
Operations Research

Publication details, including instructions for authors and subscription information:
http://pubsonline.informs.org

# The Analyst's Bookshelf

To cite this article:
(1963) The Analyst's Bookshelf. Operations Research 11(6):1005-1025. https://doi.org/10.1287/opre.11.6.1005

# *The Analyst's Bookshelf*

## Hugh J. Miser, Editor

## BOOKS

### *Reviews*

**C F CARTER, G P MEREDITH, and G L. S SHACKLE (editors), *Uncertainty and Business Decisions, Second Edition*, Liverpool University Press, Liverpool, England, 1962, 165 pages, 25 shillings**

**R A D EGERTON, *Investment Decisions under Uncertainty*, Liverpool University Press, Liverpool, England, 1960, 111 pages, 18 shillings sixpence**

IN 1949 PROFESSOR SHACKLE published his *Expectation in Economics*, a work that has aroused widespread interest, not only among economists but also among logicians, psychologists, and statisticians Shackle's main thesis is that any satisfactory theory of economics, especially a dynamic theory, must allot a central role to expectation However, expectation in terms of probability was explicitly rejected by him, if by 'probability' is meant any objective quantity defined by frequency of occurrences in repeated trials, for, argued Shackle, decisions in economics are not made in repetitive circumstances, each one being highly individual This led him to what some people would call a subjective theory of belief, expressible in terms of degree of surprise

These notions have been developed and critically examined by a number of authorities, and in particular formed the basis of a meeting of the British Association at Liverpool in 1953 The papers given on that occasion were published in 1954 and are reproduced as Part 1 of the present version of *Uncertainty and Business Decisions* Part 2 comprises four papers that were written later EGERTON'S book on *Investment Decisions under Uncertainty*, belongs to the same school and may be regarded as part of the original work

The repudiation of the mathematical theory of probability relieves Shackle's followers from some important difficulties, for example, how to measure the probabilities concerned, and how to adapt the theory to deal with decisions in the face of novelty But they are firmly impaled on the other horn of the inferential dilemma even if it is possible to set up in a quantifiable form a theory expressible in terms of belief, surprise, or something of the kind, what reason have we to suppose that there is any correspondence in nature between this theory and what actually happens? A fair amount of the book is taken up with this question in one form or another One must at least concede that the authors recognize the problem and face it squarely

In the first paper PROFESSOR GALLIE considers uncertainty as a philosophical problem

Under the influence of rationalizing philosophers we have all been tempted to ignore the inescapable reality of what is contingent or irreducibly uncertain in human affairs For, to speak very roughly, the mathematical theory of probability treats what is uncertain as though it were not so as though our regrettable ignorance can, in the case of any given question of fact, theoretically be transmuted into a very peculiar kind of knowledge, i e , knowledge of a frequency ratio of a number of possible outcomes

The theme is taken up by PROFESSOR O'CONNOR in the second paper He perceives clearly the problem of relating degree of certainty in terms of potential surprise to measures of the credibility of a hypothesis The line of escape seems to be that successful decisions are based on experience in decision making (at which point, one might suggest, the frequency adherent can again raise his voice) "Decisions in complex situations are much more analogous to the practice of an acquired skill than to the dispassionate and explicit weighing of evidence "

The third paper, by DR I J GOOD, deals with mathematical tools It is rather condensed and I am not sure that anyone unacquainted with Dr Good's previous work would understand what he is driving at But he makes some useful points For example, Shackle originally proposed that, in the face of uncertainty, attention is focussed on special outcomes, and Good is not satisfied that this always accords with the precepts of rational behaviour, again, the rules of combination of surprise are not clear if I should be mildly surprised if horse A won the first race and very surprised if horse B won the second, how surprised should I be if they both were to win?

PROFESSOR G P MEREDITH contributes two papers, one on methodological considerations in the study of human anticipation and one on uncertainty, expectation, and decision in business affairs PROFESSOR B R WILLIAMS discusses the impact of the theory of uncertainty with particular reference to the theory of profits Professor Shackle himself restates his theory in summary form

For the operations-research worker it comes as a slight surprise (if I may use the word) to find that it takes the authors some time to get round to the questions that would first occur to the OR mind as a matter of observational fact, who does make economic decisions and how are they made? PROFESSOR CARTER, apart from having some modifications of his own to propose to Shackle's theory, concludes on a hopeful note "The next step is, I think, to accumulate case studies on investment decisions (whether for financial or 'real' investment) and to examine them to see if they enable us to discriminate between rival theories " MR A D ROY devotes the whole of his paper to the empirical testing of alternative theories of uncertainty

