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Letter to the Editor—The Report of the 1961 Lanchester Prize Committee

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Letters to the Editor

THE REPORT OF THE 1961 LANCHESTER PRIZE COMMITTEE

by

Martin Ernst, Ralph E. Gomory (*Chairman*), and John B. Lathrop

(Received October 15, 1962)

THE 1961 Lanchester Prize Committee continued to follow the procedures developed by previous Committees. ORSA members selected for their knowledge of various fields of operations research were invited to select "the best paper on operations research or reporting on an operations-research study, identified as such." This year, 56 publications were examined for prizeworthy papers by 95 screeners.

Coverage

All articles appearing in *Operations Research*, *Management Science*, the *Operational Research Quarterly*, and the *Naval Research Logistics Quarterly* were assigned individually, two screeners to a paper. All other publications were examined by two screeners each. The following publications were covered:

<i>Administrative Science Quarterly</i>	<i>Journal of the Association for Computing Machinery</i>
<i>Advanced Management</i>	<i>Journal of the Australian Mathematical Society</i>
<i>Aeronautical Space Engineering</i>	<i>Journal of Farm Economics</i>
<i>American Economic Review</i>	<i>Journal of the Franklin Institute</i>
<i>American Statistician</i>	<i>Journal of Industrial Engineering</i>
<i>Annals of Mathematical Statistics</i>	<i>Journal of the Operations Research Society of America</i>
<i>Applied Statistics</i>	<i>Journal of the Operations Research Society of Japan</i>
<i>Behavioral Science</i>	<i>Journal of the Royal Statistical Society (Series A and B)</i>
<i>Bell System Technical Journal</i>	<i>Journal of the Society for Industrial and Applied Mathematics</i>
<i>Biometrics</i>	<i>Management Control Systems</i>
<i>Biometrika</i>	<i>Management Science</i>
<i>Canadian Journal of Mathematics</i>	<i>Management Technology</i>
<i>Conflict Resolution</i>	<i>Naval Research Logistics Quarterly</i>
<i>Econometrica</i>	<i>Operational Research Quarterly</i>
<i>The Engineering Economist</i>	<i>Pacific Journal of Mathematics</i>
<i>Ericsson Review</i>	<i>Proceedings of the AIEE</i>
<i>General Systems, Yearbook of the Society for General Systems Research</i>	<i>Proceedings of the AIIE</i>
<i>Harvard Business Review</i>	<i>Proceedings of the Institute of Radio Engineers</i>
<i>Highway Research Board, NRC, Proceedings and Bulletins</i>	
<i>Industrial Quality Control</i>	
<i>Information and Control</i>	
<i>Journal of the American Statistical Association</i>	

<i>Proceedings of the Joint Computer Conferences</i>	<i>Review of Economics and Statistics</i>
<i>Progress in Operations Research</i>	<i>SIAM Review</i>
<i>Quality Control and Applied Statistics, Including Operations Research, Yearbook 1960</i>	<i>Simulation and Gaming A Symposium</i>
<i>Quarterly of Applied Mathematics</i>	<i>Sociometry</i>
<i>Quarterly Journal of Economics</i>	<i>Systems Research and Design</i>
<i>Railway Age</i>	<i>Technometrics</i>
<i>Review of Economic Studies</i>	<i>Theory of Traffic Flow</i>
	<i>Transactions of the ASQC</i>
	<i>Transactions on Engineering Management</i>

Screeners

Those who accepted service as screeners are listed below This report carries with it the sincere thanks of the Committee and the SOCIETY for their efforts

- | | |
|------------------|---------------------|
| ABLAHAT, A A | GRIESMER, J H |
| ABRAMS, J W | GUPTA, S K |
| ASTRACHAN, M | HALBERT, M |
| BATCHELOR, J H | HARRIS, F J |
| BEER, S | HARRISON, J O , JR |
| BERDAHL, E O | HENRY, J H |
| BERNHOLTZ, B | HERTZ, D B |
| BLYTHE, R H , JR | HETRICK, J C |
| BRIGHAM, G | HITCHMAN, N A |
| BROWN, A A | HOFFMAN, A J |
| BROWN, R G | HOPKINS, N J |
| BUTTERWORTH, A V | HORVATH, W J |
| CAYWOOD, T E | HOWARD, W G |
| CHARNES, A | HOWLAND, D |
| CHRISTIE, L S | HU, T C |
| CHURCHMAN, C W | JACOBS, E M |
| CLAPHAM, J C R | JEWELL, W S |
| COLE, I H | JOHNSON, R B |
| CRANE, R R | JONES, A W |
| CUSHEN, W E | KARP, R M |
| DEAN, B V | KOENIGSBERG, E |
| DEBEAU, D E | KORGEN, R L |
| DEEMER, W L | LAVIN, M M |
| DOBBIE, J M | LEESE, E L |
| EDIE, L C | LENCE, R H |
| ENGEL, J H | LEVITAN, R E |
| FAIR, W R | LITTLE, J D C |
| FEENEY, G J | MANDELBROT, B B |
| FLAGLE, C D | MARSHALL, B O , JR |
| GAYER, H K | MCCLOSKEY, J F |
| GAZIS, D C | MOOD, A M |
| GEHRIG, J J | NICHOLSON, G E , JR |
| GERLOUGH, D L | OYSTER, D E |

