OPTIMA

MATHEMATICAL PROGRAMMING SOCIETY NEWSLETTER

MARCH 1981

NUMBER 3

Mathematical Programming At Oberwolfach

Achim Bachem

Oberwolfach is a small village in the heart of West Germany's scenic Black Forest, a hamlet better known to the community of mathematicians than most of the larger cities of this country. The reason is that the Mathematisches Forschungsinstitut (Mathematical Research Center), an institute of high international reputation, is located here at Oberwolfach-Walke, a part of Oberwolfach. This institute is devoted to one-week research conferences and workshops in all areas of mathematics and is headed by Professor Dr. M. Barner of the University of Freiburg. The high reputation of the Oberwolfach institute stems from the fact that for decades leading experts in all fields of pure and applied mathematics have gathered here for highly productive research conferences. In several branches of mathematics there are well-known Oberwolfach-theorems, -problems, and/or -solutions which were stated or solved at such workshops. Those working in many classical fields of mathematics have developed such a strong "Oberwolfach attitude" that they return here from all parts of the world every year or two.

There are many more branches in mathematics than weeks in a year. Thus it is not easy for new branches of mathematics to become established here and to schedule a week of the year for them.

This year from January 25 to 31, 1981 a conference on Mathematical Programming was held at the Mathematisches Forschungsinstitut. It was directed by H. Kŏnig (Saarbrüken), B. Korte (Bonn) and K. Ritter (Stuttgart) who also organized the first meeting in this series in May, 1979. A Mathematical Programming Study based on material delivered at this first conference has just appeared as number 14. It was during this first Oberwolfach Conference in 1979 that Khachiyan's method was first brought to the attention of the scientific community of the Western world. The theoretical, as well as practical, consequences were discussed here at informal meetings, although Khachiyan's proof was not well understood at the time. The first improvements were done by Gâcz and Lovász and their paper is one of this Mathematical Programming Study.

Mathematisches Forschungsinstitut

For this second conference 68 participants from 11 countries were invited and 45 papers were presented covering the entire sphere of mathematical programming. One of the main themes of the conference was the bridging of the two main areas of mathematical programming, namely the continuous approach including nonlinear optimization, control theory and approximation theory on the one hand and combinatorial (or discrete) optimization on the other. The ellipsoid algorithm by L.G. Khachiyan and N. Shor served as an excellent vehicle for bringing both groups closer together. But as L. Lovász indicated in his talk, the many analogies between submodular functions and convex analysis seem to be further proof that discrete and continuous programmers should draw closer together.

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PRIZES FOR MATHEMATICAL PROGRAMMING

Committees which will select the awardees for both the Fulkerson Prize in Discrete Mathematics and the Dantzig Prize in Mathematical Programming are now in place, and will entertain nominations for awardees. Such nominations should be made to the Chairman of the respective Committee or, if more convenient, to any of its members. Each prize will be awarded to one or more people at the Eleventh Symposium on Mathematical Programming to be held in Bonn, Federal Republic of Germany, August 23-28, 1982.

The Chairman of the Fulkerson Prize Committee is Dr. Ronald L. Graham, (2C-380, Bell Laboratories, 600 Mountain Avenue, Murray Hill, NJ 07974, U.S.A.; telephone 201-582-4696). The other members are Richard M. Karp (Computer Science Division - EECS, University of California, Berkeley, U.S.A.) and Victor L Klee, (Mathematisches Institut, Universitaet Erlangen - Nuernberg, F.R.G. until July 1981; then Dept. Mathematics, University of Washing-

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Prizes

ton, Seattle, U.S.A.).

According to the Fulkerson Prize specifications: "Papers to be eligible should have been published in a recognized journal during the six calendar years preceding the year of the Congress. . . . The prizes will be given for single papers, not series of papers or books, and in the event of joint authorship the prize will be divided.

"The term 'discrete mathematics' is intended to include graph theory, networks, mathematical programming, applied combinatorics, and related subjects. While research work in these areas is usually not far removed from practical applications, the judging of papers will be based on their mathematical quality and significance."

The Chairman of the Dantzig Prize Committee is Professor Roger J.-B. Wets (Department of Mathematics, University of Kentucky, Lexington, Kentucky 40506, U.S.A. telephone 606-258-8157). The other members are E.M.L. Beale (Scientific Control Systems, Ltd., Milton Keynes, England), John Dennis (Dept. of Math. Sciences, Rice University, Houston, U.S.A.), and P. Wolfe (IBM Research Center, Yorktown Heights, U.S.A.).