Part 2 consists of four papers that have been published in learned journals since the first edition was issued A review and criticism by MR J W N WATKINS of the Shackle theory, further papers by Professor Williams and Professor Meredith extending and analyzing some of the basic concepts, and a paper by Professor Carter on the present state of the theory of decisions under uncertainty

There is a great deal in this book that will interest any person who pays the least attention to his own thought-processes, whether in economic studies or elsewhere It may be held to constitute the prior analysis on which any practical study should be based But there are few, if any, practical studies available yet, and the relation of theory to real-life behaviour remains to be established In

particular there is little here that will enable a decision to be made in a given economic situation I do not say this in any adverse critical spirit, but it seems fair to observe that the ultimate justification of all this work must rest on the extent to which it furnishes a satisfactory theoretical framework for future empirical studies

Mr Egerton's book, which might well have been part of the previous work, but is self-contained, considers the application of Shackle's ideas to investment It is a survey of existing theory and an attempt to remove some of the difficulties, rather than a handbook for investors, who, indeed, will find little to help them in actually making up their minds in any given case Again I do not say this in a spirit of adverse criticism A thorough examination of the problem is well worth while and a necessary prologue to more detailed study of what really happens in decisions concerning investment But again, the ultimate value of the theoretical studies must depend on the extent to which they can explain observation, for which the ground is now cleared

M G KENDALL
CEIR (UK), Ltd

**A I BERG (editor), *Cybernetics at Service of Communism, Volume I*, Moscow/Leningrad, 1961, translation published by Office of Technical Services, U. S Department of Commerce, Washington, D C , 1962, 435 pages, $22.25**

THIS BOOK is the first of three volumes started in 1959 in connection with the creation of the Scientific Council on Cybernetics at the Academy of Sciences in the USSR In it ACADEMICIAN A I BERG has assembled a collection of papers representing the breadth of Soviet thinking in this 'science of control'

It is clear that cybernetics, as defined in the Soviet Union, holds an important place in planning there The 22nd Congress of the Communist Party of the Soviet Union (CPSU) established the objective of developing by 1980 a national cybernetics system devoted to the service of communism To ensure realization of this purpose, the USSR Council of Ministers has established an extensive special program in cybernetics—theory, technology and applications—reporting to the State Committee on Research and Development

It is significant that this program is under the direction of Academician A I Berg who, in the Soviet 'multiple-hat' approach, appears to have budgetary and decision power over cybernetics, including computer development and applications

This first volume is aimed at attracting the attention of Soviet readers to the new science In his introduction, Berg points out that the Soviet leaders have long recognized the need for scientific control of the state and that the "entire work of building communism by the Party is based on a knowledge of the laws of development of society," this fact giving it an organized, planned, and scientifically substantiated character Lenin is credited with pointing out the need for control and emphasizing the need for studying the "fundamentals of theory on the subject of our state apparatus" and knowledge of the fundamentals of the science of control

Berg indicates that World War II and study and control of its operations spawned many new sciences

The theory and study of operations
The theory of mathematical games
The theory of 'mass service'
Mathematical statistics and theory of probability
The theory of reliability

The rapid development of radio electronics and instrument construction led to electronic automation This, coupled with mathematical machines, made it possible to pose anew the problem of improved control of complex processes and operations "In this way a new science of control was born, cybernetics "

Berg points out how scientists have been gradually shifting their attention from observation, cataloguing, and classifying to explaining the facts observed, and, now, to learning how to control the environments involved He points out that the successes so far show the need for developing scientific work leading to the attainment of specific aims of practical life

Berg credits both the advent of computers and systems-oriented scientific effort as being the core of cybernetics The discussions in this article, as well as the other 19 in the book, indicate that cybernetics to the Soviets represents in technical material what we in the US include under such topics as these

Operations research and management science
Advanced industrial engineering
Systems engineering
Control engineering
Datamation and information retrieval
Econometrics

Additionally, an important difference is noted in the method and scope of application of the concept In reading the various articles, one gets the impression that cybernetics is not only an organizing term to bring the various fields of science into focus and mutual compatibility in the service of political objectives, but also a self-conscious scientific and political agreement to establish an official organization to see that it *is* done If so, this would seem to have an important effect on reducing the semantic problems and putting newly developed scientific theories into practice in very short times

The articles are grouped in four sections

The collection, processing, and transmission of information
Cybernetics and nature
Cybernetics and the humanitarian sciences
Cybernetics in science and engineering

In several instances, authors comment that while much of the methodology, meaning primarily the mathematical concepts, has been developed in capitalistic countries, only in a communistic state can true application of cybernetics be made and the full benefits realized

