
THOMAS L. SAATY

EDUCATION

Ph.D., Mathematics, Yale University, 1953
Post-graduate study, The Sorbonne, University of Paris, 1952-53
M.A., Mathematics, Yale University, 1951
M.S., Physics, Catholic University of America, 1949
B.A., Columbia Union College, 1948

POSITIONS

1979 -present, University of Pittsburgh, Distinguished University Professor Chair,

with appointments to the Philosophy of Science; Operations, Decision Sciences and Artificial Intelligence at the Joseph M. Katz Graduate School of Business; School of Engineering; Mathematics and Sociology.

In the early to mid 1970's he was invited by the American Association for the Advancement of Science to give the National Science Foundation Chautauqua type short courses, two-day lectures on the mathematics of operations research, at four university centers from North to South in the East, Central, and Western divisions (gave about ten 2-day workshops over a period of three years).

1969-1979, University of Pennsylvania, Professor

with appointments in the Wharton School to the Graduate Groups of Operations Research (Chairman, 1969-71), and Social Systems Sciences, and appointments in the University to the Graduate Groups of Applied Mathematics, Energy Management and Power, Peace Science, Civil Engineering, and Decision Sciences.

From 1963 to 1967 he regularly presented 2-week short courses at the University of California Life Long Learning Extension Program on the UCLA campus on graphs and networks (Aug. 1965 and August 1967), nonlinear analysis with applications (June-July 1964 and June 1965), operations research (Sept. 1966), queueing theory (June-July 1963), and optimization and stochastic models with applications (August 1966).

1963-1969, Arms Control and Disarmament Agency, Washington, D.C. Scientific Analyst

1965-1967, Conference Board of the Mathematical Sciences, Washington, D.C. Executive Director

1961-1963, Office of Naval Research, Head: Mathematics Branch.

1959-1961, Office of Naval Research, Director of Advanced Planning (Completed a report on the feasibility - infeasibility of the hydrofoil for the U.S. Navy and supervised the production and synthesis of a completed report on chemical and biological warfare.)

1958-1959, U.S. Embassy, London, Scientific Liaison Officer.

1957-1958, Navy Management Office, Scientific Analyst

1954-1957, Operations Evaluation Group (MIT), Scientific Analyst

1953-1954, Melpar, Inc. Scientific Analyst, submarine defense

AWARDS AND HONORS

2012 Awarded the Herbert Simon Award for Outstanding Contribution in Information Technology and Decision Making for the paper "The Possibility Of Group Welfare Functions" coauthored with Professor Luis G. Vargas, published in the International Journal of Information Technology & Decision Making (IJITDM)

2011 Awarded Doktor Honoris Causa degree by Jagiellonian University (Poland's oldest) in Krakow

2010 Award for Excellence in Teaching

2009 The University of Pittsburgh Chancellor's Distinguished Research Award

2008 Awarded the INFORMS Impact Prize

2007 Awarded the International Quality Function Deployment Akao Prize from Japan

http://www.qfdi.org/who_is_qfdi/akao_prize.htm

Who's Who in America and in American Men of Science

International Society of the Analytic Hierarchy Process (ISAHP) established in honor of Saaty's Analytic Hierarchy Process. International Meetings have been held in Tianjin 1988, Pittsburgh 1991, Washington, DC 1994, Vancouver 1996, Kobe 1999, Bern 2001, Bali 2003, Hawaii 2005, Chile 2007 and Pittsburgh 2009.

2005, Member, National Academy of Engineering: "For the development and generalization of the analytic hierarchy process and the analytic network process in multicriteria decision-making."

2004, Honored with a gathering of scholars and friends to talks and dinner, Oct. 25

2000, Gold Medal: The International Society of Multicriteria Decision Making

1998, Elected member of the International Academy of Management

1984, Beta Gamma Sigma Honor Society

1982, Alumnus of the Year Honor, Columbia Union College

- 1982, Notified that the Thomas L. Saaty Prize awarded to best research papers in Mathematics and Management has been established.
- 1977, Won the Franz Edelman Award for Achievement in Operations Research and the Management Sciences, College on the Practice of Management Science for his contributions and leadership in one of the best applied studies of the year: The Sudan Transport Plan, work in which 40 scientists, engineers and world renowned Wharton colleague economist (Lawrence Klein, Nobel Laureate) were involved over a period of two years to develop a comprehensive transport plan for the Sudan in Africa, a million dollar study sponsored by the Kuwait fund for Arab Economic Development
- 1973, Awarded the Lester R. Ford prize by the Mathematical Association of America for a major work on the four-color problem.
- 1972-1976, Invited by the Association for the Advancement of Science (AAAS) in collaboration with the National Science Foundation to give Chautauqua type two day lectures eight times a year around the US to professors of mathematics and science, on the latest ideas in modeling, problem-solving and decision-making, planning and resource allocation.
- 1970, Elected to the National Academy of Sciences, Spain
- 1959, Elected Fellow of the American Association for the Advancement of Science.

Best lifetime accomplishments- Brief Account

1. Being his class's curve-breaker in Organic Chemistry, at the age of 20, corrected the Encyclopedia Britannica about what ketones consisted of.
2. Received scholarship in mathematics at Yale University.
3. Contributed to the development of the new and widely known and applied field of Linear Programming : Parametric programming with S.I. Gass (3 papers); initiated research by others by publishing an article on the number of vertices of a polyhedron, important for estimating the number of steps needed to solve a linear programming problem.
4. While in his twenties, wrote the first book in the field: Mathematical Methods of Operations Research published by McGraw Hill and translated to Russian and Japanese. The famous Russian mathematician B.V. Gnedenko said that it is the best book on the subject among the many books written in the United States.
5. Queuing theory – was first to solve for the average waiting time for the well known time-dependent waiting line problem with a single line having multiple servers; published a large paper called “Resume of Queuing Theory” followed by a book on the subject, reviewed by D.G. Kendall of Oxford as “a substantial encyclopedia of queuing theory... an extremely useful work of reference which will be valuable in many ways.”
6. Was chosen nationally as Scientific Liaison Officer, The Office of Naval Research at the US Embassy in London (1958-1959) to travel in Europe visiting scholars in Mathematics and in Operations Research and write and distribute well written reports to researchers at universities in the US about their research.