The Dantzig Prize specifications state: "The prize is intended to reward outstanding contributions to the field of mathematical programming. The contribution(s) for which the award is made must be publicly available and may belong to any aspect of mathematical programming in its broadest sense. The contributions eligible for consideration are not restricted with respect to the age or number of their authors although preference should be given to the singly-authored work of 'younger' people."

The Fulkerson Prize is jointly administered by the Mathematical Programming Society and the American Mathematical Society, and was first awarded at the Tenth International Symposium on Mathematical Programming at Montreal in August, 1979. The Dantzig Prize is jointly administered by the Mathematical Programming Society and the Society for Industrial and Applied Mathematics; it will be first awarded in 1982. —P. Wolfe

news from COAL

During the recent months, the Committee on Algorithms has achieved a number of milestones. As reported previously in this column, COAL had organized a conference on "Testing and Validating Mathematical Programming Software." That conference, held January 5-6, 1981 in Boulder Colorado, was viewed by those who attended as a success. It brought together MP Software users, developers, and testers from the Operations Research profession, as well as other related fields, who have an interest in developing a sound methodology for comparing and evaluating such software. The sessions were interesting, informative, and well-attended. The panel discussion on the last day was especially provocative in that it focused on future directions for COAL to take in the area of MP software performance evaluation. A proceedings will be published, and copies can be obtained by writing to John M. Mulvey, School of Engineering and Applied Science, Princeton University, Princeton, N.J. 08540.

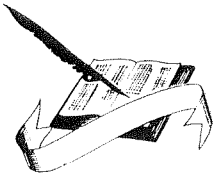
Also at that conference, a COAL business meeting was held in which a subcommittee was appointed to investigate the possibility of creating a Central Testing Laboratory which could serve as a focal point for disseminating information about codes, test problems, and testing methodologies. The subcommittee will be asked to look at questions of funding, location, and feasibility (would such an undertaking help or merely create an unnecessary bureaucracy or super-structure?).

Also during the business meeting, a nominating subcommittee was appointed to seek candidates to fill the posts of COAL Chairman and COAL Newsletter Editor which will become vacant at the Bonn meeting of MPS. Another topic discussed was that of holding another such conference on testing methodologies. It was agreed that another one should be held in a place other than North America in 1983. Several sites have been proposed and will be evaluated. Plans were also made for COAL Sessions to be included in the Bonn meeting.

Other recent COAL activities include the publication of COAL Newsletter No. 5, which is being mailed as I write this, and plans for COAL sessions at forth coming ORSA/TIMS conferences. Karla Hoffman will be chairing a session at the Toronto meeting, on "Testing Curve Fitting Software."

I'll close this column with the same request with which it was closed last time. If you are aware of research in the development or testing of optimization software, or of any issue that might be of interest to COAL, please write to Karla Hoffman, editor of the COAL Newsletter, so that we may highlight it in the next issue. Her address is: Center for Applied Mathematics, National Bureau of Standards, Washington, D.C. 20234.

—Richard H.F. Jackson, Chairman
The Committee on Algorithms



CORNELL ANNOUNCES FULKERSON LECTURE SERIES

The School of Operations Research and Industrial Engineering at Cornell University is pleased to announce the establishment of an annual lecture series in honor of the late **D.R. Fulkerson.** A leading figure in network flow theory and combinatorics, D.R. Fulkerson was Maxwell Upson Professor of Engineering at Cornell from 1971 until his death in 1976. The Fulkerson Lectures will feature distinguished speakers in all areas of operations research. The first Fulkerson Lecturer will be **George B. Dantzig,** Criley Professor of Transportation in Operations Research and Computer Science at Stanford University. Professor Dantzig will speak on

Origins of Linear Programming
Energy/Economic Models and Large-Scale Methods
Expected Number of Steps of the Simplex Method

on May 7 - 8, 1981.

—R.G. Bland

Oberwolfach

The papers presented dealt with the constructive equivalence of separation and optimization, relations between submodularity and convexity, general duality theory, stochastic linear programming, discrete programming with nonlinear objective functions and designing polynomial algorithms using Newton and penalty methods. Moreover, new results in graph theory, the theory of polyhedra, complexity theory and theory of algorithms for scheduling and sequencing problems were presented. An area of central effort included modifications of Newton's method for special C_1 -functions, line search methods, optimality conditions for nonsmooth problems and for quadratic optimization problems. According to the Oberwolfach custom there was no rigid program, but the schedule for each day (9 lectures per day) were established informally the night before.