The problem of reliability, which will be treated in the second volume, is mentioned as being of prime importance in the application of cybernetic concepts Berg makes points that many American reliability engineers will recognize

- We must stop thinking of reliability as a problem that has been 'thought up'
- People should be held strictly responsible for slurring over these problems and for lack of attention to them

- "Even if satisfactorily solved for today (which it certainly is not) it [the problem of reliability] will arise anew tomorrow and will never be eliminated until new technology and new instruments are developed and incorporated into practice "
- Reliability is "an 'eternal' problem, and it will never be solved by episodic measures "

In later sections, redundancy in nature is discussed in regard to reliability By this analogy it is suggested perhaps that larger-scale systems with greater redundancy are an answer "The problem of increasing the reliability of electronic and automation facilities and cybernetic facilities cannot be solved by the efforts of electronic specialists alone For the solution, wider use should be made of mathematics constructors and technologists " It appears that the Soviet engineers and scientists have much the same problems as we experience

On the basis of the articles in this book, which deal primarily with philosophy, intent, and organizational matters rather than accomplishments, it is impossible to assess the relative degree of progress of the two societies The major accomplishment in the Soviet Union so far seems to be the recognition of the role of science in national affairs and the place of cybernetics in this approach, as the following quotations bring out

> Scientific workers of the Soviet Union are undoubtedly doing everything possible to justify the faith of the Party and the tremendous assistance which it is giving to science in the Soviet Union In their everyday labor activity they will be guided by the excellent thoughts presented in the Draft Program
>
> The progress of science and engineering under conditions of a socialistic system of economy makes it possible most effectively to utilize the resources and power of nature in the interests of the people, to discover new types of energy, create new materials, work out methods of acting on climatic conditions, mastering cosmic space The use of science becomes the decisive factor in the powerful growth of the productive forces of society The development of science and the incorporation of its achievements into the national economy will in the future be the subject of special concern of the Party

Speaking at the First All-Union Conference of Scientific Workers on 12 June 1961, ACADEMICIAN M V KELDYSH, President of the Academy of Sciences, USSR, is quoted as saying "To date we do not have an adequate work front in the field of cybernetics, the science of control processes, which at the present time is of first practical and theoretical importance Research in this field should be activated and integrated at an appropriate institute or special coordination council "

In a chapter on *Cybernetics and Economics*, V D BELKIN describes several programs of interest relating to the planned, centralized use of mathematical models and data-processing approaches A few quotations serve to bring out the direction being given in applied economics

> The greatest advantage of socialism is the *planned development of economics* Based on public ownership of the means of production, the socialistic economy of the Soviet Union is being developed according to a general plan and, because of this, can be regarded as a single system, to a certain degree, for the application of cybernetic methods
>
> The development of the national economic plan from the viewpoint of cybernetics can be regarded as a definition of the strategy of economic development The plan constitutes the specific embodiment of the policies of the CP [Communist Party] in the field of the national economy Making up the plan should be based on adequately detailed and accurate information

Providing such information is the function of registration and the national statistics Hence, along with planning, *the most important system for application of cybernetics in economics is the national statistics*

For effective control and planning of the national economy, first it is necessary to be disposed of sufficiently *complete, accurate and timely information*, which can be provided by the accomplishment of registration and statistics in an appropriate way As has been pointed out by N S KHRUSHCHEV "successful solution of problems of building communism is inconceivable without a centralized system of registration and statistics in the national economy of the country " (Report to the Seventh Session of the Supreme Council USSR, 1957)

At the present time, provision has been made for the realization of large scale measures for automation of registration and statistics both at lower and medium levels (at enterprises and *sovnarkhozes*) and in the higher echelons (republic statistical administrations, Central Statistical Administration of the USSR) The direction of this very important work has been entrusted to the Central Statistical Administration of the USSR by the government

In describing the 'National Planning System,' Belkin says

State planning is the most important link in the control of the national economy of the USSR Rapid and steady growth of the complex and multicomponent national economy of the USSR requires the constant perfection of socialistic planning The incorporation of computers into the practice of planning in the very near future will be a great contribution to the solution of this problem The high speed of computers makes it possible to considerably accelerate the making out of plans, to increase the efficiency of administrative and planning organs However, this by far does not exhaust the significance of computers for planning

In this planning effort, Belkin describes how expenditure tables for the thousands of products produced in the Soviet economy are compiled from standards of consumption The updating, refining, and extension of these fundamental tables is a major effort that is supported by a large system of branch scientific research institutes which make up the standards These tables, projected over the planning period, form the equivalent of a detailed budget Belkin relates that complete expenditure tables have been calculated for the first time at the Institute of Electronic Control Machines of the Academy of Sciences USSR, using high-speed M-2 and BESM computers

