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First International Conference on Operations Research

OXFORD, ENGLAND, SEPTEMBER 2-5, 1957

REPORT by THORNTON PAGE

*Chairman of the Organization Committee for the Operations
Research Society of America*

ANOTHER STEP was taken in establishing operations research as a recognized profession, a strong boost was given to the development of OR in Europe, and a fruitful exchange of ideas between experts took place—all during the four days in Oxford (and another day at eight nearby industrial and governmental OR agencies) devoted to this First International Conference. Two hundred and forty-two delegates from 20 nations drew closer in many ways as they shared their problems, discussed methods of solution, and reported progress; in fact, the cooperative spirit developed to such an extent that the question of whether we should have another conference was soon displaced by the question of how soon another could be organized.

CREDITS

THE ORIGINAL PROPOSAL for the international conference was made by R. L. ACKOFF, Case Institute, and transmitted to B. H. P. RIVETT, Secretary of the Operational Research Society (UK), on January 17, 1955. The idea was immediately seized upon by members of ORS (UK), ORSA, and TIMS—the three original sponsoring Societies. Committees were formed in the spring of 1956, as shown in Table I, and plans were well crystallized by September of that year. During these first months there were several major differences in concept to be ironed out: ORS wanted to maintain a scholarly atmosphere, ORSA emphasized the international aspects, and TIMS the organizational aspects of OR. Thus it came about that the Conference was limited to 250 delegates (partly by the choice of meeting place), papers were selected and published in advance for pre-Conference study, delegations were solicited from over 30 countries, including the USSR, Poland, Czechoslovakia, and Hungary, and a half-day session was set aside for reports on the progress of OR in various countries.

Other features developed at this time were parallel panel sessions on five problems facing the OR profession, parallel colloquia on specific OR activities in the United Kingdom involving visits to eight different establishments, and informal evening discussion groups. The French Society, SOFRO, was added as a 'counterpart society' sponsoring the Conference, and, although there could be no formal action because other national societies had not yet been formed, it was agreed to have one evening meeting of selected delegates to discuss continuation of the international conferences.

The major problem in 1956 was the selection of papers for presentation at the plenary sessions of the Conference. The announcement of the Conference asked for abstracts to be submitted before December 1, 1956, a date later changed to January 1, 1957, by which time over 100 abstracts had been received. The ORS and ORSA-TIMS Committees then bravely attacked the difficult problem of selecting about 30 for publication and presentation at the Conference. Copy was to be at the printers by April 15, so that a pre-Conference printing could be dis-

TABLE I
ORGANIZING COMMITTEES

ORS (UK)	ORSA and TIMS
CHARLES GOODEVE, <i>Chairman</i>	THORNTON PAGE, <i>Chairman, ORSA</i>
B. H. P. RIVETT, <i>Hon. Secretary</i>	DAVID B. HERTZ, <i>Chairman, TIMS</i>
MAX DAVIES	JOHN W. ABRAMS
ROGER EDDISON	JOHN P. COYLE
L. T. HEMS	GLEN D. CAMP
JOSEPH LEWIS, <i>ORSA-TIMS liaison</i>	LOUIS P. CLARK
J. STRINGER	WALTER L. DEEMER
E. C. WILLIAMS	JOSEPH LEWIS
MISS B. KORNITZER, <i>Secretary</i>	MICHAEL LEYZOREK
	S. B. LITTAUER

tributed before August 1, 1957. On the basis of 80 abstracts, the ORSA-TIMS Committee, with the advice of Council members and over 20 referees, encouraged authors to prepare and submit full texts of 40 papers, of which 22 appeared in the final publication. As our deadlines approached, the reading of full texts was necessarily speeded up and limited to fewer members of the Committee, Deemer, Hertz, and Page taking the major share of the load. Eddison, Davies, and Rivett likewise deserve mention for their efforts on the British side in screening over 20 abstracts to publish 8 of the final papers. During all this, Lewis played an important role from his London office as coordinator and international liaison.

The final stage of detailed preparation for the conference—arranging for accommodation at Oxford, scheduling sessions, panel meetings, colloquia, and tours, instructing chairmen, authors, and commentators, and providing innumerable services for the delegates—was entirely undertaken by the ORS Committee, organized and led by Sir Charles Goodeve.

DELEGATES

IT WAS RECOGNIZED early on that the Conference would be oversubscribed by Americans and British, both because these two countries have so much OR activity, and because it would be easier for them to get to Oxford than for other nationals. The financial difficulty was substantially reduced by the remarkably low conference fee (\$56, of which about half represented the cost of room and board). Delegations from India, Australia, and other British Commonwealths were encouraged by

Goodeve and Rivett—and those from other countries by Page, Camp, and Deemer. Although it was at first planned to arrange for financial assistance to cover travel expenses, this proved too difficult, except for funds granted by the ORSA and TIMS Councils for a few speakers and officers.

