear), convex polyhedra, stable matching, and the theory and practice of electoral systems, jury decision, and social choice. He is Directeur de recherche de classe exceptionnelle (emeritus) of the C.N.R.S. at the Ecole Polytechnique (Paris). He was awarded the John von Neumann Theory Prize by INFORMS in 2013.

Early Life

Michel Balinski was born in Geneva, Switzerland, the son of a Polish diplomat at the League of Nations and the grandson of the Polish bacteriologist and UNICEF founder Ludwik Rajchman. He was living with his grandparents in France when in 1940 the family fled the Nazis via Spain and Portugal to the United States. He graduated from the Edgewood School in Greenwich CT in 1950, earned a B.A. degree cum laude in mathematics at Williams College in 1954 and a M.Sc. in economics at the Massachusetts Institute of Technology in 1956. He completed a Ph.D. in mathematics under the supervision of Albert W. Tucker at Princeton University in 1959.

Career

After completing his Ph.D. Balinski remained at Princeton as a Research Associate then Lecturer in mathematics. From 1963 to 1965 he was Associate Professor of Economics at the Wharton School of the University of Pennsylvania. He was then appointed to the Graduate School of the City University of New York, first as Associate Professor then (as of 1969) Professor of Mathematics. One of his doctoral students at the City University was another noted mathematician, Louis Billera, through whom he has many academic descendants. In 1978 he was appointed Professor of Organization and Management and of Administrative Sciences at Yale.

In parallel with his academic work Balinski engaged in consulting as of the time he was a graduate student at Princeton. A participant in the beginnings of what became the consulting firm Mathematica, he was a Senior Consultant with the firm from 1962 to 1974. He also acted as a consultant elsewhere, including the Rand Corporation, Mobil Oil Research, the ORTF (Office de Radiodiffusion-Télévision Française), the Mayor's office of the City of New York (as member of the Operations Research Council), and Econ, Inc. From 1975 to 1977 he was Chairman of System and Decision Sciences at IIASA (International Institute for Applied Systems Analyses) at Laxenburg, Austria.

 In 1980 Michel Balinski settled in France, becoming Directeur de Recherche de classe exceptionnelle of the CNRS (Centre National de Recherche Scientifique) at the Laboratoire d'Econométrie of the Ecole Polytechnique in 1983. Concurrently he was Leading Professor of Applied Mathematics and Statistics and of Economics at SUNY (State University of New York) Stony Brook (1983-1990), where he founded and was the first Director of the Institute for Decision Sciences (that has since become the Center for Game Theory in Economics).

Upon becoming Director of the Laboratoire d'Econométrie (1989 to 1999) he co-founded and co-directed the joint Ecole Polytechnique/Université de Paris 1 Ph.D. program "Modélisation et methodes mathématiques en économie: optimisation et analyse stratégiques," and its successor the joint Ecole Polytechnique/Université Pierre et Marie Curie (Paris 6) Ph.D. program "Optimisation, jeux et modélisation en économie."

He was a visiting professor at other institutions, including the Ecole Polytechnique Fédérale de Lausanne (1972-1973), the Université Scientifique et Médicale de Grenoble (1974-1975), the Universidad de Chile in Santiago (1994), and INSEAD in Fontainebleau (1997-1998).

Balinski was the founding Editor-in-Chief of the journal *Mathematical Programming* in 1971, one of the founders of the Mathematical Optimization Society in 1970, and President of that society from1986 to 1989.

Research contributions

Balinski's Ph.D. thesis concerned the vertex enumeration problem, the algorithmic problem of listing all vertices of a convex polytope or finding all optimal solutions of a linear program, and some of his subsequent work continued to concern polyhedral combinatorics. The thesis includes the fundamental theorem, published in 1961, that the skeletons of polytopes in n-space viewed as graphs are n-connected, meaning that at least n edges must be removed to disconnect the graph of the remaining vertices and edges. He also proved the Hirsch conjecture for several different classes of polytopes associated with the transportation problem, showed that the diameter of the skeleton of the assignment polytope viewed as a graph is 2, and found the polytope whose vertices are the stable matchings of the university admissions problem.

His contributions to linear and nonlinear optimization include a primal/dual simplex method that incorporates a natural proof of termination and leads to a self-contained, elementary but rigorous, constructive account of the theory and the basic computational tool of linear programming; the use and economic interpretation of dual prices; and a proof that prices in von Neumann's model of an expanding economy are marginal values. His work in integer programming includes the formulation and analysis of the fixed cost transportation problem; one of the first computationally successful practical uses of Gomory's cutting plane algorithm (1968, truck deliveries with cost functions in part concave, in part convex); and an extensive survey paper on integer programming which was awarded INFORM's Lanchester Prize in 1965. In 1970 he published one of the earliest papers on the closure problem and its applications to transportation planning.

Balinski has made important contributions to the theory of electoral decisions, namely, representation and apportionment on the one hand, and voting on the other. His 1982 book with H. P. Young has had direct practical application in apportioning the seats of assemblies to regions in several countries (including the UK). He conceived and developed "biproportional apportionment" that has been adopted (as of 2014) in five of Switzerland's cantonal elections. His 2010 book with Rida Laraki proposes a new theory and method of voting called "majority judgment" where voters evaluate the merit of each candidate in a well-defined ordinal scale (instead of voting for one or several candidates, or rank-ordering them) and majorities determine society's evaluation of each candidate and thereby its rank-ordering of them all. This, they prove, overcomes the most important drawbacks of the traditional theory of voting (including Arrow's impossibility theorem).