7. Solved a version of the Chapman-Kolmogorov equations with absorbing barriers, used later to develop a model for the growth of bacteria (tularemia), implemented by the Army Chemical Corp. Later supervised work at the Arms Control and Disarmament Agency done by the Midwest Research Institute in Kansas City to test the fragility of such bacteria under different temperatures and thereafter thwart the possibility of waging bacteriological warfare.
8. As director of advanced planning at the Office of Naval Research supervised a study on chemical warfare for the US Pacific Fleet and another on the infeasibility of using hydrofoils in a substantive way for the US Navy.
9. As director of the mathematics Branch at the Office of Naval Research invited 18 leading mathematicians in the world to give a lecture at the George Washington University each contributing a chapter in the three volume series that he edited: Lectures on Modern Mathematics, published by John Wiley.
10. Wrote two volumes on non-linear mathematics covering 13 types of equations published by McGraw-Hill. The first volume was co-authored with J. Bram.
11. At the Arms Control and Disarmament Agency Co-authored a report on trading off the Soviet Badger and the US B-52 bombers.
12. In 1968 wrote the book Mathematical Models of Arms Control and Disarmament published by John Wiley and reviewed in Management Science in 1969: "This fascinating book is an important contribution to the pressing task of discovering some valid underlying mathematical structures in politics" later translated to Russian: also supervised a group of economists and game theory consultants on disarmament negotiations four of whom later won the Nobel Prize (Robert Aumann, Gerard Debreu, John Harsanyi, Reinhard Selten).
13. Director of the Conference Board of the Mathematical Sciences, 1964-1966.
14. President of a corporation, that cooperated with the World Bank and the supporting Kuwait Fund to develop a comprehensive transport system of 103 air, land, rail, road and water projects in the Sudan in Africa that is one of the most fertile countries in the world and seventh largest in area through which the White and Blue Niles flow. Won a prize for that work from the Institute of Management Science in 1977.
15. In 1972 won the Lester R. Ford prize from the Mathematical Association of America for a comprehensive article on the very long-standing mathematical Four-Color Problem, solved on the computer with more than 1000 cases, soon after, exhaustively, by three mathematicians.
16. Assisted the government of Tanzania to choose the best of a dozen worldwide contractors to build the new capital in the central city Dodoma instead of the ocean city Dar es Salaam.
17. Developed the Analytic Hierarchy Process for the measurement of intangibles, providing foundations for the mathematics of the social sciences, particularly in decision making. This work incorporated the mathematical concept of inconsistency and its measurement, a concept that is prohibited through an axiom in economics and game theory. He also applied the concept of consistency to limiting jury size. In 2000 he won the International Decision Making

Society's Gold Medal; in 2005 the Japanese Akao Prize and elected to the National Academy of Engineering and in 2008 the INFORMS impact award for this work.

18. Developed the Analytic Network Process for the measurement of intangibles with dependence and feedback. This process contributed to the invention of the much needed concept of a supermatrix whose entries are matrices of column Perron vectors.
19. Discovered the fundamental functional equation for neural activity to establish the proportionality between brain information from stimuli and the original source of the stimuli, solved by the world-renowned functional equation specialists, Janos Aczel, and later for operators by Nicole Brillouet-Belluot; this several years work culminated in a book on the brain in 2000..
20. In 2013 generalized the solution of the fundamental functional equation from the real and complex domains to the other two division algebras the quaternions and octonions and conjectured the Fourier transforms of these two solutions. The object was to interpret how neural firings work with feeling and thinking in the abstract domain.
21. Applied the AHP/ANP to conflict resolution by developing equations for making fair tradeoffs applied to conflicts in South Africa, Northern Ireland and, more recently, the Israeli-Palestinian conflict.
22. In 2010 won the Herbert Simon Award along with student, colleague and friend Luis Vargas for proving that it is *possible* to derive a representative group judgment from individual judgments if one were to use paired comparisons with numerically represented cardinal judgments. Kenneth Arrow had proved that if the individuals use ordinal judgment (either A is preferred to B or B is preferred to A) then it is *impossible* to derive from them a representative group judgment. In 1972, Arrow won the Nobel Prize for his proof.
23. In 2011 honored with Doctor Honoris Causa by Jagellonian University, the oldest university in Poland. They had applied AHP to decide that Poland should not join the Euro for a few years, acted on by Prime Minister Jaroslaw Kaczynski.
24. Wrote book, Compact City, an imaginative and practical work about future 3-dimensional cities whose first version he co-authored with G.B. Dantzig, inventor of the simplex process in linear programming.
25. In a paper "The Natural Law of Structured Cooperation", in 2014, demonstrated the Conjecture (An Empirical Law): In order that a system of homogeneous elements and components functions synchronously with a modicum of consistency, the number of its elements in each component of its hierarchic structure must be small, no more than 7 or 8, depending on the system. In nature, because of symmetry, both bilateral in animals and multilateral in matter, 8 is the more likely number. In thought and imagination, 7 is the maximum number.

