George Dantzig at RAND, Berkeley, and Stanford

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October 14, 2008

Overview

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1. At RAND

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1. At RAND
2. At Berkeley

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3. At Stanford

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4. At Rest

1952–1960:The RAND Corporation

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RAND was established in 1945 as the Air Force's Project RAND through a special contract with the Douglas Aircraft Company reporting to Air Force Major General Curtis LeMay.

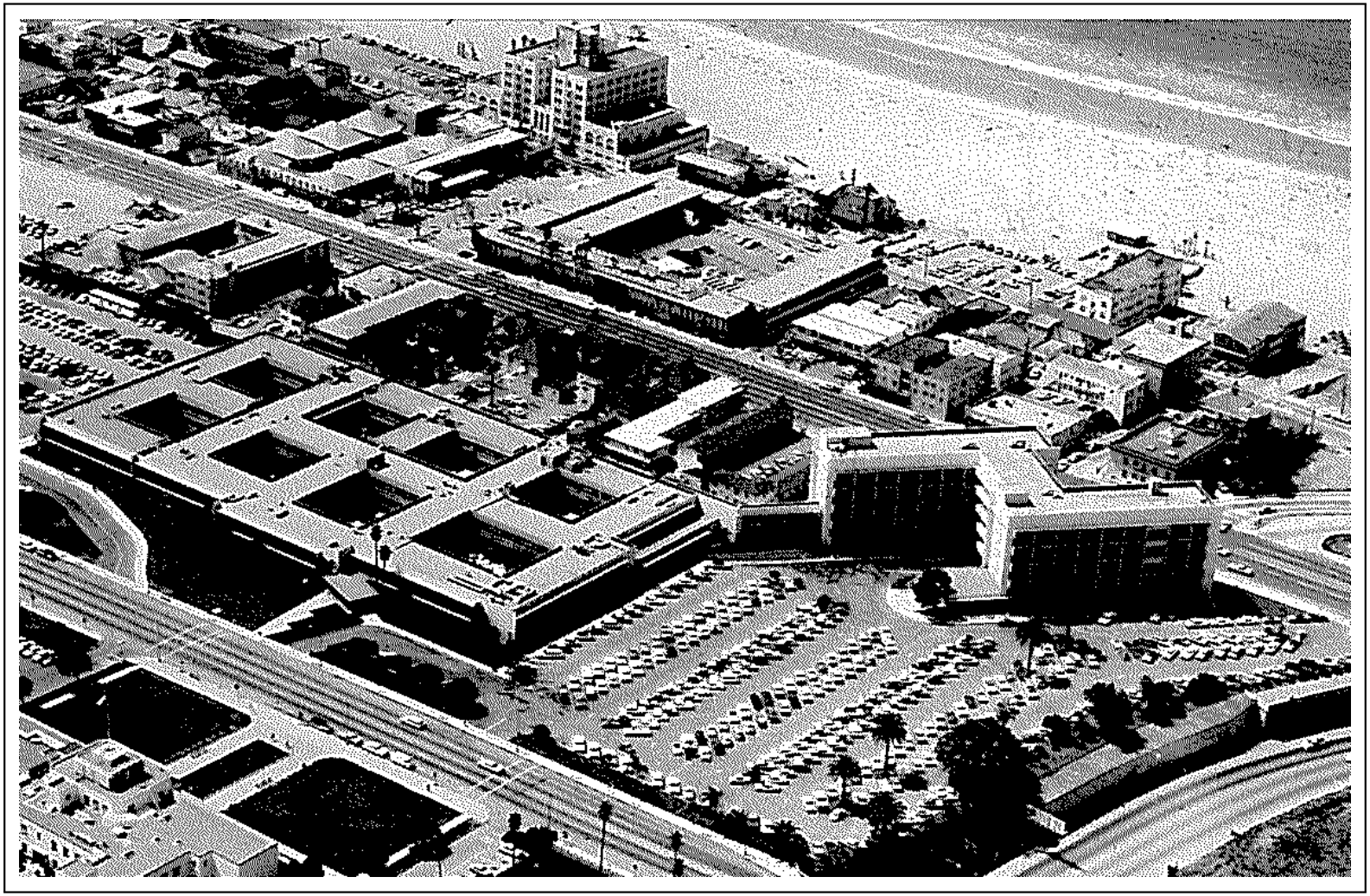
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In 1948 RAND became an independent, nonprofit organization, but with a reputation as an Air Force think tank.

The Rand Corporation Building



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Supplying West Berlin by air presented an enormous logistical challenge to military and civilian planners.

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The in-house staff was augmented by a steady stream of stimulating visitors.

