OR and Policing – Looking Back, Looking Forward

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NSF Workshop on Decision Analytics for Dynamic Policing
Arlington, Virginia
May 9, 2019
New York City RMP – Radio Motorized Patrol 1939
New York City RMP – Radio Motorized Patrol 2019
To My Beginnings:
400 Memorial Drive
Cambridge, Massachusetts

September, 1965
OPERATIONS RESEARCH CENTER
Enter:

- **Professor Alvin W. Drake, MIT Operations Research Center**
- **Dr. Alfred Blumstein, Institute for Defense Analyses, Arlington, Virginia**
- **Professor Philip M. Morse, Professor and Founding Director, MIT Operations Research Center**
In at the Beginnings: A Physicist's Life

Philip M. Morse

The MIT Press, 1976
TASK FORCE REPORT:
SCIENCE AND TECHNOLOGY

A Report to
THE PRESIDENT'S COMMISSION ON LAW ENFORCEMENT AND
ADMINISTRATION OF JUSTICE

Prepared by
THE INSTITUTE FOR DEFENSE ANALYSES
The work of the Task Force was under the overall direction of Dr. Alfred Blumstein and was prepared as an integrated effort by the staff and a number of consultants. The regular members of the staff and the subjects they covered were:

Mr. Ronald Christensen, University of California, systems analysis and corrections operations.

Mr. Ronald Finkler, Institute for Defense Analyses, information systems.

Dr. Saul I. Gass, International Business Machines, police operations.

Mrs. Sue Johnson, consultant, systems analysis.

Dr. Peter Kelly, Kelly Scientific Corp., communications and electronics.

Mr. Raymond Knickel, consultant, police electronics equipment.

Mr. Richard Larson, Massachusetts Institute of Technology, systems analysis.

Dr. Joseph Navarro, Institute for Defense Analyses, court operations.

Miss Jean Taylor, Institute for Defense Analyses, court operations.
Soon, in Any Emergency, You Can Dial 9-1-1

WASHINGTON — An American in need of emergency help will one day be able to summon it by dialing 911 from any telephone in the United States, the American Telephone and Telegraph Co. announced Friday.

If he's at a pay station and doesn't have a dime, the caller will still be able to reach either the operator or a central 911 switchboard which will be in contact with police, firemen, doctors and other public safety agencies.

The universal emergency number will eventually work from any dial phone in the country, A.T.&T. said. It will take several years and cost $50 million to install, the company said, and will go into service first in New York, Washington and other major cities.

The system was recommended last February by the President's Crime Commission.

Federal Communications Chairman Rosel Hyde said he was delighted it was going to be created.

DIAL 911
Page 3
"911, May I help you?"

(July 1, 1968 – NYPD, 1970 FDNY)

NEW YORK CITY'S
FIRE DEPARTMENT
JUST GOT A NEW EMERGENCY PHONE NUMBER.
911.

To report a fire in New York City, dial 911. The same number that gets you the police or an ambulance in an emergency. Remember the number...911. For police, ambulance and fire emergency.
Letters to the Editor of the *New York Times*
Letters to the Editor of the New York Times
Improving the Effectiveness of New York City’s 911

Richard C. Larson

In Drake, A. W., Keeney, R. L., and Morse, P. M. (eds.), Analysis of Public Systems, MIT Press, 1974
Figure 9.2 Distribution of calls, delays, and manning levels (Sat., Aug. 10).
Figure 9.2 Distribution of calls, delays, and manning levels (Sat., Aug. 10).
NYPD Police Commissioner
Howard R. Leary

- Formal Briefing
- With two lieutenants
- “Easter Bunny Graphs” (P = ?, T = ?)
- Results implemented within one week
More.....
Awarded ORSA’s 1972 Lanchester Prize, for best of-the-year English language OR contribution.
Measuring the Response Patterns of New York City Police Patrol Cars

Richard C. Larson
**Problem:** A Police Precinct with \( m \) Radio-Dispatched Police Patrol Cars is NOT an \( M/M/m \) Queue!
A HYPERCUBE QUEUING MODEL FOR FACILITY LOCATION AND REDISTRICTING IN URBAN EMERGENCY SERVICES

RICHARD C. LARSON*
M.I.T., Cambridge, Mass., U.S.A.

Acknowledgements — This work was supported in part by the U.S. Department of Housing and Urban Development under a contract to the New York City Rand Institute and in part by the National Science Foundation (Division of Social Systems and Human Resources) under a grant to the M.I.T. Operations Research Center. The author thanks Jan Chaiken and Saul Gass for suggesting changes in an earlier draft.
Markov Process

Balance of Flow Equations, Finite Capacity Queue System
Figure 5.12 Three-server hypercube state space augmented by infinite tail (allowable transitions added for comparison with Figure 5-13.)
FORD TO CITY: DROP DEAD
Vows He'll Veto Any Bail-Out

WASHINGTON

Abe, Carey
Rip Stand

Stocks Skid,
Dow Down 12
Approximating the Performance of Urban Emergency Service Systems