In addition, people assembled for evening sessions on a variety of different topics. For instance. L. Lovász and A. Schrijver gave a lecture on the recent proof of the van der Waerden conjecture. The proof was done by the Russian mathematician Yegorichev in 1980. The famous van der Waerden conjecture (now a theorem) concerns the following problem. The permanent, per (A), of an nxn matrix $A = (a_{ij})$ is defined by per $(A) = \Sigma_\pi a_{1\pi(1)} .. a_{n\pi(n)}$ where π ranges over all permutations of $[1,...,n]$. Van der Waerden conjectured in 1926 that if A is doubly stochastic (i.e. $A \geqslant 0$ and every row and column sum of A is 1), then per $(A) \geqslant n! / n^n$ (where the matrix with all entries equal 1/n attains equality). Yegorichev's proof rests upon an inequality due to A.D. Aleksandrov (1938) and a result of D. London (1971).

A. Wierzbicki gave an informal evening discussion "on the Kornai Cycle" which was also used to discuss the actual economic situation in Poland.

M. Balinski brough attention to an address of John von Neumann ("The Mathematician") and headlined an evening discussion: "Is Mathematical Programming Baroque?" (In his address John von Neumann stated that "at a great distance from its empirical source or after much 'abstract' inbreeding, a mathematical subject is in danger of degeneration" and warns the mathematician: "at the inception the style is usually classical; when it shows signs of becoming baroque, then the danger signal is up"). The community agreed that mathematical programming has just passed its stone age but is still far from baroque!

Wednesday afternoon was reserved for hikes with different degrees of difficulty. Most of the group went up the snow covered hills and had a nice walk to the hamlet of St. Roman where they reassembled at a cafe for Black Forest cake and/or Black Forest Kirschwasser. The meeting was closed with a piano concert by Professor Spedicato on Friday night.

Besides this series of conferences on mathematical programming, which hopefully will be continued in 1983, there are ocassionally other meetings at Oberwolfach on related topics of mathematical programming. In 1980, for instance, there were weeks for mathematical game theory (J. Rosenmüler), optimization and optimal control (A Auslender, W. Oettli, J. Stoer) and for mathematics of operations research (H. König, K. Neumann). Thus mathematical programming has become established at Oberwolfach.

There are (at least) two characteristic features of this institute which give it an individual and personal atmosphere. First there is the custom that every participant is seated for lunch and dinner at some round table by a random choice (due to a random distribution of napkins by the kitchen personnel). Thus everybody has a chance to get acquainted and after a few days most participants know each other. Naturally, mathematicians do not want a chance to play a role but want to optimize this seating procedure! Thus at a graph theory meeting in 1967 G. Ringel formulated the now well-known "Oberwolfach problem" as follows: "Is it possible to seat an odd number 2n+1 of people at s round tables T_1, T_2, ...,T_s (where T_i can accommodate exactly $k_i \geqslant 3$ people and $\Sigma k_i = 2n+1$) for m different meals so that each person has every other for a neighbour exactly once?" The problem is equivalent to decomposing the complete graph K_{2n+1} into isomorphic edge-disjoint 2-factors and includes both the classical problem of decomposing K_{2n+1} into Hamiltonian circuits and also the so-called "Kirkman schoolgirl problem." Several authors gave solutions for special cases, but the problem remains open in general. Thus the distribution of napkins at Oberwolfach is still done by the kitchen personnel.

The Institute is perfectly equipped for its job. Besides excellent lecture facilities, good accomodations and a good library there are pleasant game rooms, music rooms,

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OPTIMIZATION DAYS 1981

May 13-14, 1981
University of Quebéc, Montréal

Following the tradition of eight previous meetings, the conference is being organized by six academic institutions in Montreal. The conference is sponsored by the MPS, CAMS, IEEE Control Systems Society and SIAM. It will be followed by the second annual meeting of the Canadian Applied Mathematics Society, May 14-15.

Abstract deadline was January 31, 1981. Registration fee is $30 before April 15, $40 after April 15 and $3 for students. Direct inquiries to the Chairman:

Professor Efim Galperin
Department of Mathematics
Université du Quebéc a Montréal
P.O. Box 8888, Station"A"
Montréal, Quebéc, Canada
Telephone (514) 282-3221

New *Letters* Journal Announced

North-Holland Publishers has announced a new journal, **OPERATIONS RESEARCH LETTERS**, which will feature short articles and rapid publication. Articles will be limited to four double column printed pages and will be published within three months of submission. The Editor is **George L. Nemhauser** (Cornell). The aim of the journal, the first of its type in the OR field, is to provide researchers and practitioners timely access to new developments. Papers may be published which are part of a larger study that will later be a full-length paper in another journal.