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- Lloyd Shapley
- Philip Wolfe

RAND visitors & consultants

K.J. Arrow
L. Hurwicz
T.C. Koopmans
J.F. Nash, Jr.
P.A. Samuelson
H.A. Simon
R.M. Solow
T.S. Motzkin

J. von Neumann
A.W. Tucker
D. Blackwell
R. Dorfman
M. Dresher
A.S. Manne
M. Flood
M. Shubik

Dantzig's research at RAND

Major research directions

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- LP and variants of the Simplex Method

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- Large-scale LP
  - Compact basis methodology
  - Block structures
  - Decomposition Principle
- Linear programming under uncertainty

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- Network optimization

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  - Network flows

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- Network optimization
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- Integer programming

Dantzig's research at RAND

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  - Network flows
  - Shortest path problem
  - Traveling salesman problem
- Integer programming
- Nonlinear optimization

Dantzig's other activities

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- Second Symposium in Linear Programming (1955)

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- Second Symposium in Linear Programming (1955)
- Third Symposium in Linear Programming (1959)

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- Second Symposium in Linear Programming (1955)
- Third Symposium in Linear Programming (1959)
- *Linear Programming and Extensions*

Dantzig's beliefs

- Mathematical programming could be used to improve mankind's lot.

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- The availability of good software is essential to the widespread adoption of mathematical programming methodology.

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In so doing, Dantzig fulfilled an ambition dating back to his graduate student days at Cal.

On leaving RAND

My leaving [RAND] had to do with the way we teamed up to do research. In the beginning I was part of a team with Ray Fulkerson and Selmer Johnson. For a time we did great things together. Then after a while, although we remained good friends, each of us got busy doing his own thing. . . . There were no new people being hired to work with us as disciples.

From an interview with D. Albers (1986)

Building O.R. at Berkeley

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- Supervised 11 doctoral students.
- Completed *Linear Programming & Extensions*.
- Diversified his research interests.
- Established the University of California's Operations Research Center.

Operations Research Center early 1960s

Operations Research Center early 1960s

- Note barbed wire
- Note chain-link fence



Dantzig 101

The final test of a theory is its capacity to solve the problems which originated it.

Dantzig 123

1. Real world problems come first.

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2. Mathematical modeling comes next.

Dantzig 123

1. Real world problems come first.
2. Mathematical modeling comes next.
3. Theory and algorithms follow as needed.

Modeling as a metaphor

In teaching Linear Programming, George Dantzig emphasized the column approach wherein the right-hand side is expressed as a linear combination of columns with each column corresponding to an activity.

Modeling as a metaphor

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This is in contrast to the row approach which views the feasible region as the intersection of hyperplanes or halfspaces.

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The difference can be thought of as an emphasis on

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activities versus constraints .

George attached more importance to activities than to rules.

He also tended to use single activities to achieve multiple goals .

1966–2005: Stanford University

In 1966, Dantzig accepted an offer to join the Operations Research Program (and Computer Science Department) at Stanford University.

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The following academic year, the O.R. Program became the O.R. Department.

Stanford O.R. Department Faculty 1967

Dantzig, Manne, Hillier, Iglehart, Veinott, Kalman, Lieberman, Arrow, Cottle



O.R. House at Stanford, circa 1967



Dantzig's early initiatives at Stanford

- Presidency of TIMS

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- Joint seminar with Berkeley

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- Mathematical Programming Language

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- Model Development Laboratory

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- Model Development Laboratory
- Systems Optimization Laboratory

Dantzig's later initiatives at Stanford

- Mathematical Programming Society

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- International Symposium on Math. Prog.

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- The PILOT Project

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Dantzig's later initiatives at Stanford

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- *Compact City* (with T.L. Saaty)

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- Response to the interior-point challenge

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- Programming under uncertainty
  (with G. Infanger)