Belkin describes the considerable attention being given to mechanization of information processing within the Gosbank System (State Bank of USSR) The Gosbank employs more than 80,000 persons in the technical computations and calculations required in its 3 5 million personal accounts There are 2 million entries in personal accounts each work day, with more than a billion operations per year being performed He concludes with the observation that the use of computers and cybernetic methods in socialistic economics is a most important element in the world competition between socialism and capitalism

A I KITOV writes in a chapter entitled *Cybernetics and Control of the National Economy*

The main advantages of the socialistic method of production over the capitalistic method are centralization of control, which is accomplished in the interests of the entire people, and planning of the management of the economy These advantages, in principle, require an appropriate scientific system of organization and technical control facilities of the national economy for the purpose of realization under conditions of a progressively complexified economy In the Draft Program of the CPSU

the need for organization of extensive application of cybernetics, electronic computers and controllers in various fields of the national economy, including planning, the area of accounting, statistics and control has been specially emphasized

Kitov points out that cybernetics is being used in two ways in obtaining control of the national economy in investigating economic processing and determining optimum solutions, and secondly, in the automation of control-data collection In the first area, he indicates that such techniques as dynamic programming, the theory of games and mass service, nonlinear and integer programming, and the theories of schedules and 'columns' are being applied Automation of control of the national economy is described as the important task in building communism Kitov states that the resultant efficiency of public work is the most important criterion in evaluating the application of automation, and then outlines a plan for the establishment of an integrated national control The following quotations reveal both the goal and the progress toward it

It should be noted that in recent years, in the development of computing technique, there has been a clearly-defined tendency toward the creation of powerful computing multipurpose complexes, directly connected with a large number of subscribers by means of communication channels Such computing centers can obtain information from the subscribers and give them the results entirely automatically Examples of such combinations with a speed of more than one million operations a second are the Stretch, Atlas, TsBM-1604, L-3060 and other systems

It has been determined that the operation of such powerful centralized information-processing systems is economically considerably more advantageous than the incorporation and utilization of a large number of small machines in various institutions The major computing centers spend a large part of the time for the processing of data statistical processing of economic information, processing of correspondence, calculations of wages and other financial calculations, the management of technical material accounts, the accomplishment of planning calculations and others These problems are very stable with respect to their content and methods of solution and are distinguished by the periodicity with which they come in

Therefore, the incorporation of computers into the control of the national economy should be planned from the very beginning in the form of creation of large computing centers designed for complex servicing of a number of enterprises and institutions Therefore, a single national territorial system of information-calculation centers with a single centralized control should be created These calculation-information centers should be created for comprehensive servicing of the needs of the *sovnarkhozes*, offices and departments of the Gosbank, the organs of the Central Statistical Administration, organs of the Gosplan and other institutions

At the first stage these centers can be created as autonomous institutions in which bringing the basic data for processing and receiving the results of the computations will be accomplished mainly by hand

Subsequently, these computing-information centers should be gradually connected by automatic communication lines with various institutions and enterprises of a given region

Gradually, reliable automatic communication of the centers with one another according to a definite structure should be established

The system of centers connected by communication channels in the future will form a single automated system of control of the national economy of the country

An important advantage of the single system of centers lies also in the fact that this system makes it possible to solve the problem of mass incorporation of computing technique into the national economy with considerably lesser expenditure of facilities and time than the decentralized practice of machine utilization

With the creation of a single system of nation-wide computing centers it is possi-

ble radically to solve such important problems as standardization of the computing machines produced For this purpose it is necessary to select the most powerful type of multipurpose computer, which will be the basic machine for these centers

However, it is exceedingly important that all the work be accomplished gradually, by stages, thereby, the volume of the initial investments will be comparatively small, and future development and incorporation of automation facilities should proceed through the saving obtained With corresponding concentration of personnel and proper selection of the first areas to be automated, various automated control centers can be put into operation in a short time, which should immediately give an essential saving and serve as the basis for extensive application of cybernetics to the area of control of the national economy

The titles of the articles in this book illustrate the broad coverage of cybernetics as it is conceived in the Soviet Union today Cybernetics at the service of communism, some methodological problems of cybernetics, some problems of cybernetics and statistics, problems of information theory, sampling, initial processing, storage and transformation of information about the course of production processes, problems of communications and cybernetics, cybernetic problems in the biological sciences, problems of cybernetics in medicine, neurocybernetics, study of the principles of information processing by the brain, man in automatic control systems, cybernetics and economics, cybernetics and control of the national economy, linguistic problems of cybernetics and structural linguistics, possibilities of using cybernetic technique in the solution of certain problems of law, cybernetics in meteorology, cybernetics and chemistry, teleautomatics and cybernetics, the use of cybernetics in electrical systems, cybernetic transportation problems

