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ROBERT H ROY, *The Administrative Process*, The John Hopkins Press, Baltimore, 1958, 236 pages, $5 00

THIS IS THE KIND of book that anyone who knows "Rob" Roy, Dean of Engineering at Johns Hopkins, would expect him to write His great personal charm, his deep appreciation of the human side of management problems, his understanding of the tools and techniques of modern management research, and his broad experience with management problems, combine to produce an unusual book

It is a book about management at the highest levels Dean Roy uses the term 'administration' in the sense that has given the name to our schools of business administration He has no concern with the nit-picking details that many associate with the word.

This is a beautiful book It was designed by the author and is a tribute to his many years in the book-manufacturing business

It is a readable book Some speech mannerisms have intruded themselves into his conversational style, but it is more to the point to state that the book is hard to put down It can, and probably will, be read in a single sitting

The book is anecdotal The author draws on his experiences in printing, as a university administrator, and as a labor arbitrator to introduce and drive home the points that he makes I was at first puzzled by the lack of the usual trappings of scholarship, particularly the lack of suggested readings or a bibliography But such would be inappropriate in this book This is Rob Roy's book—and his philosophy—and is not his condensation and rearrangement of other people's books and other people's philosophies

The first four chapters deal with the administrative process as such The remaining chapters go into detail on such topics as organization, delegation of authority, staff organization and operations analysis (which chapters appeared as articles in *Operations Research*, vol 4, pp 309–323, 1956), deification of numbers, forecasting and planning, resolution of conflict, morale, communication, executive overload, organizations and individuals, and criteria for decisions

The value of the book lies, however, not in its coverage of the usual—and some unusual—topics but rather in the 'message' and the perspective it conveys There is no question but that the complexity and tempo of management's job has accelerated to a dizzying degree since the days before World War II What was good enough then is not good enough now Despite all of the fancy aids to management that have appeared, management's job remains fundamentally the same it has to decide, and people are bound up in, affect, and are affected by decisions The rules, the theories, the organization chart do not cover all of the problems Management still has to put both head and heart into its job

The message is an optimistic one, however Anecdote after anecdote shows

what can be done Where management failed, the proper course is elucidated Where management succeeded, the reasons are elucidated . The sub-title given on the dust jacket—"a guide to successful human management"—is well chosen

I must admit to a strong prejudice in favor of this book, partly because of my admiration and respect for the author, partly because I agree so completely with just about everything he has to say I recognize that it will evoke criticism from those who are, in my opinion, oversold on the role of science in management But I will insist that anyone interested in management and its problems will benefit greatly from thoughtful reading of this book I recommend it especially to my colleagues in operations research

JOSEPH F McCLOSKEY
Haskins & Sells

WILLIAM FELLER, *An Introduction to Probability Theory and Its Applications, Volume 1*, Second Edition, John Wiley & Sons, Inc , New York, 1957, 461 pages, $10.75

NO DOUBT a large number of operations researchers were disappointed with the announcement last September of the publication of the second edition of Feller's *Probability, Volume One* Since the first edition of *Volume One* has been highly respected by almost every operations researcher, many have long been eagerly waiting for *Volume Two* rather than this revised edition Thus the question of the need of the second edition arises quite naturally That is, is the second edition a significant improvement over the first?

At first glance it appears that there may have been only few changes in the revision There are still seventeen chapters plus the introduction These begin with the sample-space discussion and end with the familiar chapter on queuing Some of the intervening chapters look very much like corresponding chapters in the first edition, and upon closer examination are Thus, the general plan of the second edition is approximately the same as the first

However, there do exist distinct differences in this second edition It does not take long to discove. a definite streamlining in most chapters In addition, the elements of queuing theory have been woven into the context throughout the book and serve 'as a unifying thread ' There is some shifting of topics from one place to another For example, to Chapter 6 on Binomial, Poisson Distributions have been added the sections on the Law of Large Numbers from the old Chapter 7 and the Negative Binomial from Chapter 11 Finally, there has been added a considerable amount of new material, such as the discussion of the central term and the tails of the binomial