Empirical and computational results will be published, as well as (substantiated) outlines of new theoretical results. For further information, including instructions to authors, contact:

North- Holland Publishing Company
P.O. Box 211, Amsterdam, The Netherlands
52 Vanderbilt Ave, New York, NY 10017

OPTIMA

Newsletter of the Mathematical Programming Society

Donald W. Hearn, Editor
Achim Bachem, Associate Editor

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Oberwolfach

etc. Thus in the evening participants group together to enjoy the friendly atmosphere of the house. This is the second unique feature of "Oberwolfach".

The Mathematisches Forschungsinstitute has an interesting history which is strongly interwined with the life of its founder, Professor Dr. W. Süss. His wife Irmgard Süss has written a nice booklet about the beginnings of the Mathematical Research Institute at Oberwolfach which she presented at the dedication of the new building of the Institute in 1967. Let us mention a few highlights.

In the beginning the Institute was known simply by the name of the house "Lorenzenhof". The name originally belonged to a farm in the valley below, where there is now a sawmill. When the farm went bankrupt in 1905 ownership changed several times until in 1942 the Baden Ministry of Education bought the site and established a fund ("Pfälzischer Katholischer Schulfond") for its maintenance. The site was considered as a possible appendage of Freiburg University where at that time Professor Süss held the position of University Rector. But finally other forces prevailed and Lorenzenhof was added to the teacher training college of Rippoldsau.

In 1942/43, the National Research Council (NRC) (Reichforschungsrat) was founded and Süss managed to have basic research declared to be of military importance. When the NRC created a circle for mathematical research in the Department of Physics (Fachsparte Physik), Süss was asked to accept the position of leadership in this field.

Already for some time Süss had thought it desirable to create a central international institute for mathematics. The fact that he just received an offer of a Professorship from Göttingen while serving as President of the German Mathematical Society (DMV) and Rector of the University of Freiburg gave him the leverage to set his project in motion. In 1944 the Baden Ministry of Education offered him the Lorenzenhof as an appropriate place for the institute and in September 1944, Kneser, Sperner and Süss met at Oberwolfach for a kind of founders session. In the beginning there was much coming and going between Freiburg and Oberwolfch. During university summer vacation many mathematicians from Freiburg stayed at Lorenzenhof and held colloquia there.

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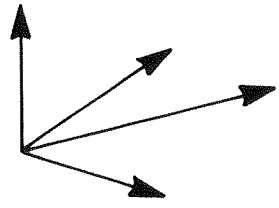
10th IFIP CONFERENCE ON SYSTEM MODELING AND OPTIMIZATION

August 31 to September 4, 1981
New York City

The aim of this conference is to discuss recent advances in the mathematical representation of engineering, socio-technical and socio-economic systems as well as in the optimization of their performance. Topics include mathematical programming, combinational optimization, optimal control and computational complexity. The conference will be composed of invited as well as contributed papers in 15 minute presentations. A Conference Proceedings will be published. The conference language is English.

Abstract deadline was February 15, 1981 with notice of acceptance by April 30, 1981. **J. Stoer** is chairman of the International Program Committee and **R.F. Drenick** and **F. Kozin** are co-chairmen of the Conference Organizing Committee. For further information, contact 10th IFIP Conference, Polytechnic Institute of New York, 333 Jay Street, Brooklyn, N.Y. 11201, U.S.A. Telephone (212) 643-2305.



Advanced Study Institute

THEORETICAL APPROACHES TO SCHEDULING PROBLEMS

July 16 - 19, 1981
Durham, England

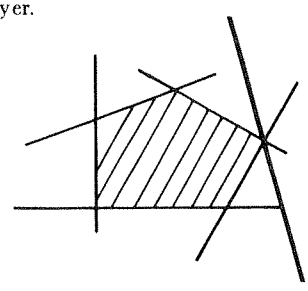
The institute is sponsored by the NATO Advanced Study Institutes Programme and Systems Science Panel, by The Institute of Mathematics and Its Applications, and by the Mathematisch Centrum, Amsterdam. Lecturers include **M.A.H. Dempster, E.Gelenbe, E.L. Lawler, J.K. Lenstra, A.H.G. Rinnooy Kan** (Program Committee), **E.G. Coffman, Jr., M.L. Fisher, J.C. Gittins, S.M. Ross, L.E. Schrage** and **G. Weiss.**

Further information can be obtained from J.K. Lenstra and A.H.G. Rinnooy Kan, c/o Econometric Institute, Erasmus University, P.O. Box 1738, 3000 DR Rotterdam, The Netherlands.