A careful reading of Volume I reveals that much of it describes plans and not accomplishments, and that Soviet workers have many of the same problems that management and management scientists in other countries face A recurring theme throughout the book is that only in a communistic society, with its positive central direction, can a true application of cybernetic control theory be made In short, Soviet scientists and engineers in cybernetics appear to be enthusiastically directing their efforts to the goals of communism

In view of our traditional American separation of government and industry, and the desire of major segments of our population for as little government as possible, it would not be difficult to believe that, if any country were to achieve a completely integrated and controlled economy in which "cybernetic" principles were applied to achieve various goals, the Soviet Union would be ahead of the United States in reaching such a state And one can easily argue that if such an organization of scientific effort is achieved anywhere, an effective application of science and its methods to the problems and goals of the state could result Therefore, it will be interesting to see how the Soviet experiment and program described in this book come out Certainly, a significantly more efficient and productive Soviet economy would pose a major threat to the economic and political objectives of the Western World Thus, cybernetics, in the broad meaning given it in the Soviet Union, may be one of the weapons Khrushchev had in mind when he threatened to "bury" the West

This book deserves close attention, particularly for its description of the use of scientific methods in achieving political aims

D G Malcolm
Management Technology Inc

**JAMES H. BATCHELOR, *Operations Research: An Annotated Bibliography, Volume 3*, Saint Louis University Press, Saint Louis, Missouri, 1963, 400 pages, $12 50**

**OPERATIONS RESEARCH GROUP at Case Institute of Technology, *A Comprehensive Bibliography on Operations Research 1957–1958*, Publications in Operations Research No 8, John Wiley and Sons, Inc , New York, N. Y., 1963, 417 pages, $8 75**

THIS third volume in Batchelor's series of annotated bibliographies contains 1596 listings for 1960, plus 35 items supplementing the listings in the previous volumes, and an index of about 5000 entries Since this volume carries forward the practices of its two predecessors, the reader is referred to earlier reviews in this JOURNAL for a more complete discussion of its properties, for Volume 1, see **8** (1960), pages 283–286, and for Volume 2, see **11** (1963), pages 158–159 The first Batchelor volume listed 4195 items through 1957, and the second listed 2528 items for 1958 and 1959, thus the three volumes together list 8319 items for the years through 1960

The volume prepared by the Operations Research Group at Case is the second and final one of an effort that began with a volume (No 4 in ORSA's Publications in Operations Research series) that covered the literature through 1956 (reviewed in this JOURNAL in volume 7 (1959), pages 540–543), the new volume for 1957–1958 includes the 207 items for 1957 contained in a supplementary listing in the first volume, as well as those issued separately by Case in a loose-leaf plastic-bound pamphlet in 1959 [for a review of this latter item, see this JOURNAL's volume **8** (1960), pages 286–287] The first volume contained about 3000 items, and the one under review here contains 5500 items (although the coverage is nominally for 1957 and 1958, some items for 1959 are included, as well as others omitted from the earlier volume), thus, if we deduct the 207 items in the first volume's supplementary 1957 listing that are now covered by the second, the two books list a total of about 8300 items

Since the present Case volume carries forward the practices of its predecessor, the reader is referred to the 1959 review cited above for a description and discussion of them However, the new volume has an additional feature that deserves comment Instead of the "special bibliographies" of the first volume, there are four "subject indices" that cover both volumes While these listings do not meet all of the objectives of a complete general index, they are cleverly designed to meet most of them, thus, they increase the value and usefulness of the two volumes substantially

For a discussion of the overlap in coverage of the Batchelor and Case volumes, the reader is referred to the 1960 review of Batchelor's first volume cited above, the reviewer suspects that the findings of this comparison of the initial volumes of the two series could be extended to cover the additional volumes.