Perhaps the most significant change is the new Chapter 3 By streamlining the old Chapter 3 on Occupancy Problems and inserting it into Chapter 2, Feller made room for a delightful chapter entitled "Fluctuations in Coin Tossing and Random Walks " This chapter "illustrates the power of combinatorial methods by deriving in an elementary way important results previously obtained by advanced analytical tools The results concerning fluctuations in coin tossing show that widely held beliefs about the law of large numbers are fallacious These results are so amazing and so at variance with common intuition that even sophisticated colleagues

doubted that coins actually misbehave as theory predicts" The theory is then illustrated with the results of 10,000 tosses of a coin

For those who know the first edition, it is no surprise to note that this is an extremely well-written text The general streamlining has done nothing to spoil the readability of the book, but on the contrary has improved it There are almost no errors, and the few that exist are of a minor typographical nature

What about *Volume Two?* Feller still gives hope that it will eventually be written In the discussion of the central limit theorem (p 229) he refers to a "much more general theorem whose formulation and proof are deferred to the second volume" Let us hope that this second volume will be a reality soon

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ALEXANDER G KOROL, *Soviet Education for Science and Technology*, The Technology Press of M I T and John Wiley & Sons, Inc , New York, 1957, 513 pages, $8 50

MUCH IS BEING said and written these days about the need for improved education in our primary and secondary schools, particularly in science and mathematics All too often a comparison is drawn with specific Soviet educational accomplishments with the consistent implication that their educational system is outperforming ours A comparison of two systems so different in operation and objectives, on the basis of one or two numerical ratios, can easily be misleading

ALEXANDER G KOROL has provided us with an excellent opportunity to improve our understanding of Soviet education and to better evaluate it in comparison with our own The book is factual, thoughtful, and well-written A veritable handbook of facts is contained in 56 major and many more minor tables, 48 pages of appendices and a 12-page selective bibliography Throughout the book, however, the text can be read without close reference to the tabular information if the reader prefers Detailed description, discussion, and conclusions pave the way for a rewarding final chapter devoted to broad conclusions and comparisons

Korol devotes 130 pages to the Soviet system of mass education He describes the organization, curriculum, instruction, textbooks, and examinations of the standard ten-year schools, and the nature and significance of the growing secondary technical schools In 270 pages he examines Soviet higher education the institutional system, selection, enrollment, and graduation, the academic plan, sample curricula, teachers, textbooks, and facilities, the teaching process, and finally the graduate training The value and impact of the book are best illustrated by illuminating facts and observations drawn directly from it

The formal absolute uniformity of curricula, textbooks, and methods of instruction in the ten-year schools are in sharp contrast with major local differences in performance The goal of ten years of universal education probably will not be achieved at least until sometime after 1960 Even this prediction is faced with the fact that since 1940 brief vocational training has been substituted for completion of the ten-year school for some 16 million youth as a part of the USSR "State Labor Reserve" program

The ten-year schools suffer from a serious shortage of plant and equipment, but have a considerably more favorable pupil-teacher ratio than our own schools The graduates of the many Pedagogical Institutes as well as a definite proportion from the lower end of the university graduate rostrum are assigned to teach in secondary schools The "eminent position" of Soviet secondary school teachers is not reflected in money income "The depressed financial status of Soviet primary and secondary teachers stands in a very sharp contrast to the relatively very high standing of college and university teachers—with a ratio of incomes of approximately 1 to 5 "

The ten-year school, originally established mainly as a college preparatory school, is now undergoing a major readjustment since the majority of its vastly expanded graduating classes now find it impossible to go on to higher education The result has been that "the curriculum changes in the last four years have perceptibly shifted the Soviet ten-year school educational process away from the areas of intellectual inquiry and toward the cultivation of manual skills, away from the humanities and toward science and technology, away from academic efforts and toward trades and vocational endeavors Secondly, the 1955–1956 ten-year school curriculum provides for a somewhat smaller academic load than formerly" and "the syllabi of the individual subjects have also been somewhat scaled down " Vocational detours prior to graduation seem to be a continuing part of the plan In addition there have appeared a variety of technical trades schools "decidedly of the terminal type conceived more or less on a crash basis to alleviate the shortage of qualified workers in industry and agriculture and to help wean the reluctant ten-year school graduate from his visions of the privileged status which in the Soviet Union is firmly indentified with higher education "