FACULTY POSITIONS AVAILABLE

School of Industrial and Systems Engineering
Georgia Institute of Technology

The School of Industrial and Systems Engineering at Georgia Tech invites applications for faculty positions. Individuals with interests in areas such as mathematical programming, operations research, human factors, uses of minicomputers in manufacturing processes, warehousing and location are encouraged to apply. Several openings are available and appointments may be made at a rank commensurate with the individual's record. Georgia Tech is a major educational and research institution and faculty members are expected to contribute in both research and undergraduate and graduate educational programs. Applicants should possess the Ph.D. in Industrial Engineering, Operations Research, Statistics or related fields. Interested individuals should submit their resume to: Director, School of Industrial and Systems Engineering, Georgia Institute of Technology, Atlanta, Georgia 30332. Georgia Tech is an Equal Opportunity/Affirmative Action Employer.



FACULTY POSITIONS AVAILABLE

University of Florida
Department of Industrial and Systems Engineering

The University of Florida, Department of Industrial and Systems Engineering, invites applications for two tenure track positions. Applicants must have an earned doctorate in Industrial Engineering, Operations Research, or a related discipline, and a strong commitment to teaching and research. Candidates should have a strong background in the application of mathematics and statistics to problems in industrial engineering, operations research, and/or statistical decision theory. Possible areas of emphasis include, but are not limited to: theory and design of production and distribution systems; applications of systems theory and decision theory in engineering; and resource allocation modeling. These positions are in association with the University of Florida Center for Econometrics and the Decision Sciences. A strong minor interest in economics is desirable.

Rank and salary of these openings will be commensurate with the applicant's experience and background. Applicants for a senior level position must have demonstrated the ability to carry on a strong independent research program.

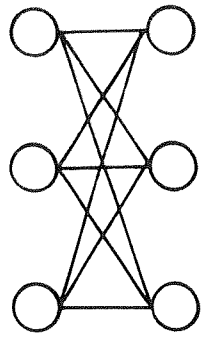
Send detailed resume, with names and addresses of three or more references to: Chairman, Faculty Search Committee, Department of Industrial and Systems Engineering, University of Florida, Gainesville, FL 32611. Applications for a January, 1982 appointment, must be received by May 1, 1981.

The University of Florida is an Affirmative Action/Equal Opportunity Employer.

Oberwolfach

After the war, Mr. Wohleb, a friend of Süss, managed to have the government of South-Baden assume responsibility for rental of the house instead of the no longer existent German government. So the life of the institute continued and as time passed mathematicians came to Oberwolfach from all over the world for meetings and study vacations. The international reputation started to bloom late in the summer of 1946 when Charles Ehresmann from Strasburg, Heinz Hopf from Zürich, Henri Cartan from Paris, and Hadwiger and Stiefel from Bern and Zürich visited Oberwolfach. From then on the Guests Book vividly shows the gradual increase in the number of visitors of all nationalities. In 1966 the "Volkswagenwert-Stiftung" built the new building we have today. Credit for the international reputation which Oberwalfach enjoys today, also goes to Professor Barner, the current Director who has continued the ideas of Süss and the traditions of the Institute.