RICHARD C. LARSON

Massachusetts Institute of Technology, Cambridge, Massachusetts

397 citations
STRUCTURAL SYSTEM MODELS FOR LOCATIONAL DECISIONS: AN EXAMPLE USING THE HYPERCUBE QUEUEING MODEL

Modèles de systèmes structuraux des décisions d’emplacements – Un exemple utilisant le modèle de queue hypercube

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New York City
EMS Hypercube
New York City
EMS Hypercube
The Manhattan Distance Metric

Phone call from NYC, student Victor Li: “Professor Larson, I have some terrible news for you.” Larson: “What is it?” Victor: It’s the Manhattan distance metric, it does not work, not even in Manhattan!”
Finding Minimum Rectilinear Distance Paths in the Presence of Barriers

Richard C. Larson
Massachusetts Institute of Technology, Cambridge, Massachusetts 02139
Victor O. K. Li
University of Southern California, University Park, Los Angeles, California 90007

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162 citations
FIG. 4. Illustration of the path push and amalgamation process.
Facility Locations with the Manhattan Metric in the Presence of Barriers to Travel

RICHARD C. LARSON and GHAZALA SADIQ
Massachusetts Institute of Technology, Cambridge, Massachusetts
(Received September 1980; revised October 1981; accepted January 1983)

Operations Research
Vol. 31, No. 4, July–August 1983

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1981

Amedeo Odoni

1061 Citations

Thank You, NSF!
Research Applied to National Needs (RANN)
More Sophisticated Queueing

AN N-SERVER CUTOFF PRIORITY QUEUE

CHRISTIAN SCHAACK and RICHARD C. LARSON
Massachusetts Institute of Technology, Cambridge, Massachusetts
(Received March 1984; revisions received July 1985, January 1986; accepted January 1986)
AN $N$ SERVER CUTOFF PRIORITY QUEUE WHERE ARRIVING CUSTOMERS REQUEST A RANDOM NUMBER OF SERVERS*

CHRISTIAN SCHAACK AND RICHARD C. LARSON
Harvard Business School, Boston, Massachusetts 02163
Operations Research Center, Massachusetts Institute of Technology,
Cambridge, Massachusetts 02139
Minimizing the Cost of Dispatch Delays by Holding Patrol Cars in Reserve

Stephen R. Sacks,¹ Richard C. Larson,² and Christian Schaack³
Before GPS, examining how policing would be affected by real-time vehicle location information...
Evaluating a Police-Implemented AVM System: The St. Louis Experience (Phase I)

RICHARD C. LARSON, MEMBER, IEEE, KENT W. COLTON, AND GILBERT C. LARSON

EVALUATING DISPATCHING CONSEQUENCES
OF AUTOMATIC VEHICLE LOCATION IN
EMERGENCY SERVICES

Richard C. Larson* and Evelyn A. Franck†
Operations Research Center, Massachusetts Institute of Technology
WHAT HAPPENED TO PATROL OPERATIONS IN KANSAS CITY?
A REVIEW OF THE KANSAS CITY
PREVENTIVE PATROL EXPERIMENT

RICHARD C. LARSON

President, Public Systems Evaluation, Inc.
and
Associate Professor
Massachusetts Institute of Technology
Cambridge, Massachusetts 02139

126 citations
40 Years of OR Research and Consulting

- Public Systems Evaluation (PSE)
- ENFORTH Corporation
- Queues ENFORTH Development (QED)
- Structured Decisions Corporation (SDC)
Police service aides: Paraprofessionals for police

James M. Tien, Richard C. Larson

33 Years in business
The Future???

- AI in Policing...
- Data Analytics ....

- Whatever we do, we still need....
Additional Details Related to Tonight’s Talk Can be Found Here:

PUBLIC SECTOR OPERATIONS RESEARCH:
A PERSONAL JOURNEY

RICHARD CHARLES LARSON
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EPILOGUE

Over the years, I have witnessed first-hand the immense bravery and professionalism of the men and women of New York City’s emergency services: police, fire, and emergency medical (now merged with fire). The paper you have just read was accepted for publication on September 4, 2001. On September 11, our nation’s history was changed forever. A criminal band of suicidal zealots perpetrated outrageous crimes against humanity, with two of four hijacked airplanes being deliberately crashed into the twin towers of the World Trade Center in New York City. Approximately 3,000 innocent people were killed, from over 60 countries—representing all races, religions, and ethnicities.
Brave men and women of the New York City fire and police departments responded quickly to the first calls; the key goal: saving human lives. They saved many by their rapid and effective response. But when the twin towers suddenly fell, the NYPD lost 23 police men and women and the NYFD lost an astonishing 343 firefighters and paramedics. I join many millions of other Americans and hundreds of millions worldwide to extend my deep and heartfelt sympathy and condolences to the victims and their families.
Let’s collectively try to fix Public-Police Relations
Let’s collectively try to fix Public-Police Relations
Let’s collectively try to fix Public-Police Relations
Let’s collectively try to fix Public-Police Relations
And our firefighters...
And EMS Professionals....
Thank YOU