In the end, 120 U.S. and Canadian members of ORSA and TIMS were invited to attend, and 61 came. The attendance, by country, is given in Table II. Many of the other delegations included ORSA and TIMS members.

TABLE II
ATTENDANCE BY COUNTRIES

Austria.....	1	Japan.....	2
Australia.....	7	Netherlands.....	14
Belgium.....	5	Norway.....	5
Canada.....	5	Poland.....	2
Denmark.....	3	South Africa.....	1
France.....	25	Spain.....	2
Germany.....	4	Sweden.....	17
India.....	2	Switzerland.....	2
Israel.....	1	United Kingdom.....	80
Italy.....	8	United States.....	56

CONFERENCE PROGRAM

DELEGATES STARTED ARRIVING Sunday afternoon, September 1, and found their way with some difficulty to assigned rooms in Balliol and Magdalen Colleges, there to learn that Oxford undergraduates get along without plumbing on every floor and with the nearest bath sometimes 100 yards away along an outside path. On the credit side, meals were served in medieval halls—with high barrow ceilings, huge stone fireplaces, and oak-panelled walls on which hang portraits of past scholars and potentates. What is more, tankards of beer and ‘tuns’ of cider (the fermented variety) were available at the buttery for a small fee. Lady delegates and couples had been housed in hotels and a separate guest house, but we all ate together, seated on long oaken benches, and served by the famous Oxford ‘scouts’ (men servants, who also do duty as valets and chambermaids).

The plenary sessions of the Conference were held in the new University Physiology Laboratory, about 10 minutes’ walk from the Colleges, where the auditorium held an audience of 250, again seated on wooden benches. Coffee and tea were served during mid-morning and mid-afternoon breaks in a separate room, and a spacious entrance hall provided another meeting place for informal discussion.

Table III shows the Conference program, which was conducted entirely in English. A complete volume of *Proceedings*, edited by Davies, Eddison, and Page, is in press and expected to appear during December; it will contain the full text of papers presented, and a summary of discussion. Each speaker was allowed 7 minutes (controlled by a set of red and green signal lights!), and discussion was generally deferred until the end of a group of papers. Certain members of the audience were asked in advance to prepare comments on each paper, and additional

TABLE III
CONFERENCE PROGRAM

Monday Afternoon, September 2

Welcome by the Chairman, SIR WILLIAM SLATER (President, Operational Research Society, United Kingdom)

Session on COMMON THEMES (Chairman, SIR WILLIAM SLATER)

P. M. MORSE, Massachusetts Institute of Technology, *The Research Aspect of Operations Research*

CHARLES F. GOODEVE, British Iron and Steel Research Association, *The 'Scientific Method'*

B. O. KOOPMAN, Columbia University, *Combinatorial Analysis of Operations*

RUSSELL L. ACKOFF, Case Institute of Technology, *The Concept and Exercise of Control in Operations Research*

JOHN W. ABRAMS, Royal Canadian Air Force, *The Role of Operational Research in a Decision-Making Organization*

Monday Evening, September 2

Reception and Conference Dinner

Tuesday Morning, September 3

Session on METHODOLOGY (Chairman, THORNTON PAGE, Chairman ORSA-TIMS International Conference Committee)

A. W. ROSS, Royal Naval Scientific Service, *Approximate Methods in Operational Research*

CLAYTON J. THOMAS, U. S. Air Force, *The Genesis and Practice of Operational Gaming*

HERBERT K. WEISS, Northrop Aircraft Inc., *Lanchester-type Models of Warfare*

GEORGE B. DANTZIG, The Rand Corporation, *Concepts, Origins and Use of Linear Programming.*

J. STRINGER, Central Electricity Authority AND K. B. HALEY, Birmingham University, *Application of Linear Programming to a Large-Scale Transportation Problem*

EDWARD L. BRINK AND JOHN S. DECANI, University of Pennsylvania, *An Analogue Solution of the Generalized Transportation Problem with Specific Application to Marketing Location*

Tuesday Afternoon, September 3

Session on METHODOLOGY (Chairman, Dr. David B. Hertz, Chairman TIMS International Conference Committee)

J. W. COHEN, N. V. Philips' Telecommunicatie Industrie, *A Survey of Queuing Problems Occurring in Telephone and Telegraph Traffic Theory*