Several years ago ORSA's Publications Committee and Council undertook a bibliographical program that had the objectives of (1) closing the gaps in the coverage of past literature and (2) establishing a journal that would provide current and continuing coverage (for details of this program, see the ORSA BULLETIN for Spring 1961, pages B-48 through B-54) The two volumes reviewed here complete the first of these objectives and the second has been achieved by *International Abstracts in Operations Research* (the journal which ORSA publishes for the International Federation of Operational Research Societies), which covers on a con-

tinuing basis the literature from 1961 onwards Thus the basic bibliographical tools for the operations researcher today are the two Case volumes, the three Batchelor books, and a complete file of IAOR

The first Case volume was supported by ORSA and Case Institute, the second by ORSA, Case, and the National Science Foundation, the second Batchelor volume was supported by the NSF, the third by the NSF, ORSA, and the RAND Corporation

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**DON G. MITCHELL, *The Challenges Facing Management*, New York University Press, New York, N. Y , 1963, 70 pages, $2.50**
**JOHN F. MEE, *Management Thought in a Dynamic Economy*, New York University Press, New York, N Y , 1963, 138 pages, $3 00**
**WILLIAM T. MORRIS, *Management Science in Action*, Richard D Irwin, Inc , Homewood, Ill , 1963, 308 pages, $9 00**
**DONALD J CLOUGH, *Concepts in Management Science*, Prentice-Hall, Inc , Englewood Cliffs, N J , 1963, 425 pages, $12 00**

THESE four books present an opportunity to look at a cross section of literature on or of interest to management and operations research in several different ways

MITCHELL is, of course, one of the best known of the successful professional executives who have guided American industry through the technological revolution that started with World War II His three lectures overlap and repeat to some extent but he expresses himself on five problems that confront management, particularly in the advanced-technology industries (1) the maintenance of human relations, particularly in connection with (2) automation, which he feels should be pressed because it helps in (3) meeting foreign competition, as does (4) the support of research and development in addition to that involved in automation, and finally (5) the relations of Government and industry

At no time does he ascribe any particular role to science in connection with management He does speak of evaluation of alternatives, but as a management function and not as an area where science, under whatever name, might be of assistance Contrarily, he is quite empirical and occasionally dogmatic with respect to the functions of management

MEE is a professor in the Graduate School of Business at Indiana Like Mitchell's, his book is based on lectures given at New York University He does a superb job of placing the development of management in proper perspective, from the era of the owner-manager, through the 'captains of industry' of the late nineteenth century, into the financial management of the early twentieth century, to the professional management of today

He also traces the emergence of the scientific-management movement of the turn of the century, through the concepts of the 1920's into the increasingly analytical approaches that are now current Most operations-research specialists will object to some of his observations about our role and contribution, but this reviewer feels that he maintains a judicious balance in his assessment of operations research

A feature of Mee's book is a chronological bibliography of management thought, starting with DUPIN AND BABBAGE in the 1830's and carrying down through 1962

The two remaining books in this group are textbooks for an introductory course Both are written by industrial engineers, one at a Canadian and the other at a U S university

MORRIS, of Ohio State, has developed *Management Science in Action* almost completely without mathematics, even in his discussion of models and of probability and statistics He develops I The Setting, II Science in Action, and III Line and Staff Dynamics to show what progress has been made in bringing science to the support of management, how this support is given, and how it may be used by management

CLOUGH, of the University of Toronto, has a much more conventional (and mathematical) approach He discusses I Decision-Making and Leadership Concepts, II Economic Concepts for Executive Decision-Making, and III Mathematical Concepts for Executive Decision-Making, to which he adds an appendix on Elements of Matrix Algebra and one of Statistical Tables

This reviewer has the feeling that along this spectrum from empiricism to mathematics Morris has made the greatest conceptual contribution and the best case for the use of science in support of management

JOSEPH F MCCLOSKEY
North American Aviation, Inc

**STANLEY C HOLLANDER, *Business Consultants and Clients*, Bureau of Business and Economic Research, Graduate School of Business Administration, Michigan State University, East Lansing, Michigan, 1963, 238 pages, $7 00**

THE BOOK contains a bibliography of 478 English-language items with summaries ranging in length from a few words to two pages relating to the marketing of management research and advisory services, most of the items listed were published between 1950 and 1962 The listing contains the following sections general (14 items), suppliers of research and advisory services (200 items), management of research and advisory organizations (10 items), purchasers of research and advisory services (40 items), government as a purchaser of research and advisory services (17 items), reasons for using outside services and consultant's advantages (25 items), client-supplier relations (77 items), research and advisory services in foreign countries (49 items), ethics of advice and research (9 items), miscellaneous (6 items), directories (30 items), and statistical note (1 item) There is a short introduction and an index of authors Twenty-six of the items deal directly with operations research, and many others contain implications for OR The book is a valuable resource for anyone interested in its subject Its preparation was partially supported by a grant from ARTHUR D LITTLE, INC

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## *Books Received*

RUSSELL L ACKOFF AND PATRICK RIVETT, *A Manager's Guide to Operations Research*, John Wiley and Sons, Inc , New York, N Y , 1963, 117 pages, $4 25

JOSEPH BECKER AND ROBERT M HAYES, *Information Storage and Retrieval Tools*,

*Elements, Theories*, John Wiley and Sons, Inc., New York, N. Y., 1963, 462 pages, $11.95. An introductory textbook for a university course.