MEMBERSHIPS

National Academy of Engineering
Fellow, American Association for the Advancement of Science
American Mathematical Society
Mathematical Association of America
Operations Research Society of America
International Institute for Strategic Studies
World Future Society
International Peace Science Society
International Academy of Management
Beta Gamma Sigma

EDITORIAL POSITIONS

Present

The International Journal of Systems, Measurement and Decisions, Associate Editor
Information Technology and Decision Making, Associate Editor
Journal of Multi-Criteria Decision Analysis, Associate Editor
Journal of Systems Science and Systems Engineering (JSSSE), Associate Editor
International Journal of Organizational Analysis, Associate Editor
International Journal of Commerce and Management, Associated Editor
Real Academia de Ciencias; Revista de la Real Academia de Ciencias Exactas, Fisicas y Naturales, Series A Matematicas, Scientific Committee member

Past

Journal of Operations Research, Associate Editor, 1958-63
Mathematical Reviews, Reviewer, 1954-75
Newsletter for the Mathematical Sciences, Editor (and originator), 1965-67
Naval Research Logistics Quarterly, Associate Editor
Applied Mathematical Letters, Associate Editor
The Journal of Mathematical and Computer Modeling, Associate Editor

CONSULTING

Governments of France, Egypt, Sudan, Kuwait (Council of Ministers), Tanzania, and the United Nations. Westinghouse; U.S. Steel; RCA; Woods Gordon of Canada; R.J. Reynolds; The Ford Foundation; American Cyanamid; Colonial Penn Insurance; Pan American Airlines; Monsanto; Xerox; Kodak; North American Rockwell; Westinghouse; Booz Allen Applied Research; Logistics Management Institute; The Urban Institute; Electric Power Research Institute; NASA; AID; LEAA; Department of State, Department of Defense; Department of the Air Force; National Institute of Health; National Bureau of Standards; Bureau of the Census.

RECENT RESEARCH INTEREST

Decision Making: Developing the mathematical theory of the Analytic Network Process (ANP) for decisions with dependence and feedback to decisions with benefits opportunities, costs and risks. The ANP is a generalization of the Analytic Hierarchy Process (AHP), which I created, by assisting governments and corporations in making decisions such as: trading off weapon systems in arms control negotiations, defending against attacks by terrorists and the feasibility of acquiring manufacturing plants in overseas countries in the face of strong competition.

Conflict Resolution: Applying the Analytic Network Process to propose solutions to a variety of international conflicts discussed in my book Conflict Resolution and several works after including the 2003 war in Iraq and the Israeli-Palestinian conflict. Proposed and widely circulated the creation of an International Center for Conflict Resolution (ICCR). Corresponded and visited with interested world leaders. I am concerned about the spread of nuclear weapons around the world and the increasing threat of a world war.

Process thinking as an advance in systems thinking suggests that systems are always subject to change and improvement, and this applies to our world in general and its integration through the spread of ideas and through trade and interdependence. There is no holding back of the progressive forces shaping the future of mankind. I am writing a book to show that the AHP/ANP is a natural way for people to work together by laying out their goals and purposes to plan and design systems that allow for change and for improvement. I have developed and extensively applied a practical method for projecting the likely future based on the use of both tangible and intangible factors and for working backwards to identify strategies to better attain desired futures.

Research on neural networks: how the synthesis of firing of neurons is intimately related to decision making using ratio and proportion.

OTHER INTERESTS

Collector, editor and publisher of twenty-two books on "The Thinking Man's Humor" (an international collection), under various humorous pseudonyms

Owner of a very comprehensive collection of books on Beethoven and of all his recorded works

Builder of furniture

Long time carer and waterer and sometimes planter as needed with wonderful and multi talented wife Rozann of a large and beautiful garden (1000 tulips, 100's of impatience etc. etc.) in the spring and summer

BOOKS

The Neural Network Process (NNP), RWS Publications, 4922 Ellsworth Avenue, Pittsburgh, PA 15213, 2014.

Compact City: The Next Urban Evolution in Response to Climate Change, RWS Publications, 4922 Ellsworth Avenue, Pittsburgh, PA 15213, 2013.

Models, Methods, Concepts and Applications of the Analytic Hierarchy Process (with L.G. Vargas), Kluwer Academic Publishers, Boston, Much Revised, 2013.

The Encyclicon Volume 3 (with L. G. Vargas), RWS Publications, 4922 Ellsworth Avenue, Pittsburgh, PA 15213, 2011.

Principia Mathematica Decernendi: Mathematical Principles of Decision Making, RWS Publications, 4922 Ellsworth Avenue, Pittsburgh, PA 15213, 2010.

Il decision making e i decisionali Multicriterio: Le metodologie AHP e ANP, (with Domenico Falcone and Fabio De Felice) HOPELI, Milano, Italy, 2009.

The Encyclicon Volume 2 (with Brady Cillo), RWS Publications, 4922 Ellsworth Avenue, Pittsburgh, PA 15213, 2008.

Group Decision Making: Drawing our and Reconciling Differences (with Kirti Peniwati), RWS Publications, 4922 Ellsworth Avenue, Pittsburgh, PA 15213, 2008.

Decision Making with the Analytic Network Process: Economic, Political, Social and Technological Applications with benefits, Opportunities, Costs and Risks, (with L.G. Vargas), 2006, Springer's International Series.

Theory and Applications of the Analytic Network Process, RWS Publications, 4922 Ellsworth Avenue, Pittsburgh, PA 15213, 2005.

The Encyclicon, (with M. Ozdemir), RWS Publications, 4922 Ellsworth Avenue, Pittsburgh, PA 15213, 2005.

Creative Thinking, Problem Solving & Decision Making, RWS Publications, 4922 Ellsworth Avenue, Pittsburgh, PA 15213, 2001, Revised 2006.

Models, Methods, Concepts and Applications of the Analytic Hierarchy Process (with L.G. Vargas), Kluwer Academic Publishers, Boston, 2000.

The Brain, Unraveling the Mystery of How it Works: The Neural Network Process, RWS Publications, 4922 Ellsworth Avenue, Pittsburgh, PA 15213, 2000

The Analytic Network Process: Decision Making with Dependence and Feedback, RWS Publications, 4922 Ellsworth Ave., Pittsburgh, PA 15213, 1996, completely revised and published 2001.