PAXSON, E W	TAYLOR, J G
PETTEE, G S	THOMAS, C J
PINA, E I	TRAURING, M
RADFORD, K J	TYLER, G W
RATOOSH, P	VIGDER, J S
SANDIFORD, P J	WALSH, J E
SCHOOR, M G	WEINBERG, R S
SHEAR, S K	WEISS, H K
SHEPPARD, D	WHITIN, T M
SHERMAN, S	WHITMORE, W F
SILBER, J	WILKINSON, R I
SMITH, N M, JR	WILSON, P B
STEIN, A	WINKLER, S
SUMMERS, G W	ZIMMERMAN, R E
SUTHERLAND, W H	

Selection of the Prize Paper

Thirty-four articles from 16 publications were cited as prizeworthy by one or more screeners. All papers cited were studied by members of the prize committee and unanimous agreement was reached on the award. In addition, the Committee members read and considered several additional papers from the literature which they thought worth considering.

The Committee nominated the following paper for the prize:

E. VENTURA, "Application of Dynamic Programming to the Control of Stock and to the Calculation of a Maximum Stock Capacity," *Operational Research Quarterly*, **12**, 66-78 (1961)

The following were cited for honorable mention:

D. R. FULKERSON, "A Network Flow Computation for Project Cost Curves," *Management Science*, **7**, 167-178 (1961)

JAMES E. KELLEY, JR., "Critical-Path Planning and Scheduling: Mathematical Basis," *Operations Research*, **9**, 296-320 (1961)

RALPH E. GOMORY and T. C. HU, "Multi-Terminal Network Flows," *SIAM Journal*, **9**, 551-570 (1961) *

The Committee regards the Ventura paper as an excellent example of the intelligent and economical use of mathematics to solve an important practical problem. The problem, which involved the expansion of a port facility, was carefully formulated and a rather complicated cost function was developed that took into account the many factors involved. The costs all depended on the way the facility was used. By eliminating cost factors that could be shown to be small, and by introducing a prediction that enabled the major factor to be predicted one period ahead, an extremely simple rule for the optimal use of the facility was developed from what appeared to be a complicated situation. Use of this rule then enabled a decision to be made on the question of expanding the port facility. The Committee agreed with the screeners' views on the clarity of exposition and general excellence of the paper as a combination of practicality and good technique.

* At the recommendation of Martin Ernst and John B. Lathrop this paper, not listed in the original report of the Committee, was added by the expressed action of the Council of the Society at its meeting on November 6, 1962.

The papers by Fulkerson and Kelley are considered important because of their success in adding to the body of knowledge on the widely used critical-path and PERT-type techniques. The problem of completing a project at minimum cost within a required time or of obtaining the cost-time trade-off curve is solved in these papers and in a way that makes possible effective computation for the large networks that occur in practical problems.

The Committee would like to express its great appreciation for the enormous amount of work done by DR JAMES H GRIESMER of IBM Research in helping to organize and carry out the survey in a most efficient way and for his help during the Chairman's illness.

LETTER TO THE EDITOR

John M. Danskin

Institute of Naval Studies, Cambridge, Massachusetts

(Received April 30, 1962)

SOME years ago I sought to publish another version of the paper, *A Game Theory Model of Convoy Routing*, now published in this issue of OPERATIONS RESEARCH, under a disguise.

Disguises are sometimes hard to come by. The basic elements of this problem were (1) merchant ships, operating on various (1a) routes, (2) submarines, preying on the ships, and (3) escort vessels, decreasing the effectiveness of the submarines. I sought an operation, in which certain (1) activities were going on at various (1a) places, (2) these were elements preying on those activities, and (3) those interested in the activities under (1) were devoting effort to decrease the effectiveness of the elements doing the preying. I discarded disguise after disguise because they were too obvious.

Then the one reported on here occurred to me. I wrote it up, with the ships, subs, and escorts replaced by the agents, police, and bribes below, and the mathematics retained. It seemed then too frivolous, and I never did anything with it. Years later I found the proposal in my files. Now a paper giving the real problem is published. I can see no harm in now publishing the memo as originally written in 1954.

PROPOSED INTRODUCTION TO A PAPER FOR ORSA

A Model of an Organized Bookmaking Operation

Let us suppose that a large entrepreneur of horserace betting has n establishments situated in an environment hostile to such establishments. I.e., he is making illegal book in n joints.

The environment in question expresses its hostility by dispatching police forces to the various establishments. The group interaction of the police and the agents of the entrepreneur results in the arrest of some of the agents. The number of arrests is assumed equal to the product of the volume of bets made at the establishment raided and the number of police sent there, multiplied by a proportionality factor (called p .) depending on the character of the neighborhood in question.