P. NAOR, Israel Institute of Technology, *Some Problems of Machine Interference*

ROBERT M. OLIVER, Massachusetts Institute of Technology, *The Design and Error Analysis of a Sampled-Data Production and Inventory Control System*

J. H. ENGEL, Operations Evaluation Group, U. S. Navy, *Use of Clustering in Mineralogical and Other Surveys.*

T. C. KOOPMANS, Cowles Foundation for Research in Economics, *Water Storage Policy in a Simplified Hydroelectric System*

STAFFORD BEER, United Steel Companies Ltd., *The Mechanical Simulation of Stochastic Flow*

Tuesday Evening, September 3

Informal discussion groups

TABLE III—Continued

Wednesday Morning, September 4

Session on APPLICATIONS (Chairman, SIR CHARLES GOODEVE, Chairman International Conference Organizing Committee)

T. KAWATA, Tokyo Institute of Technology, *Standing Time of a Freight Car in a Marshalling Yard*

GEORGE J. FEENEY, Stanford Research Institute, *The Empty Boxcar Distribution Problem*
J. G. WARDROP, Road Research Laboratory, U.K., *The Traffic Capacity of Weaving Sections of Roundabouts*

R. P. HYPHER, Canadian Defence Research Board, *Operational Research in Mining*

J. C. R. CLAPHAM AND H. D. DUNN, National Coal Board, *Communications in Collieries*

THORNTON PAGE, Operations Research Office, U.S.A., *The Value of Information in Decision Making*

*Wednesday Afternoon, September 4**Panel Meetings*

- A. Education and Training
- B. Organization of Operational Research Groups
- C. Communication of Results of Operational Research
- D. Relationship of Operational Research and Other Managerial Aids
- E. Forecasting Future Needs and Technique

Wednesday Evening, September 4

Visit to Festival Theatre, Stratford-on-Avon

Thursday Morning, September 5

Session on APPLICATIONS (Chairman, BERNARD O. KOOPMAN, President Operations Research Society of America)

J. R. MANNING, Boot, Shoe and Allied Trades Research Association, *Tolerances in Fitting Shoes*

MELVYN GOETZ, Westinghouse Electric Corporation, *An Application of a Dynamic Simulation Compound Model to a Scheduling Problem*

F. D. ROBINSON AND W. E. DUCKWORTH, Glacier Metal Co., Ltd., *An Application of Queuing Theory to the Speed of Estimating*

JOHN HARLING AND M. J. BRAMSON, ORbit (Operational Research) Ltd., *Level of Protection Afforded by Stocks (Inventories) in a Manufacturing Industry*

J. K. W. SLATER, National Institute of Agricultural Engineering, *The Collection of Data on the Use of Machinery on Farms*

Thursday Afternoon, September 5

Session on DEVELOPMENT OF OPERATIONAL RESEARCH (Chairman, ROGER G. CRANE, President TIMS)

A. H. SCHAAFSMA, N. V. Philips' Gloeilampenfabrieken, *Operational Research in Holland*

KENICHI KOYANAGI, Union of Japanese Scientists and Engineers, KAZUO TADA, Ground Self Defense Force AND MACON FRY, Operations Research Office, *Operational Research in Japan*

FRANCESCO BRAMBILLA, Centro per la Ricerca Operativa, *The Present State of Operations Research in Italy*

M. SALZMANN, Centre de Recherche Operationelle, Paris, *Operational Research in France*

TABLE III—Concluded

DAVID B. HERTZ, Arthur Andersen & Co., *Progress of Industrial Operations Research in the United States*
 P. J. ROBINSON, Imperial Oil Ltd., *Operational Research in Canada*
 R. S. GANDER, United Steel Companies, Ltd., *Operational Research in the United Kingdom*
 C. WEST CHURCHMAN, Case Institute of Technology, *Summing Up*

Thursday Evening, September 5

Informal Discussion Groups

Friday, September 6, Morning and Afternoon

Colloquia on OPERATIONS RESEARCH ACTIVITIES

<i>Air transport</i>	London Airport
<i>Road transport</i>	Road Research Laboratory
<i>Fuel and power</i>	Central Electricity Authority Headquarters, London
<i>Computers</i>	Northampton Polytechnic, London
<i>Industries in small units</i>	Headquarters of the Dept. of Scientific and Industrial Research, London
<i>Manufacturing industry</i>	Coventry
<i>Iron and steel industry</i>	Iron and Steel Institute, London

verbal reports on progress in OR were made for other countries than the 7 listed for Thursday afternoon, September 5.