Every graduate of the ten-year school has had the equivalent of 5 1 high-school years in mathematics and 6 9 in science In algebra, all ten-year-school graduates (1 3 million in 1956) would be qualified to take the College Board Advanced Mathematics Examination, as compared with about 10 per cent of our high school graduates (150,000 in 1953) On the other hand, the method of teaching is time-consuming, rigid, authoritarian, and based on memorization and literal adherence to the text Students are overloaded with excessive homework assignments Preparation for final examinations is principally drill on standardized examination questions with reliance on memorization

Schools for sub-professional training are called *technicums* or "specialized secondary schools " There are the 4-year technicums that are roughly equivalent to our vocational high schools and the newer 2-year technicums that are similar to our terminal-type junior colleges Enrollment in these schools (now 245,000 per annum) has doubled since 1940 and promises to achieve the planned objective of 1 5 technicians for every engineer It exceeds our equivalent enrollment by at least a factor of ten

Soviet higher education is marked by its utilitarian and vocational orientation In addition to 34 universities, there are well over 700 institutes Only in the universities, however, are the basic sciences taught as fields of specialization The institutes are set up on the basis of a great variety of vocational fields ranging from engineering fields to art and physical culture Their enrollment, particularly in engineering and in evening and correspondence categories, is increasing rapidly

Every area in the life of a Soviet academic institution and every phase of the academic process is controlled by the USSR Ministry of Higher Education The administrative structure of these institutions "embodies the usual Soviet pattern of organization, with multiple lines of limited authority and unlimited accountability which converge and can be resolved only at the highest level of the central government" Thus, "educational development in the Soviet union is to be visualized as distinctly a step function of decisions centrally made on a big scale"

There was issued in 1954 a set of far-reaching instructions the quality of graduates was to be improved, they were to be trained more broadly, encouraged to do more independent work, and equipped for more rapid integration within industry and other fields Since that time, admissions policies, curricula, distribution of academic time, structure of facilities, and the range of options, have undergone considerable change

During the last few years the number of applicants for higher education, particularly in science and technology, has permitted a high degree of selectivity Students are motivated more strongly toward higher education in general, rather than toward a particular field, but they have a general preference for the politically safe prestige fields of science Direct economic factors deter many applicants even though the tuition is small, since scholarships, at least prior to 1956, at best barely covered subsistence costs Since the actual questions on entrance examinations are left to the examiners, the difficulty of the questions and, even more important, the grading standards, vary with institution and faculty Mathematics, physics, and chemistry examinations are oral, with strong emphasis on applications in the latter two subjects

The most important single factor in the selection process is The Plan which allocates admissions quotas by field of study and by institution It not only affects the standards of selection but is also frequently incompatible with the resources of the institutions Furthermore, "the student body has progressively become weighted in favor of children of Party officials, civil servants, officers of the armed forces, and other elite groups whose relatively privileged positions are linked to the maintenance and continuity of the present regime" Students are frequently shifted between courses and between institutions, but seldom on their own initiative

The ratio of graduates to entering students in the Soviet Union (probably kept high by the Plan) is 84 per cent as compared with our 60 per cent The graduating class of Soviet resident schools of higher education in 1955 was 184 thousand and is expected to reach a peak of 250 thousand by 1959 About 55 per cent were women and about 10 per cent were 5-year university graduates In 1956, university graduates included approximately 5,000 physicists and mathematicians

"'Academic plans' established by the Soviet Ministry of Higher Education play a decisive role in shaping the entire academic process and the content and quality of instruction" Much fault is found, however, with the workability of the plans, as compared with decentralized planning A separate plan exists for every specialty, of which there were 835 in 1954 One common feature is "the almost complete absence of elective subjects," which is the means by which the American student introduces great variety into his specialization Other common features are the very large proportion of the student's time allotted to compulsory class attendance and the excessive total scheduled load imposed on the student Since

1954 there has been strong emphasis on foreign languages, especially English Even in technical fields, some 13 per cent of the student's total time is devoted to instruction in Soviet dogma—time that might have been spent on humanistic studies In practice the academic plans are subject to unavoidable local modifications under the practical limitations imposed by teaching staff, physical facilities, and textbooks