RICHARD BELLMAN (editor), *Mathematical Optimization Techniques*, University of California Press, Berkeley, California, 1963, 362 pages, $8.50.

RICHARD E. BELLMAN, ROBERT E. KALABA, AND MARCIA C. PRESTRUD, *Invariant Imbedding and Radiative Transfer in Slabs of Finite Thickness*, American Elsevier Publishing Co., Inc., New York, N. Y., 1963, 356 pages, $6.50.

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CLAUDE BERGE, *Théorie des Graphes et ses Applications*, second edition, Dunod, Paris, 1963, 280 pages, 36 francs.

JOHN E. BIEGEL, *Production Control: A Quantitative Approach*, Prentice-Hall, Inc., Englewood Cliffs, N. J., 1963, 240 pages, $7.95.

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F. J. CORBATÓ, J. W. PODUSKA, AND J. H. SALTZER, *Advanced Computer Programming*, MIT Press, Cambridge, Mass., 1963, 176 pages, $5.00.

MARY E. CORNING, *Country Reports on the Organization of Scientific Research: United States*, OECD Publications, Paris, France, 1963, 96 pages, no price (paper).

RICHARD M. CYERT AND JAMES G. MARCH, *A Behavioral Theory of the Firm*, Prentice-Hall, Inc., Englewood Cliffs, N. J., 1963, 344 pages, $8.25.

GEORGE B. DANTZIG, *Linear Programming and Extensions*, Princeton University Press, Princeton, N. J., 1963, 643 pages, $11.50.

BURTON V. DEAN (editor), *Operations Research in Research and Development*, John Wiley and Sons, Inc., New York, N. Y., 1963, 301 pages, $8.50.

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FRED J. GRUENBERGER AND DANIEL D. MCCRACKEN, *Introduction to Electronic Computers: Problem Solving with the IBM 1620*, John Wiley and Sons, Inc., New York, N. Y., 1963, 178 pages, $2.95 (paper).

FRANK A. HAIGHT, *Mathematical Theories of Traffic Flow*, Academic Press, Inc., New York, N. Y., 1963, 254 pages, $9.00.

PETER HENRICI, *Error Propagation for Difference Methods*, John Wiley and Sons, Inc., New York, N. Y., 1963, 81 pages, $4.95.

STANLEY C. HOLLANDER, *Business Consultants and Clients*, Bureau of Business and Economic Research, Graduate School of Business Administration, Michigan State University, East Lansing, Michigan, 1963, 238 pages, $7.00.

ARNOLD KAUFMANN, *Methods and Models of Operations Research*, Prentice-Hall, Inc., Englewood Cliffs, N. J., 1963, 524 pages, $16.00. An English translation of a work originally published in French in 1959.

H. N. LADEN AND T. R. GILDERSLEEVE, *System Design for Computer Applications*, John Wiley and Sons, Inc., New York, N. Y., 1963, 336 pages, $7.50.

RICHARD R. LANDERS, *Reliability and Product Assurance: A Manual for Engineering and Management*, Prentice-Hall, Inc., Englewood Cliffs, N. J., 1963, 528 pages, $15.00.

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Louise Schultz, *Data Processing: A System Orientation*, Prentice-Hall, Inc., Englewood Cliffs, N. J., 1963, 415 pages, $11.90.

Leonard S. Schwartz, *Principles of Coding, Filtering, and Information Theory*, Spartan Books, Inc., Baltimore, Md., 1963, 271 pages, $8.50.

Wilson Seney, *Effective Use of Business Consultants*, Financial Executives Research Foundation, Inc., New York, N. Y., 1963, 130 pages, $4.50.

George Steele and Paul Kircher, *The Crisis We Face: Automation and the Cold War*, McGraw-Hill Book Co., Inc., New York, N. Y., 1960 (1963 in paper), 224 pages, $2.65 (paper).

Karl H. Tietjen, *Organizing the Product-Planning Function*, AMA Research Study 59, American Management Association, Inc., New York, N. Y., 1963, 77 pages, $3.00. This volume, based on a survey of 140 firms, reports the results of the survey, describes the procedures of six firms in depth, and discusses some "guides to improved product planning."

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Dean E. Wooldridge, *The Machinery of the Brain*, McGraw-Hill Book Co., Inc., New York, N. Y., 1963, 264 pages, $2.95 (paper). An engaging introduction for the nonexpert to some of the recent developments in brain research, written to stimulate interdisciplinary teamwork aimed at "a competent theory of intellectual processes."