In all these sessions there was spirited discussion, some of it highly technical. As usual, the general philosophical papers given Monday, September 2, stirred the greatest interest and the most elaborate comment. Operational gaming, Lancaster models, and linear programming had a thorough airing Tuesday morning, queuing theory Tuesday afternoon, and traffic problems (on which almost everyone present was an expert!) on Wednesday morning.

The panel meetings were evidently a great success (possibly because they allowed more people to speak) and were later selected for a more prominent role in the next conference. Your reporter attended a split session of Panel C on *Communication of OR Results*, and heard almost all possible views expressed between the extremes of publishing sales brochures and publishing no written reports at all!

It was truly amazing, on Thursday afternoon, to learn of the rapid development of operations research in European industry; delegates from Holland, Italy, France, Sweden, Germany, Spain, Norway, and Denmark all spoke of new OR societies forming, of industrial OR groups already active, and of some research already completed. In fact, this discussion showed that the letter* on OR in NATO countries, published in this JOURNAL last year, was sadly out of date by the time it appeared.

COLLOQUIA

ON FRIDAY, the delegates were transported by bus to seven different industrial centers and agencies to discuss operational research activities now underway in

* THORNTON PAGE, *Opns. Res.* 4, 482 (1956).

Britain. Your reporter, again constrained to visit only one, attended the Road Transport session at the British Road Research Laboratory, where problems of scheduling truck deliveries and bus routes* were discussed, and where we were shown parts of the extensive data collected on accidents, traffic control systems, materials testing, inspection, etc.

Undoubtedly, these sessions served to bring delegates 'down to earth' after the rich diet of the plenary sessions. Unfortunately, no complete account of the seven colloquia can be published, because of lack of space in the *Proceedings*. However, their major purpose was well served in bringing delegates from all over the world into close contact with work in progress.

SOCIAL ACTIVITIES

OUR BRITISH HOSTS did not neglect the social amenities: a conference dinner, addressed by presidents of the three sponsoring Societies, and magnificently chaired by Sir Charles Goodeve; a tour of Oxford for the ladies (and a few delegates who had apparently satiated their urge to speak earlier!); a bus trip to Stratford-on-Avon where we saw Shakespeare's *Cymbaline* (and learned that 'soap opera' is older than radio and TV!); and evening discussion sessions in college rooms, for which generous supplies of brandy, beer, and other beverages provided by Conference funds served rapidly to relax tension between strangers from different sections.

PLANS FOR THE FUTURE

A GROUP OF SENIOR DELEGATES met on Thursday evening, September 5, at a very excellent 'pub' in nearby Woodstock, for dinner and discussion of plans for another conference. Sir Charles Goodeve, who organized the party and chaired the discussion, has since issued the following *aide mémoire*:

The discussion was focussed by a proposal by Thornton Page (U.S.):

- (a) That another International Conference on Operational Research be held about 3 years hence in Europe, preferably not in a large city;
- (b) That this conference be of the same size and nature as the 1957 Conference in Oxford; and
- (c) That steps be taken in the interim to form an international federation of national operational-research societies—specifically that the ORS (UK) Committee chaired by Sir Charles Goodeve serve as an instigating and coordinating body to draft a charter acceptable to the 1957 Counterpart Societies.

The Chairman called for discussion of these three points separately. All delegates expressed their views, some of which are recorded below. No votes were taken, but the sense of the group was clearly established in all but a few cases.

There was unanimous agreement that another international conference on OR should take place. Some argued for an early date on the basis of the rapid development of OR. Most agreed that practical limitations precluded a conference in less than 2 years, and some held that, although the interest is high, there would be little new OR to discuss in less than 3 years. *It was the sense of*

* See H. F. ELLIS, "Written in a Queue," to appear in *Opns. Res.*, February, 1958.

those present that 2½ years would be most suitable: a conference in the spring of 1960.

Although several urged that the conference be held in the U.S. or Canada it was agreed that costs there would be too high for many Europeans to attend; in addition, if it were held in the U.S. or Canada the conference would probably be more American than international. It was noted that national meetings of ORSA or TIMS in the U.S. could be designated for international attendance, and formal invitations issued to overseas guests interested. Moreover, there is reason to hold such a conference where OR needs stimulation rather than where OR is well established. Italy, France, Belgium, Holland, and the Scandinavian countries were mentioned as appropriate locations; M. Kreweras (France) suggested that France be selected, and it was generally agreed that a quiet town well out of Paris would be appropriate. (Aix-en-Provence was suggested and it was noted that Monte Carlo has an advantage in the special meaning of its name for OR.) *It was the sense of those present* that a place in Europe, not in a large city, should be selected later, on the basis of more specific proposals by national societies.