A given institution has small freedom to select and change its faculty Proposed senior-staff appointments, supposedly subject to open competition, may actually be resolved in advance at the highest level There is a pronounced tendency for the best academic talent to concentrate in the most desirable schools and geographical areas The composition of Soviet faculties has never even approximated the desired proportions, it tends to be one professor for every four docents instead of the desired two to three ratio Holding two or more academic positions simultaneously is common practice in spite of official disapproval, owing to the shortage of qualified teachers and the meagerness of real income The standard teaching load is 18 hours per week, for which there is a range of salaries of more than a factor of 15 between the lowest and highest positions

Soviet textbooks tend toward an encyclopedic comprehensiveness and detail, more suitable for a reference book Engineering textbooks, especially, are narrowly specialized, vocationally oriented, and geared to specific industries The vocational approach results in rapid obsolescence As a result, students depend heavily upon lecture notes, their own or others

Because of war damage, the Soviet school system faced a large reconstruction task after 1945 There is a very great range in the quality of school facilities with the much-publicized plant of Moscow University at one extreme About 40 square feet of dormitory space per student is considered satisfactory in most institutions The general inadequacy of equipment and facilities is causing particular concern because of the recent directive to improve the quantity and quality of internal research

In Soviet higher education, lectures, practical studies, and industrial practice are the specified forms of supervised instruction The content and organization of each lecture course is determined in great detail by a syllabus issued by the Ministry of Higher Education and not subject to change either by the professor or by the university Graphic aids and projection material for classroom instruction are receiving considerable attention The need to improve the quality of lectures is generally recognized "Soviet lectures in the social sciences—wholly independent of the teacher as to content, interpretation and emphasis—are inevitably at the lowest possible qualitative level" By contrast, Soviet lectures in mathematics and science are dependent on the instructor and are generally of high quality

For engineers, considerable time is allocated to laboratory work and shop practice, but performance is handicapped by lack of equipment and by noninstructive work assignments "—industrial practice has been held particularly important in the training of engineers," including the implication that "the student must be assigned a place and the duties of a regular plant worker" In actual practice, because of unrealistic plans and lack of interest on the part of the student, the school, and the plant, regular work stations are seldom assigned to the students

"—Soviet schools have the potential organizational advantage of an enrollment controlled as to size and categories ," but in practice "—sudden shifts in the

plan for the production of specialists have at times required individual institutions to start courses of instruction for which neither staff nor laboratory facilities were available "

In the final semester, Soviet students are freed from strict regimentation and required to complete a diploma project "The great majority must experience an abrupt transition from a high degree of regimentation to comparative freedom, accompanied by new and unfamiliar demands on originality and initiative " The diploma projects are frequently unrealistically ambitious, and are handicapped by the fact that the students encounter difficulties in obtaining routine industrial and plant statistics In spite of these difficulties, "the Soviet engineering student finds this period of his career an unusual and stimulating experience "

The quality of Soviet undergraduate education is influenced to a unique extreme by such factors as geographical location, the kind of institution, and the particular field and the type of instruction (day, evening, or correspondence) When a majority of favorable factors are present, the quality of training is in its technical content comparable to the very best available in this country "—the Soviet physics graduate is at a par with, and in his particular area of specialization perhaps at a higher level of professional preparation than his American counterpart after one year of graduate training " In terms of basic engineering preparation, the Soviet engineering graduate "does not achieve appreciably if at all a higher level of competency in his 5 years of training than his American counterpart does after a 4-year course "

In the 20 years prior to 1955, some 3 million Soviet students received undergraduate training while some 80,000 completed graduate work The choice of those to continue was made by the authorities, as was also the selection of locality of employment and job for each graduate at every level

Soviet graduate training is conducted not only at universities but also at many research organizations, as is consistent with their recent emphasis on the importance of research in graduate work Scientific research is organized in three separate complexes the USSR Academy of Sciences, the research institutes of the various ministries, and the institutions of higher education, all supposedly following the master plan for scientific and technological development