Decision Making with Dependence and Feedback: The Analytic Network Process (ANP) and

SuperDecisions Software, Guide, Manual and Examples, RWS Publications, 4922 Ellsworth Avenue, Pittsburgh, PA 15213, Pittsburgh, 1997.

Decision Making in Economic, Political, Social and Technological Environments: The Analytic Hierarchy Process, (with L.G. Vargas), paperback, RWS Publications, 4922 Ellsworth Ave., Pittsburgh, PA 15213, 1994.

Fundamentals of Decision Making with the Analytic Hierarchy Process, paperback, RWS Publications, 4922 Ellsworth Avenue, Pittsburgh, PA 15213-2807, original edition 1994, revised 2000.

The Hierarchon - A Dictionary of Hierarchies, (with Ernest H. Forman), RWS Publications, 4922 Ellsworth Avenue, Pittsburgh, PA 15213-2807, 1993.

Prediction, Projection and Forecasting, (with Luis G. Vargas), Kluwer Academic, Boston, 1991.

Embracing the Future, (with Larry W. Boone), Praeger, New York, 1990.

Conflict Resolution: The Analytic Hierarchy Process, (with Joyce Alexander), Praeger, New York, 1989.

Analytical Planning; The Organization of Systems, (with Keven P. Kearns), Pergamon Press, Oxford, 1985. Translated to Russian. Paperback edition, RWS Publications, Pittsburgh, 1991.

The Logic of Priorities; Applications in Business, Energy, Health, and Transportation, (with Luis G. Vargas), Kluwer-Nijhoff, Boston, 1982. Paperback edition, RWS Publications, Pittsburgh, 1991.

Decision Making for Leaders; The Analytical Hierarchy Process for Decisions in a Complex World, Wadsworth, Belmont, CA, 1982. Translated to French, Indonesian, Spanish, Korean, Arabic, Persian, Thai. Latest revised version, RWS Publications, Pittsburgh, 2000.

The Analytic Hierarchy Process, McGraw Hill International, New York, 1980. Translated to Russian, Portuguese, and Chinese. Revised edition, paperback, RWS Publications, Pittsburgh, 1990,1996.

Thinking with Models, (with Joyce Alexander), Pergamon Press, Oxford, 1981.

The Four-Color Problem; Assaults and Conquest, (with Paul C. Kainen), McGraw-Hill International, 1977, Dover, 1986.

Topics in Behavioral Mathematics, Mathematical Association of America, Washington, D.C., 1973.

Compact City, (with George B. Dantzig), (translated to Japanese and Russian), W.H. Freeman and Company, 1973.

Optimization in Integers and Related Extremal Problems, (translated to Russian), McGraw-Hill, 1970.

The Spirit and Uses of the Mathematical Sciences, (Editor, with F.J. Weyl), McGraw-Hill, 1969.

Mathematical Models of Arms Control and Disarmament,(translated to Russian), John Wiley and Sons, 1968.

Modern Nonlinear Equations, McGraw-Hill, 1967, reprinted by Dover, 1982.

Finite Graphs and Networks, (with R. Busacker), (translated to Japanese, Russian, German and Hungarian), McGraw-Hill, 1965.

Lectures on Modern Mathematics, Volumes I, II, III (Editor), Translated to Japanese), John Wiley and Sons, Inc., 1964-65.

Nonlinear Mathematics, (with J. Bram), McGraw-Hill, 1964; reprinted by Dover, 1981.

Elements of Queueing Theory with Applications, (translated to Russian, Spanish and German), McGraw-Hill, 1961.

Mathematical Methods of Operations Research, (translated to Japanese and Russian), McGraw-Hill, 1959.

The Unthinkable and the Possible in the Middle East with the economist Lawrence Klein Completed but unpublished (1977).

Another book on the Middle East that is relevant to our times, completed but also unpublished (1989).
Decision Technology and Problem Solving (300 pages), completed text book but not published.
Complexity and Choice, another completed but unpublished book (more than 300 pages).

CHAPTERS IN BOOKS

Chapter 1

The Analytic Hierarchy and Analytic Network Processes for the Measurement of Intangible Criteria and for Decision-Making Multiple Criteria Decision Analysis: State of the Art Surveys 2nd Edition to be edited by Matthias Ehrgott, José Rui Figueira, and Salvatore Greco, pp. 1-60. Springer 2014

The Analytic Hierarchy and Analytic Network Measurement Processes: The Measurement of Intangibles, (with M. Sodenkamp) in: C. Zopounidis, P.M. Pardalos, Handbook of Multicriteria Analysis, Springer, New York, pages 91-166, 2010.

How to Obtain Representative Group Judgments from Individual Judgments, in Technologies for Supporting Reasoning Communities and Collaborative Decision Making, John Yearwod and Andrew Stranieri, Editors, IGI Global, Hershey, PA (2010).

The Analytic Network Process- Dependence and Feedback in Decision-Making: Theory and Validation Examples, Chapter 18 in *Business Applications and Computational Intelligence*, edited by Kevin E. Voges and Nigel K. LI. Pope, Idea Group Publishing, London, 2006.

Dispersion of Group Judgments (with Luis Vargas), pp. 385-396, in "The Next Wave in Computing, Optimization and Decision Technologies" Edited by B. Golden, S. Raghvan and E. Wasil, Springer 2005.

The Analytic Hierarchy and Analytic Network Processes for the Measurement of Intangible Criteria and for Decision-Making, Chapter 9, pp.345-407 in *Multiple Criteria Decision Analysis: State of the Art Surveys*, edited by J. Figueira, S. Greco, and M Ehrgott, Springer (2005).

The first six chapters in the book *Toma de Decisiones En Escenarios Complejos*, by Claudio Garuti and Mauricio Escudey (Eds), Editorial Universidad de Santiago, Santiago, Chile, 2005.

"Fundamentals of the Analytic Hierarchy Process," Chapter 2 in *The Analytic Hierarchy Process in Natural Resource and Environmental Decision Making*, edited by Daniel L. Schmoldt, Jyrki Kangas, Guillermo A. Mendoza and Mauno Pesonen, Kluwer Academic Publishers, 2001.