In discussion of the size and nature of the conference it was urged by Prof. Morse (U.S.) that the number of delegates be more limited than in 1957—perhaps as few as 100. On the other hand, others pointed out that the increase in interest and the natural desire of 1957 delegates to attend again would make a ‘congress’ of 1000 or more delegates desirable. Both extremes were rejected in subsequent discussion of the nature and purpose of the conference: delegates should participate and contribute (rather than observe from the sidelines), and it would not do to be so exclusive that major OR activities were not represented. *It was the sense of those present* that attendance should be between 200 and 500 delegates, and that a limitation might be desirable on the size of delegation from any one country.

There was lengthy discussion of parallel plenary sessions and panel discussions. Prof. Mahalanobis (India) spoke in favour of ‘semi-parallel’ sessions, to allow delegates from ‘underdeveloped countries’ to discuss matters of lesser interest to others. This discussion developed a concept of parallel panel discussions, each based on one or more papers given in a meeting of the whole, and devoted to further discussion of a special topic. It was agreed that the panel discussions in the 1957 Conference were too short, and would have been improved if there had been time for a tea break. *It was the sense of those present that:*

- (a) The density of papers given in plenary sessions should be about six per half-day.
- (b) More specific instructions should be given to authors in advance, so that they make better use of their seven minutes’ presentation time in plenary session.
- (c) There should be at least two half days of panel meetings.
- (d) Some of the panel meetings should be devoted to topics covered by papers in plenary session.
- (e) Some of the panel meetings should be reserved for spontaneous discussion of topics developed during the conference.

On the suggestion of a permanent Federation of Operations Research Societies it was emphasized that the first thing was to decide clearly on the objectives. Among those raised in discussion were: (a) coordinating OR effort on international problems; (b) establishing an abstracting and translating service in the field of OR publications; (c) ensuring the continuity and consistent high quality of international OR conferences; and (d) obtaining travel funds and publication funds, possibly from UNESCO, UN, or OEEC.

It was the sense of those present that Sir Charles Goodeve and his Committee should continue to act as a 'caretaker secretariat' until an international federation of national OR societies can be established, if possible within 12 months, and that they should prepare a draft charter for such a federation acceptable to the Counterpart Societies (ORSUK, ORSA, TIMS, SOFRO and the Indian OR Society), dealing directly with the Secretaries or other designated officials of these national societies.

No formal instructions were given to the caretaker secretariat, but it was implied that the proposed federation would be formed of member societies rather than individual members; that its charter provide, among other things, for member societies to elect an international secretariat on a rotating basis, to vote on actions on some proportional basis, to finance such actions by prorated levies or dues, to elect new member societies on evidence of qualification, and to amend the charter by suitable majority vote; and that a suitable procedure for orderly ratification by the Counterpart Societies be devised.

Sir Charles Goodeve and the members of his Committee present accepted the responsibilities outlined above, with the understanding that others might be coopted to assist.

The attendance at this significant meeting to discuss future plans was as follows:

DR. R. L. ACKOFF, U.S.	DR. KENICHI KOYANAGI, Japan
PROF. C. WEST CHURCHMAN, U.S.	DR. G. KREWERAS, France
MR. ROGER R. CRANE, U.S.	DR. JOSEPH H. LEWIS, U.S.
MR. GUNNER DANNERSTEDT, Sweden	PROF. P. C. MAHALANOBIS, India
MR. MAX E. DAVIES, U.K.	PROF. PHILIP M. MORSE, U.S.
MR. R. J. DEAM, Australia	PROF. OLE MYRVOLL, Norway
DR. WALTER L. DEEMER, U.S.	MR. G. NORTON, U.K.
MR. R. T. EDDISON, U.K.	DR. THORNTON PAGE, U.S.
MR. MARTIN L. ERNST, U.S.	MR. B. H. P. RIVETT, U.K.
MR. R. S. GANDER, U.K.	IR. A. H. SCHAAFSSMA, Holland
SIR CHARLES GOODEVE, U.K.	SIR WILLIAM SLATER, U.K.
MR. DAVID BENDEL HERTZ, U.S.	MR. ARNE SJØBERG, Sweden
DR. BERNARD O. KOOPMAN, U.S.	DR. O. M. SOLANDT, Canada

NOTE: The Council has decided to distribute the *Proceedings of the International Conference on Operational Research* free-of-charge to all members of the OPERATIONS RESEARCH SOCIETY OF AMERICA who are active at the time of mailing, which is expected to be in January 1958. This 650-page bound volume will be offered for general sale at the price of \$7.50.