This plan and supporting legislation aim to expand research and improve graduate work in the universities, but emphasize applied science and practical orientation Educators complain that they are still limited by budgets and teaching loads Research has been an unimportant element in Soviet higher education, and continues to show greater variability than any other element

Soviet planned rates for graduate-school output have consistently not been met, partly because of failure to fill admission quotas Most undergraduates do not have the self-sufficiency necessary for graduate work Other restricting factors are finances, need for release from the employing ministry, and fear of the greater administrative responsibility and political risk

The academic plan specifies the fields of graduate specialization for each institution, sometimes with total disregard for available personnel and facilities Graduate emphasis continues to be in engineering and the physical and engineering sciences

In general the Soviet student is several years older when he becomes a *kandidat*

than the American student when he obtains his M A The Soviet *doktor* of sciences is naturally distinctly older than the American is when he gets his Ph D because the *doktor* degree is for scientific achievement rather than advanced formal preparation The *kandidat* degree is intermediate between M Sc and Ph D and is qualitatively similar in science but distinctly inferior in engineering

In line with the basic communist view of society and the individual, the Soviet educational system prescribes national maximum admission quotas, strains to fill all designated vacancies, arbitrarily alters operating plans, but clings steadfastly to its over-all objectives for the graduate commitment to the will of the Communist Party and technical competence as required Accomplishments of the system show great variation in quality and fall far short of the implications of the unanalyzed statistics

Soviet resident college enrollment is less than 7 students per thousand of population as compared with our 17 per thousand They are now training more students in science, twice as many in engineering, and almost ten times as many engineering technicians Every trained individual must work in a designated capacity and location for a number of years

Many ten-year-school graduates who fail of admission to higher education do not enter the labor force voluntarily and thus remain unemployed Actually, there are no desirable alternatives to professional education The consequent drive for education is directed by Soviet planners into desired directions by admissions quotas and scholarships

Advantages of centralized control of the education process are power to enforce decisions, to allocate resources, to coordinate educational elements, and to establish a minimum standard Disadvantages are the increasing difficulties of accurate planning, the possibility of making blunders on a national scale, the unprecedented growth of bureaucracy, and the consequent paralysis of individual initiative

The personal responsibilities of a Soviet citizen "are reduced to the acquisition and exercise of the maximal technical knowledge, vocational and professional skills, and diligence in the performance of designated duties" "But these accomplishments of *training* are not adequate criteria for judging a system of education, and it is an unhappy commentary on the state of the Western mind in this era of cold war that we have often been tempted to make an illogical transition from the one to the other" "On the contrary, we would submit that, when judged in terms of its own goals and needs, American education has a far greater and more complex task, and one that demands greater attention, dedication, and energy, than any task suggested by the allegation that the Soviet Union produces twice as many engineers per year as does the United States"

This leads to the definition of "the most important role of education in a free society it is a major avenue of progress toward the development and refinement of a self-generated scale of moral, ethical, aesthetic, and social values as standards of personal and group behavior, toward the generation of a freely and maturely arrived-at choice of alternatives and a consensus as to political, economic, and social priorities, and toward informed and responsible popular choice and effective support of elected leadership in communal, national, and international affairs"

The challenge of Soviet education lies in the degree to which its "efforts and

performance are consonant with national goals" "The locus of the threat is not Soviet education but Soviet communism" "Soviet education has also been viewed as a weapon which will help eventually to destroy the very threat that some observers believe it poses" "In consequence of the advances and the spread of knowledge, it is already difficult for the Soviet Union to keep its people in the dark on the status of the economic, scientific, and cultural progress of the Western industrial societies" "In the long run the threat of communism will be removed if the free peoples vigorously continue—Soviet Union or no Soviet Union—to pursue their highest social goals and to maintain their combined scientific, technological, and moral superiority"

L C Van Atta
Hughes Aircraft Company

RALPH M BARNES, *Motion and Time Study*, Fourth Edition, John Wiley & Sons, Inc , New York, 1958, 665 pages, $9.25

AT FIRST EXAMINATION this new edition appears to be little different from the Third Edition of 1949, or even from the Second of 1940, however, closer scrutiny shows that the subject matter has been thoroughly revised and new material added in extra chapters