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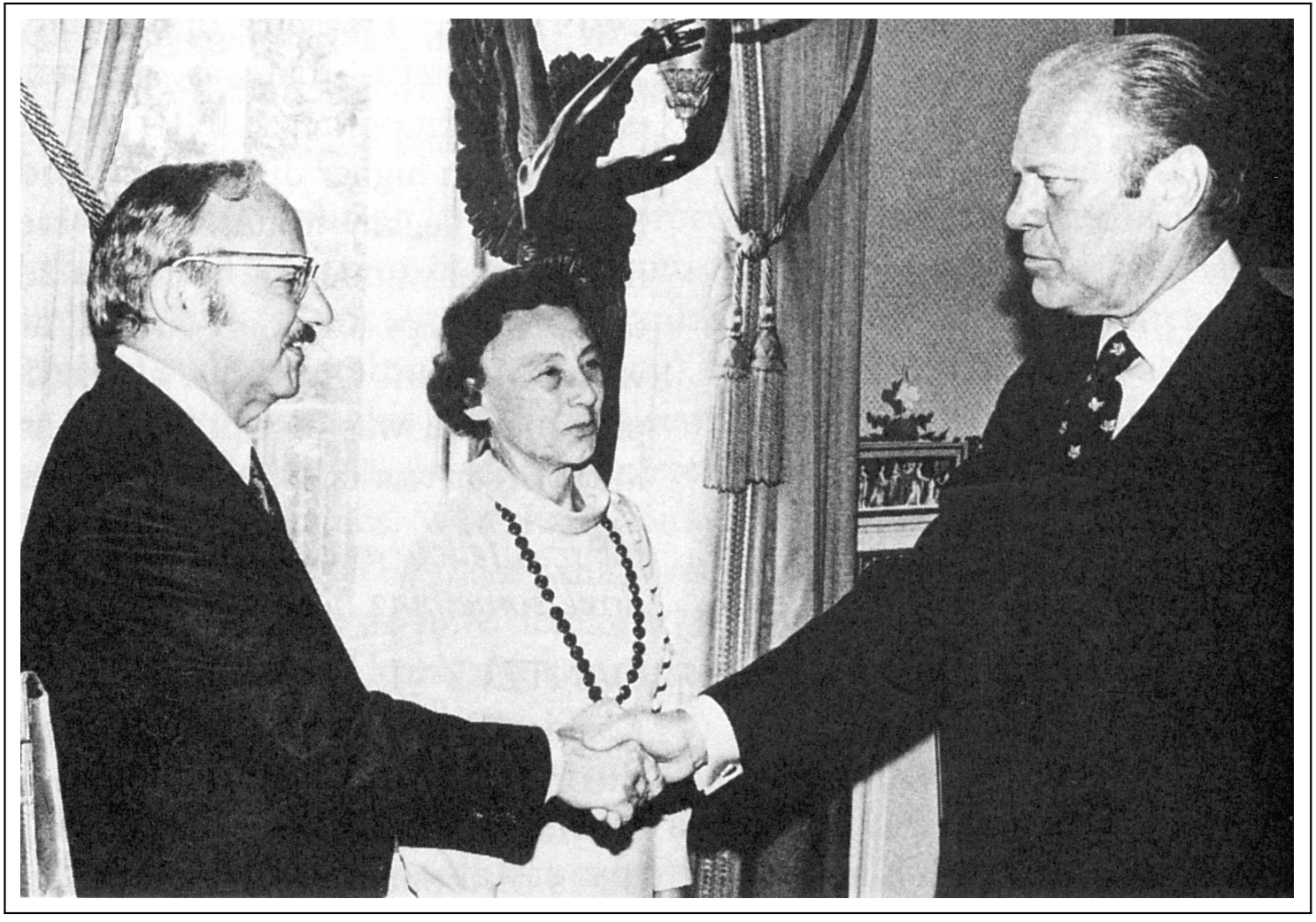
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- *Linear Programming 2: Theory and Extensions*
  (published 2003 with M.N. Thapa)
- *In His Own Image*
  unpublished sci-fi novel 1980 . . .

Dantzig's Stanford Doctoral Students

P. Abrahamson
J. Adachi
I. Adler
K. Anstreicher
J. Bigelow
J. Birge
P. De Mazancourt
G. Dobson
B.C. Eaves
R. Entriken
R. Fourer
E. Horvitz
H. Hu
A. Iusem
P. Jackson
E. Klotz
H. Konno
A. Krishna
R. Leary
S. Leichner
I. Lustig
T. Magnanti
S. Maier
S.T. McCormick
D. Morton
V. Nicholson
A. Perold
J. Pisa
M. Prindiville
D. Scott
J. Stone
M. Thapa
C. Tovey
A. Tucker
C. Winkler
R. Wittrock
Y. Ye
C. Yu

National Medal of Science 1975



Other Major Honors and Awards

1971	National Academy of Sciences
1975	National Medal of Science
1975	American Academy of Arts & Sciences
1975	von Neumann Prize (ORSA & TIMS)
1977	NAS Appl. Math. & Num. Anal. Award
1985	National Academy of Engineering
1985	Harvey Prize (Technion, Israel)
1986	Silver Medal (O.R. Soc. of U.K.)
1989	American Ingenuity Award (Coors)

Is he just saying cheese?



Honorary doctorates

Technion	1973	Columbia	1983
Linkøping	1975	Univ. Louvain	1983
Univ. Maryland	1976	Zürich	1983
Yale	1978	Carnegie-Mellon	1986

Dantzig Prizes, etc.

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- Dantzig Prize (INFORMS)

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- Dantzig-Lieberman Fellowship (Stanford)

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- Recalled to duty till AY 1996 at age 81
- 70th, 75th, 80th, 85th, & 90th birthday parties and conferences held in his honor

Celebrating George Dantzig's 90th birthday

George Dantzig at his 90th birthday party



Summing up

George Dantzig made seminal contributions to many branches of mathematical programming.

Summing up

George Dantzig's endearing qualities included

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- Generosity

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- Warmth
- Generosity
- Wit

Summing up

George Dantzig's endearing qualities included

- Warmth
- Generosity
- Wit
- Dedication

Summing up

George Dantzig's endearing qualities included

- Warmth
- Generosity
- Wit
- Dedication
- Courage

George B. Dantzig (1985)