"The Seven Pillars of the Analytic Hierarchy Process," Chapter 2 in *Multiple Criteria Decision Making in the New Millennium*, edited by Murat Köksalan and Stanley Zionts, Springer, 2001.

"Decision Making in Complex Situations - The Analytic Hierarchy Process as a Multivalued Logic", Chapter 4 - Logic, p.95 in *Causality & Non-Causality*, edited by Toshiko Sawaguchi, Forensic Press, 1992.

"Partial Differential Equations," *Computers and Mathematics with Applications*, Matthew Witten, Editor, Pergamon Press, 1985.

"The Sudan Transport Study", Chapter 6 in *Selected Readings in Operational Research for Developing Countries*, 1982.

Theory of Measurement of Impacts and Interactions in Systems,. in *Systems Methodology in Social Science Research*, Kluwer-Nijhoff Publishing, 1982.

Systemic Ordering of Complexity, in *McGraw-Hill Yearbook of Science and Technology*, McGraw-Hill editors, McGraw-Hill, 1982.

Graph Theory: the Four Color Problem, in *McGraw-Hill Year-book of Science and Technology*, McGraw-Hill editors, McGraw-Hill, 1981.

Terrorism: Patterns for Negotiation; A Case Study Using Hierarchies and Holarchies, (with J.P. Bennett), in *Terrorism: Threat, Reality, Response*, Robert Kupperman and Darrell Trent, Hoover Institution Press, 1979.

Habitat, in Social Consequences of Engineering, edited by Hayrettin Kardestuncer, Boyd and Fraser, 1979.

Interaction and Impacts in Hierarchical Systems, in Decision Information, edited by R. Thrall and C. Tsokos, The Academic Press, 1979.

Mathematische Konflikt-Analyse, in Handwörterbuch der Mathematischen Wirtschaftswissenschaften, edited by Martin Beckman, Gabler, Germany, 1978.

Methods of Conflict Analysis in Urban and International Conflicts, in Selected Readings in Quantitative Urban Analysis, edited by J. Bernstein, 1977.

Graph Theory: Some Methods and Applications, in Handbook of Operations Research, edited by S. Elmaghraby and J. Moder, D. Van Nostrand, 1978.

Variations on a Four Color Theme, in Unsolved Problems in Mathematics, in Russian, Mathematical Cybernetics Series, Moscow, 1975.

Mathematical Foundation of the Stability of Deterrence, (with Paul J. Long), in Topics in Behavioral Mathematics, Mathematical Association of America, 1973.

An Application of Decision Theory - The Development of New Tools, in Symposium on Decision Theory, Dunod, Paris, 1969.

Stochastic Network Flows, in Congestion Theory, Smith and Wilkinson, Chapel Hill, 1965

Ordering Disorderly Queues, in Queueing Theory, Recent Developments and Applications, edited by R. Cruon, The English Universities Press, Ltd., 1967.

Operational Analysis, in Mathematics for Physicists and Chemists, Vol. II, Margenau and Murphy, D. Van Nostrand, 1964.

PAPERS and ARTICLES

A Better World Through Better Decision Making, Malaysian Management Review; Jul-Dec 2013. |

Criteria for Evaluating Multi-criteria Decision Making Methods (with Daji Ergu and Gang Kou) journal of Decision analysis

An Analytic Hierarchy Process model of group consensus (with Qingxing Dong), Journal of Systems Science and Systems Engineering,

THE RATIONALITY OF PUNISHMENT – MEASURING THE SEVERITY OF CRIMES: AN AHP BASED ORDERS-OF-MAGNITUDE APPROACH, (with Mujgan Ozdemir and Jennifer Shang), *European Journal of Operational Research*

The Three Laws of Thought, Plus One: The Law of Comparisons. *Journal: Axioms*, Volume 3, Page(s):46-49, 2014

Better World through Better Decision Making, *Malaysian Management Review (MMR)*, Vol. 48, Issue 2, 2013.

The Analytic Hierarchy Process without the Theory of Oskar Perron, *International Journal of the Analytic Hierarchy Process*, Vol.5, Issue 2, 2013, ISSN 1936-6744.

Principles for Implementing a Potential Solution to the Middle East Conflict, (with H.J. Zoffer) *Notices of the American Mathematical Society*, Volume 60, Number 10, 1300-1322, 2013.

The Modern Science of Multicriteria Decision Making and Its Practical Applications: The AHP/ANP Approach. *Operations Research* 61(5):1101-1118, 2013.

On the Measurement of Intangibles. A Principal Eigenvector Approach to Relative Measurement Derived from Paired Comparisons, *Notices of the American Mathematical Society*, Vol 60, No. 2pp. 192-208, February 2013.

Neural synthesis of firing decisions in the brain, *Istanbul University Journal of the School of Business Administration Cilt/Vol:41, Sayı/No:2*, 2012, 162-171 ISSN: 1303-1732 – www.ifdergisi.org © 2012.

A New Approach to The Middle East Conflict: The Analytic Hierarchy Process. (with H.J. Zoffer), *J. Multi-Crit. Decis. Anal.* vol. 19 pp 201-225, 2012.

THE SERIOUS OMISSION OF COMPARISONS IN ARISTOTLE'S LAWS OF THOUGHT, *International Journal of the Analytic Hierarchy Process*, Vol. 3 Issue 2, 2011, ISSN 1936-6744.

The analytic hierarchy process applied to complexity (with Nina Begicevic) *Int. J. Economics and Business Research*, Vol. 4, No. 3, 2012.

The Possibility of Group Choice: Pairwise Comparisons and Merging Functions, (with L.G. Vargas), *Social Choice and Welfare*, Volume 38, Issue 3, Page 481-496, 2012.