Perhaps this revision provides the best clue to the quality of the book Few sections remain unaltered, data have been regrouped, explanations enlarged or simplified, examples replaced by better ones, and all with beneficial effect Even so, the impact on the reader of this revised work is much as it was before This is because of the soundness of the original work, it has stood the test of time and required no drastic overhaul

That the subject has continued to develop is shown by the new chapters, which are a welcome addition Often, and at times with good reason, the practices of motion and time study have been adversely criticised on the grounds that they are more art than science, but pretend to be the latter This book attempts to narrow the gap by encouraging the scientific approach in terms of making more precise measurements and in the validation of results, with the over-all object of converting the techniques into a finer tool for their many purposes

There are five new chapters, all with useful information Of particular value is the one which deals with work sampling, not only because it demonstrates the technique (which is a means of rapidly determining the activity pattern of groups of workers, etc), but because in so doing, statistical treatment of the data obtained is discussed at some length All too often, time-study engineers are completely unaware of the benefits to be obtained from the use of basic statistical procedures in their work This chapter is a useful reminder Another new chapter deals with mechanizing the making of a time study in order to process the data electronically—a useful facility if computing aids are available, and a third one with systems of motion-time data, complete with charts and explanations of them Of the remaining two, one discusses briefly mechanization and automation, and the other multifactor wage incentive plans

In preparing a book of this kind, it must be difficult to decide just how much to

include without going too far beyond the limitations imposed by its title Perhaps even more references could have been made in the text to current developments in the broader human-engineering, ergonomics field, because so much of the data now available on human abilities and limitations, and on the effects of environmental factors, are relevant to the work in motion and time study However, one book cannot contain everything, and references to work on particular problems are not difficult to find, provided that the existence of the problem is realized

To summarize, Dr Barnes has produced a comprehensive textbook with information drawn from his own extensive experience and from a wide variety of workers in this and related scientific fields It takes the reader systematically from definitions through principles to applications and specialized uses, in simple and concise terms, and thus provides both a valuable primer to the beginner, and a source of reference, revision, and new ideas, to the established worker

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BOLLETINO DEL CENTRO PER LA RICERCA OPERATIVA,
Numbers 5–6, 1957

LUIGI CASTOLDI—*Queue Alternance and Traffic Flow Control at a Crossroad* (in English), pp 1–13

"This is a study of a traffic phenomenon consisting of the alternance of red lights and green lights at a crossroad, caused by the necessary waiting of vehicles, or pedestrians, moving in a direction, for the whole time—at least—of the crossing of vehicles in queue in the crosswise direction At first the phenomenon is studied under conditions of uninterrupted queue alternance, then under circumstances of controlled traffic Consequences of practical significance are drawn about conditions eventually causing the congestion —appropriately defined—of traffic "

BASILIO GIARDINA—*An Alternate Proof of Optimal Sequencing Decision Rule for n Items on Two Machines* (in English), pp 14–18

"An alternate proof is provided for the optimizing sequencing rule developed by S M Johnson in "Optimal Two- and Three-Stage Production Schedules with Setup Times Included," *Nav Res Log Quart* **1**, 61–68 (1954)

ADRIANO GRAZZANO AND GIULIANA POZZI—*An Analog Method for Problems of Linear Programming* (in Italian), pp 27–44

"There is shown an analog criterion for the solution of the problem of maximization (minimization) with a linear function of n variables subject to m linear inequalities The criterion essentially consists of integrating the equation of the motion in a dynamic system with n coordinates, generally subject to strong viscous damping, holding potential $Z(\lambda_1, \lambda_2, \ , \lambda_n)$, which is the function to be maximized (minimized) This method, besides being extremely flexible, provides a result notably more rapid than by using the well-known simplex method while the value of the solution is obtainable with an approxi-

mation result acceptable practicably. We report a practical example of a solution comparing the results with those obtained with the simplex method." (*Translation of author's summary.*)

La Conferenza Internazionale di Oxford sulla Ricerca Operativa (in Italian), pp. 53–59. A report on the Oxford conference including abstracts of selected papers.

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Case Institute of Technology

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