# PERIODICALS

## *A New Canadian Journal*

The Canadian Operational Research Society is sponsoring the publication of a new journal of operations research under the editorship of K. J. RADFORD, supported by the following Editorial Board: JOHN W. ABRAMS, J. C. CLAPHAM, D. B. DELURY, JOHN E. ROBERTS, P. J. SANDIFORD, and J. R. WALTER. The first issue of the *Journal of the Canadian Operational Research Society* is scheduled to appear on 1 December 1963 with the following contents:

P. J. SANDIFORD, "The Origin and Growth of the Canadian Operational Research Society"

E. L. LEESE, "Queuing Theory Applied to Aircraft Maintenance"

J. W. JOHNSON AND E. M. KOVITCH, "Freight Car Distribution—The Nature of the Problem"

G. D. KAYE, "An Operational Research Approach to Some Defence Problems of Small Powers"

J. E. ROBERTS, "A Method of Solving a Particular Type of Very Large Linear Programming Problem"

A second volume is planned for 1964, and it is hoped that two issues will appear during that year. The Editor may be addressed at the Defence Research Board, Ottawa 4, Ontario, Canada.

Members of CORS will receive the new journal as a privilege of membership; others may subscribe at a rate of $5.00 per volume by sending their remittances to The Subscription Manager, P. O. Box 2225, Station D, Ottawa, Ontario, Canada.

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### *Management Science*, July 1963

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WILLIAM R. KING, "Marketing Expansion—A Statistical Analysis"

BERNARD M. BASS AND HAROLD J. LEAVITT, "Some Experiments in Planning and Operating"

EUGENE L. LAWLER, "The Quadratic Assignment Problem"

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HAROLD TOMBACH, "The Contribution of Systems Research to Long Range Planning in the Defense Industry"

***Operational Research Quarterly*, June 1963**

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P. MELLOR AND K. D. TOCHER, "A Steel-works Production Game"
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A. H. LAND, "A Problem of Assignment with Inter-related Costs"

***Naval Research Logistics Quarterly***

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JAMES H. GRIESMER AND MARTIN SHUBIK, "Toward a Study of Bidding Processes: Some Constant-Sum Games"
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C. L. M. Kerkhoven, "The Rating of Performance Levels of the S.A.M. Films"

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R. A. Dunlop, "Developing an Experience Register for Engineers"

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(NOTE: Although the titles above are all given in English, the articles in *Metra* appear variously in English, French, German, and Italian.)

## *Notes*

*Organomatik*, the *Institute for Work Organization and Business Automation*, of Belgrade, Yugoslavia, has inaugurated a new journal *Industrijska Istrazivanja* (*Industrial Research*), under the general editorship of MILOS M. SINDIC. The journal will be devoted, at least in part, to operations research.

The first issue, dated 1963, contains six articles, all in Yugoslavian, but with English and Russian abstracts. After an introductory essay by the editor, there are five articles on operations-research subjects, all by VASILIJE MARKOVIC AND RODOVAN TODIC: "General Approach to Operations Research," "General Approach to Linear Programming," "Mathematical Approach to Linear Programming," "Methods of Linear Programming," and "Optimal Production Program." The introductory article on operations research expresses the ardent, if perhaps too sanguine, hope that "operations research should become the instrument of perfect management and administration, not only in industry, but in many other fields of social activity."

The journal and its editor may be addressed % Organomatik, Milana Rakica 35, Beograd (Belgrade), Yugoslavia.

In an obituary article on the late SIR RONALD AYLMER FISHER ["Fisher's contributions to mathematical statistics," *Journal of the Royal Statistical Society, Series A* **126,** 162–166 (1963)], G. A. BARNARD calls attention to an early contribution by Fisher to game theory: "Randomization and an Old Enigma of Card Play," *The Mathematical Gazette* **18,** 294–297 (1934). Barnard states that this note "constitutes an independent development of the ideas of game theory, which had previously been expounded by Borel and von Neumann. Characteristically, whereas Borel and von Neumann had been more concerned with general theory, Fisher applied these ideas to a thorough treatment of a real problem in card play, and his analysis was the first and remains one of the very few complete analyses of realistic game situations available."

*Business Week* for July 6, 1963 (pp. 68–73) describes some implications of FOSTER L. WELDON's recent operations-research work for the Matson Navigation Co. The same journal (July 13, 1963, pp. 56–90) discusses "planners for the Pentagon" in a well-balanced report that stresses the contributions of operations research and systems analysis, as well as of the organizations and people that have contributed to their development. An excellent summary for the general reader.