Nina's Decision, How to Make Better Decisions and Resolve Conflicts: An Essay for the Layman, (with H.J. Zoffer), *International Journal of the Analytic Hierarchy Process, (IJAHP)* Vol 4, No 1 (2012): Special Issue on "AHP/ANP Multicriteria Decision Making on Sustainable Development"

An Innovative Orders-of-Magnitude Approach to Multi-criteria Decision Making: Prioritizing Divergent Intangible Humane Acts (with Jen Shang), *European Journal of Operational Research*, 214 (2011) 703–715.

Negotiating the Israeli Palestinian Controversy from a New Perspective, (with H.J. Zoffer), *International Journal of Information Technology and Decision Making*, Vol.10, Issue 1, pp. 5-64, January 2011.

Analytic Hierarchy Process, *Encyclopedia of Operations Research and Management Science*, 3rd edition, Gass/ Harris editors, Kluwer Academic Publishers, 2011.

The Eigenvector in Lay Language, *International Journal of the Analytic Hierarchy Process*, Vol. 2, No. 2, 2010.

The scope of human values and human activities in decision making, *Applied soft computing* (with Nina Begicevic) Volume 10, Issue 4, pp. 963 -974, doi:10.1016/j.asoc.2010.04.002, September, 2010.

Who Won the Winter Olympics? A Quest into Priorities and Ranking, *Journal of Multicriteria Decision Analysis*, Vol. 17, Issues 1-2, January 2010-April 2010.

Fuzzy Judgments and Fuzzy Sets,(with Liem Tran), *International Journal of Strategic Decision Sciences*, Vol. 1, No.1, January-March 2010.

Economic Forecasting with Tangible and Intangible Criteria: The Analytic Hierarchy Process of Measurement and its Validation, *Journal of Economic Horizons*, Serbia, 2010.

Forecasting the Resurgence of the U.S. Economy in 2010: An Expert Judgment Approach, (with A. Blair, G. Mandelker and R. Whitaker), *Socio-economic Planning Sciences*, September 2010.

The Analytic Hierarchy in the Transportation Sector, (with Rafikul Islam), in book *Multiple Criteria Decision Making for Sustainable Energy and Transportation Systems*, M. Ehrgott, B. Naujoks, T.J. Stewart, J. Wallenius Editors, Springer-Verlag Berlin Heidelberg 2010.

Addressing with Brevity Criticisms of the Analytic Hierarchy Process, (with L.G. Vargas and R. Whitaker), *Journal of the Analytic Hierarchy Process*, Vol. 1, No. 2, 2009.

An Essay on Rank Preservation and Reversal, (with Mujgan Sagir), *Mathematical and Computer Modelling* 49 (2009) 1230_1243

Decisions, Structure, and Natural Law, *International Journal of the Analytic Hierarchy Process*, Vol. 1, No. 1, 2009.

An Essay on How Judgment and Measurement are Different in Science and in Decision Making, *International Journal of the Analytic Hierarchy Process*, Vol. 1, No. 1, 2009.

Words from the AHP Creator, *International Journal of the Analytic Hierarchy Process*, Vol. 1, No. 1, 2009.

Extending the Measurement of Tangibles to Intangibles, (with Mujgan Sagir), *Int. J. of Informations Technology and Decision Making*, Vol. 8, No. 1, pp. 7-27, 2009.

Relative Measurement and Its Generalization in Decision Making; Why Pairwise Comparisons are Central in Mathematics for the Measurement of Intangible Factors The Analytic Hierarchy/Network Process, *Royal Academy of Sciences, Spain, Series A. Mathematics*, November, pp. 251-318, 2008

Making decisions in hierarchic and network systems, (with Mariya Sodenkamp), *Int. J. Applied Decision Sciences*, Vol.1, No. 1, pp. 24-79, 2008.

Who Won the 2008 Olympics? *Journal of Systems Science and Systems Engineering*, Vol. 17, No, 4, pp.473-486, Dec. 2008.

Synthesis of Complex Criteria Decision Making: A Case Towards a Consensus Agreement for a Middle East Conflict Resolution, (with J. Zoffer et al.) *Group Decision and Negotiation*, 17: 363-385, 2008.

The Analytic Network Process, *Iranian Journal of Operations Research*, Vol.1 No.1 pp.1-27, 2008.

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"Modeling Unstructured Decision Problems: Theory of Analytical Hierarchies," *Mathematics and Computers in Simulation*, Vol. 20, No. 3, 1978, pp. 147-157.

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"The Sudan Transport Study," *Interfaces*, Vol. 8, No. 1, 1977, pp. 37-57.

"The Forward and Backward Processes of Conflict Analysis," (with Joyce Alexander) *Behavioral Science*, Vol. 22, 1977, pp. 87-98.

"The Faculty Tenure Problem -- Determination of Requirements," (with Anand Desai), in publication, 1977.

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"A Scaling Method for Priorities in Hierarchical Structures," *Journal of Mathematical Psychology*, Vol. 15, No. 3, 1977, pp. 234-281.

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"Modeling Unstructured Decision Problems: A Theory of Analytical Hierarchies," *Proceedings of the First International Conference on Mathematical Modeling*, University of Missouri- Rolla, Vol. 1, 1977, pp. 59-77.

"A Theory of Analytical Hierarchies Applied to Political Candidacy," (with J.P. Bennett), *Behavioral*

Science, Vol. 22, 1977, pp. 237-245.

"Hoover's Problem; When is a Graph Hooverian?," (with Kun-Yuan Chen), Mathematics Magazine, 1977.

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"Hierarchies, Reciprocal Matrices, and Ratio Scales," Modules in Applied Mathematics, Cornell University, The Mathematical Association of America, 1976.

"A Measure of World Influence," (with M.W. Khouja), Journal of Peace Science, Spring, 1976.

"Optimization and the Geometry of Numbers: Packing and Covering," (with Joyce Alexander), SIAM Review, Vol. 17, No. 3, pp. 475-519, 1975.