Distinctions

Phi Beta Kappa, Williams College, 1954; Lanchester Prize, INFORMS, 1965; I.B.M. World Trade Corporation Fellow, 1969-1970; Lester R. Ford Award, Mathematical Association of America, 1976; Honorary Master of Arts, Privatum, Yale University, 1978; Special Service Award, Mathematical Optimization Society, 1982; Honorary Doctorate (Ehrendoktors, Mathematisch-Naturwissenshaftlichen) Universität Augsburg, 2004; Murat Sertel Lecturer (inaugural lecture), 8th International Meeting of the Society for Social Choice and Welfare, Istanbul, July 2006; Messenger Lecturer, Cornell University, September 2007; IFORS Distinguished Lecturer, INFORMS National Meeting, Washington, D.C., October 2008; Lester R. Ford Award, Mathematical Association of America, 2009; Celebration of Michel Balinski's 78 years at the 23rd International Conference on Game Theory, SUNY Stony Brook, July 2012; John von Neumann Theory Prize, INFORMS, 2013; INFORMS Fellow, 2014.

Publications

Author or co-author of over a hundred articles, Michel Balinski has published three books and edited seven.

Books:

M. L. Balinski and H. P. Young, *Fair Representation: Meeting the Ideal of One Man, One Vote*. Yale University Press, New Haven, CT and London, 1982. 2nd edition, Brookings Institution Press, Washington, D.C., 2001. Japanese translation, Chikura-Shobo Publishing Co., Tokyo, 1987. [Given the George H. Hallet Award, 2008, "[For] a book published at least 10 years ago that has made a lasting contribution to ... representation and electoral systems."]

M. L. Balinski, *Le suffrage universel inachevé*, Editions Belin, Paris, 2004.

M. L. Balinski and Rida Laraki, *Majority Judgment: Measuring, Ranking and Electing*. M.I.T. Press, Cambridge, MA, 2010.

Selected papers:

M. L. Balinski, An algorithm for finding all vertices of convex polyhedral sets. *Journal of the Society for Industrial and Applied Mathematics* 9 (1961) 72-88.

M. L. Balinski, On the graph structure of convex polyhedra in n-space. *Pacific Journal of Mathematics* 11 (1961) 431-434.

M. L. Balinski, Integer programming : methods, uses, computation. *Management Science* 12 (1965) 253-313. Reprinted in G. B. Dantzig and A. F. Veinott, Jr., eds., *Mathematics of the Decision Sciences*, Lectures in Applied Mathematics, American Mathematical Society, vol. 11, 1968, 179-256 ; in H. W. Kuhn, ed., *Proceedings of the Princeton Symposium on Mathematical Programming*, Princeton University Press, 1970, 199-266; and in M. Jünger et al, eds., *50 Years of Integer Programming 1958-2008*, Springer Verlag, 2010, 133-197. [Given the 1965 Lanchester Prize].

M. L. Balinski and W. J. Baumol, The dual in nonlinear programming and its economic interpretation. *The Review of Economic Studies* XXXV (1968) 237-256.

M. L. Balinski and A. W. Tucker, Duality theory of linear programs: a constructive approach with applications. *SIAM Review* 11 (1969) 347-377.

M.L. Balinski, On a selection problem. *Management Science* 17 (1970) 230-231.

M. L. Balinski and H. P. Young, Interpreting von Neumann model prices as marginal values. *Journal of Economic Theory* 9 (1974) 449-463.

M. L. Balinski and H. P. Young, The quota method of apportionment. *American Mathematical Monthly* 82 (1975) 701-730. [Given the Lester R. Ford Award].

M. L. Balinski and G. Demange, An axiomatic approach to proportionality between matrices. *Mathematics of Operations Research* 14 (1989) 700-719.

M. L. Balinski and T. Sönmez, A tale of two mechanisms: student placement. *Journal of Economic Theory* 84 (1999) 73-94.

M. Baïou and M. L. Balinski, The stable allocation (or ordinal transportation) problem. *Mathematics of Operations Research* 27 (2002) 662-680.

M. L. Balinski, What is just? *American Mathematical Monthly* 112 (2005) 502-511.

M. L. Balinski, Fair majority voting (or how to eliminate gerrymandering). *American Mathematical Monthly* 115 (2008) 97-113. [Given the Lester R. Ford Award].

M. L. Balinski, Projets électoraux: le droit rencontre les mathématiques. *Recueil Dalloz* no. 3, 2009, pp. 183-186.

M. L. Balinski and R. Laraki, Jugement majoritaire versus vote majoritaire (via les présidentielles 2011-2012). *Revue Française d'Economie* XXVII (2013) 11- 44.

M. L. Balinski and R. Laraki, Judge: Don't Vote ! *Operations Research* 62 (2014) 483-511.

External links

https://www.informs.org/Explore/History-of-O.R.-Excellence/Biographical-Profiles/Balinski-Michel

https://www.google.fr/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CCQQFjAA&url=https%3A%2F%2Fopus.bibliothek.uni-augsburg.de%2Fopus4%2Ffiles%2F55%2Fbalinski.pdf&ei=hpaCVYOyLciqUdK8gvAE&usg=AFQjCNHwv3Qt5y4-pkbPuPnfWIyDv4mpdg

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http://www.eurekalert.org/pub_releases/2013-10/ifor-mbo100813.php

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http://en.wikipedia.org/wiki/Balinski's_theorem

http://www.math.cornell.edu/~billera/misc/Abstracts.html

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http://www.college-de-france.fr/site/pierre-rosanvallon/seminar-2012-02-29-10h00.htm

http://mitpress.mit.edu/books/majority-judgment

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