"Hierarchies and Priorities--Eigenvalue Analysis," University of Pennsylvania, 1975.

"Measuring the Fuzziness of Sets," Journal of Cybernetics, Vol. 4, No. 4, 1974, pp. 53-61.

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"Impact of Thermal Energy Storage on Power System Planning and Operation," (with Michael Tinkleman and Lawrence Lapide), IEE Power Engineering Society Summer Meeting and EHV/UHV Conference, Vancouver, Canada, July 15-20, 1973.

"An Eigenvalue Allocation Model for Prioritization and Planning," Energy Management and Policy Center, University of Pennsylvania, 1972.

"Operations Research in International Conflict," Peace Research, 1972.

"Planning: A Triangle of Imagination, Politics and Applied Science," Proceedings, Institute of Management Sciences, Cairo, 1972, pp. 24-26.

"Operations Research: Some Contributions to Mathematics," Science, Vol. 178, 1972, pp. 1061- 1070.

"Mathematical Structures Applicable to Multi-Party Conflicts," *Peace Research*, Vol. 17, 1972, pp. 7-30.

"Optimum Position for m Airports," *Naval Research Logistics Quarterly*, Vol. 19, No. 1, 1972, pp. 101-109.

"Thirteen Colorful Variations on Guthrie's Four Color Conjecture," *American Math. Monthly*, Vol. 79, No. 1, pp. 2-43, 1972.

"The Future of Operations Research in the Government," *Interfaces*, Vol. 2, No. 2, 1972, pp. 1-19.

"Personal Values in Operations Research: A Gloomy View -- A Challenge," *Summation*, Vol. 17, No. 4, 1972, pp. 6-12; also a talk before the American Mathematical Society, Atlantic City, 1971.

"Using the Analysis of Options Technique to Analyze a Community Conflict," *Journal of Conflict Resolution*, Vol. 15, No. 2, 1971, pp. 133-144.

"On Polynomials and Crossing Numbers of Complete Graphs," *Journal of Combinatorial Theory*, Vol. 10, No. 2, 1971, pp. 183-184.

"The Number of Intersections in Complete Graphs," *Tekhnicheskaya Kibernetika*, No. 6, 1971, pp. 151-154.

"Symmetry and the Crossing Number for Complete Graphs," *Journal of Research of the National Bureau of Standards*, Vol. 73B, No. 2, 1969, pp. 177-186.

"On Mathematical Structures in Some Problems of Politics," *The Mathematics Teacher*, Vol. 61, No. 7, 1968, pp. 677-682.

"On Nonlinear Optimization in Integers," *Naval Research Logistics Quarterly*, Vol. 15, No. 1, 1968, pp. 1-22.

"La Decision, Agregation et dynamique des ordres de preference," *Proceedings of Colloques Internationaux du Centre National de la Recherche Scientifique*, Aix-en-Provence, No. 171, July, 1967, pp. 241-250.

"Two Theorems on the Minimum Number of Intersections for Complete Graphs," *Journal of Combinatorial Theory*, Vol. 2, No. 4, 1967, pp. 571-584.

"Remarks on the Four Color Problem: The Kempe Catastrophe," *Math. Magazine*, Vol. 40, No. 1, 1967, pp. 31-36.

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"A Conjecture Concerning the Smallest Bound on the Iterations of Linear Programming," *Operations Research*, Vol. 11, No. 1, 1963, pp. 151-153.

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"Some Stochastic Processes with Absorbing Barriers," *Journal of the Royal Statistical Society*, Vol. 23, No. 2, pp. 319-334, 1961.

"Stochastic Processes with Small Barriers," Chapter 5 in *Elements of Queueing Theory*," T.L. Saaty, McGraw-Hill, 1961.

"Education in Operations Research," *Pi Mu Epsilon*, 1961.

"Time-Dependent Solution of the Many-Server Poisson Queue," *Operations Research*, Vol. 8, No. 6, pp. 755-772, 1960.

Discussion of "The Nature of Mathematical Thinking," April, 1959, in *Mathematics, Education and Industry Technology*, London, 1960.

"Aircraft Overhaul in the U.S. Navy," (with K. Webb), *Proc. International Conference on Operations Research*, 1960.

"Coefficient Perturbation of a Constrained Extremum," *Operations Research*, Vol. 7, No. 3, pp. 294-302, 1959.

"An Application of Semi Groups Theory to the Solution of a Mixed Type Partial Differential Equation," Rend Math. di Torino, Vol. 18, 1959, pp. 53-76.

"A Note on the Fourier Transform of Bessel Functions," Rend Math di Torino, Vol. 93, 1958- 59, pp. 1-4.

"Five Papers by Conny Palm," (detailed analysis), Operations Research, 1958.

"Résumé of Useful Formulas in Queuing Theory," Operations Research, Vol. 5, No. 2, 1957, pp. 162-200.

"Approximation to the Value of the Objective Function in Linear Programming by the Method of Partitions," Operations Research, 1956.

"The Computational Algorithm for the Parametric Objective Function," (with Saul Gass), Naval Research Logistics Quarterly, Vol. 2, pp. 39-45, 1955.

"The Number of Vertices of a Polyhedron," American Math. Monthly, Vol. 62, No. 5, pp. 326-331, 1955.

"Parametric Objective Function, Part II, Generalization," (with Saul Gass), Operations Research, pp. 395-401, 1955.

"Parametric Objective Function, Part I," (with Saul Gass), Operations Research, Vol. 2, No. 3, pp.316-319, 1954.

OTHER REPORTS AND STUDIES

Mathematics in: Ireland, February, 1959; Cambridge University, February, 1959; Greece and Turkey, April, 1959; Israel, May, 1959; London University, June, 1959.

Pure Mathematics, Statistics and Operations Research in Madrid and Barcelona, June, 1959.

Operations Research in: France, December, 1958; Holland and Scandinavia, December, 1958; Italy, April, 1959; the U.A.R.--Egyptian Region; Turkey (with an Illustration of the multiplex method), May, 1959; United Kingdom, June, 1959; Switzerland, Austria and West Germany, August, 1959.

SCIENTIFIC NOTES, 1958-1959

Mathematical Education at Oxford, November, 1958; Operations Research at BEA and BOAC: Mathematics activity at the University of Oslo, January, 1959; Recent research in probability at Stockholm and Helsinki, June, 1959; Department of Pure Mathematics at the University of

Birmingham; Mathematics teaching in the U.S.S.R.

OPERATIONS STUDIES FOR THE U.S. NAVY

Research in prediction theory on Submarine and Aircraft Detection, 1953-1954; Several mathematical studies of Operations Research problems arising in the U.S. Navy, 1954-1957, unpublished; Chemical and biological warfare, 1960.

Reviews of a large number of books for many technical journals.

Member of editorial boards of several mathematics and social science journals.

SIGNIFICANT PRESENTATIONS GIVEN

3 hour presentation to the Senate in Argentina on AHP 1997

Presentation to the president of Sudan at Jaffar Nimeiry in Khartoum

Have given over the years 3 day workshops on AHP and ANP around the world (US, UK, Austria, Norway, Italy, Spain, China, Japan, Indonesia, Singapore, South Africa, Colombia, Brazil, Peru, Ecuador, Chile, Turkey, Iran)

Presented longer 1 week to 2 week workshops (Chile, Italy)

Presentation to the National Defense University in Washington, February 2001

Presentation at the Pentagon to Navy Admirals Buss and Brown in 2007 (on ANP analysis of what to do about Iran – bombing Iran was a much-discussed option at the time and the analysis revealed that was the almost the worst option)

Presentation to the Navy Department on Chemical/Biological warfare as the leader of the team on a project about it

1960's conducted short courses lasting 2 weeks on nonlinear mathematics and operations research at UCLA

1970s gave 2 day Chautauqua seminars organized by the National Science Foundation and the Association for the Advancement of Science at 12 centers around the US

1972 Several week high level government seminars about no peace no war in Cairo, Egypt in which officials communicated to President Sadat the findings having used very early forms of the AHP with group participation

1972 Prioritization in Dar es Salam of the contending international designers to plan the new capital city of Dodoma for Tanzania

2007 Invited to give 3 hour class on Creative Thinking at Harvard University

PH.D. DISSERTATIONS SUPERVISED

1972

David Michael Berman: The Number of 5-cycles in a Tournament
(Now at University of New Orleans)

- 1973
Michael Tinkleman: Power Systems Capacity Expansion
(Now at Electric Power Institute)
- 1975
Reynaldo Mariano: Allocation Models for Energy Planning
(Now with Canadian Bell Telephone)
- 1976
Fred Ma: Planning Models for the Assessment of Advanced Energy Storage Systems;
(Advanced mathematics and energy)
(Now with Systems Research Corporation)
- Joyce Alexander: An Analysis of Conflict in Northern Ireland
(Now with Immaculata College, PA)
- Nagy Hanna: Towards a Methodology for Planning Models; Case Study: Transportation
Planning in the Sudan (Now with the International Bank for Reconstruction and Development-
World Bank)
- 1977
Peter Blair: Hierarchical Systems and Multiobjective Planning: Applications to the Energy Park
Concept
(Now at University of Pennsylvania)
- 1979
Eren Erdnener: A New Approach to Performance Measurement in Architecture
- Abdolhamid Gholamnezhad: Critical Choices for OPEC Members and the United States: A
Hierarchical Search for Their Desired Future
(Now with Eastern Illinois University)
- Boris Odynoki: Planning the National Health Insurance Policy: An application of the Analytic
Hierarchy Process in Health Policy Evaluation and Planning
(Now at Northern Illinois University)
- Luis G. Vargas: Measurement and Optimal Resource Allocation in Social Systems
(Now at the University of Pittsburgh)
- 1994
David Hauser: Structures for Best Decisions: The Analytic Hierarchy Process
- 1995
Munleong Chan: A Decision Support System for Complex Marketing Problems

1996

Kirti Peniwati Srisoepardani: The Possibility Theorem for Group Decision Making: The Analytic Hierarchy Process

2012

Orrin Cooper: The Analytic Network Process Applied in Supply Chain Decisions, in Ethics, and in World Peace

Provided major thesis ideas and help in the following cases:

1971

Howard Simkowitz: Common Carrier Vehicle Scheduling over Multi-Link Networks Using Optimal Trip Path Estimation
(Now with Commonwealth of Massachusetts energy program)

1974

Lawrence Bein: Airport Terminal Frontage Parking (Sequential Search Under Completion)
(Now with Arthur D. Little, Boston)

1977

Kun Y. Chen: On a Class of Stochastic Programming Problems -- A Network Approach
(Now with Upjohn Pharmaceutical Company)

1979

Glen Shimamoto: Reza Banai Committee

Supervised several Master's theses in the 1950's and 1960's at the George Washington University and Catholic University of America. Assisted extensively on a Ph.D. dissertation that generalized one of my papers at the American University in Washington, D.C. by Alexander Crow.

A PLACE TO PRESERVE A TESTIMONIAL

“It has been a privilege and a pleasure to share my life with Tom Saaty. It has been an intellectual journey every day to see his fascinating mind work and it has been an earthly journey as well as his ideas have taken us to so many places as he shared them with others in the world. He is a tremendously creative man with an inquiring mind. He constantly turns things over, looking at them from fresh perspectives and asking questions no one ever thought to ask before. What someone once said about the Greeks, “They were born to take no rest themselves, nor to give one to others,” is certainly true of him, and I would not have missed a minute of it. He is a great and original thinker, of a kind that comes along once in a great while. I am so glad I am on this earth at the same time he is.”

-Rozann