The participants of the Mathematical Programming meeting were: J.M. Abadie (Paris), A. Auslender (Aubiere), A. Bachem (Erlangen), E. Balas (Köln), M.L. Balinski (Paris), M.J. Best (Waterloo), B. Brosowski (Frankfurt), R.E. Burkard (Köln), A.R. Conn (Waterloo), W.H. Cunningham (Ontario), B. Dejon (Erlangen), L.C.W. Dixon (Hertfordshire), J. Fisher (Stuttgart), J. Fonlupt (Grenoble), D. Goldfarb (New York), A. Goldstein (Seattle), B. Gollan (Würzburg), H. Griewank (Cambridge), M.D. Grigoriadis (New Brunswick), M. Grötschel (Bonn), R. Henn (Karlsruhe), M.R. Hestenes (Los Angeles), P. Huard (Clamart), E.L. Johnson (Yorktown Heights and Bonn), C. King (Stuttgart), W. Knödel (Stuttgart), H. König (Saarbrücken), B. Korte (Bonn), W. Krabs (Darmstadt), D. Kraft (Oberpfaffenhofen), C. Lemarechal (Le Chesnay), F. Lempio (Bayreuth), J.K. Lenstra (Amsterdam), T. M. Liebling (Lausanne), L. Lovász (Szeged), O.L. Mangasarian (Madison), L. McLinden (Urbana), K. Mehlhorn (Saarbrücken), D. Naddef (Grenoble), G. Nemhauser (Ithaca), K. Neumann (Karlsruhe), W. Oettli (Mannheim), M. Padberg (Le Chesnay), D. Pallaschke (St. Augustin), M. Plummer (Nashville and Bonn), M.J.D. Powell (Cambridge), A Prékopa (Budapest), W.R. Pulleyblank (Calgary and Bonn), A.H.G. Rinnooy Kan (Rotterdam), K. Ritter (Stuttgart), S. Rolewicz (Warszawa), S. Schaible (Alberta), R.B. Schnabel (Boulder), R. Schrade (Bonn), A. Schrijver (Amsterdam), D.F. Shanno (Arizona), E. Spedicato (Bergamo), J. Stoer (Würzburg), M.J. Todd (Cambridge), P. Tonit (Namur), L.E. Trotter (Ithaca), W. Vogel (Bonn), H. Werner (Bonn), A Wierzbicki (Laxenburg), L.A. Wolsey (Louvain-LaNeuve), P. Young (Laxenburg), U. Zimmermann (Köln), J. Zowe (Bayreuth). ●



SECOND MATHEMATICAL PROGRAMMING SYPMOSIUM IN JAPAN

October 19-20, 1981
Kyodai – Kaikan, Kyoto, Japan

This symposium will consist of sessions in **Linear and Nonlinear Programming** chaired by Kaoru Tone, **Multiobjective Optimization** chaired by Nobuo Sannomiya, and **Applications** chaired by Tatuso Aonuma. Participation from abroad will be welcome. Contact a session chairman or the Chairman of the Executive Committee:

Prof. Toshihide Ibaraki
Department of Applied Mathematics and Physics
Faculty of Engineering
Kyoto University, Sakyo-Ku, Kyoto, Japan 606

–M. Iri

SIAM CONFERENCE ON THE APPLICATIONS OF DISCRETE MATHEMATICS

June 10 - 20, 1981

Rensselaer Polytechnic Institute
Troy, New York

Objectives of the conference are to critically examine recent applications of discrete mathematics, to review recent developments in discrete mathematics that have potential applications, and to identify problems that have to be solved to enhance the application of discrete techniques. The conference immediately follows the three-day SIAM National Meeting at the same site.

Invited speakers include **Vasek Chvatal**, (McGill), **John Edmunds**, (Waterloo), **Peter L. Hammer**, (Waterloo), **Richard A. Karp**, (Berkeley) and **George L. Nemhauser**, (Cornell). Keynote speaker is **Alan Goldman**, Department of Mathematical Sciences, Johns Hopkins University.

Authors of contributed presentations are invited to submit their full paper manuscripts for consideration by the Conference Committee, for inclusion in the proceedings of the conference, which will be published as a special issue of *SIAM Journal on Algebraic and Discrete Methods.*(The abstract deadline was March 2.) Full papers must be submitted prior to, or at the conference, and these will be subject to SIAM's standard refereeing process.

Conference Organizing Committee: Ronald L Graham, Bell Laboratories; Daniel J. Kleitman, Massachusetts Institute of Technology; Fred S. Roberts (Chairman), Rutgers University.

Advance registration material will be available in May 1981. For additional information, contact Mr. H.B. Hair, SIAM, 117 South 17th Street, Philadelphia, PA 19103. Telephone (215) 564-2929.

Announcing

XIth International Symposium on Mathematical Programming
August 23-27, 1982

Will be organized by the Institut für Ökonometrie und Operations Research and the Sonderforschungsbereich 21 (DFG) of the Reininische Frederich-Wilhelms-Universitat Bonn.

All inquiries should be addressed to: Math Prog. Secretariat, Institut für Operations Research, Nassestrasse 2, D-5300 Bonn 1, W. Germany.

Achim Bachem
Martin Grötschel
Co-Chairman
Organizing Chairman

Bernard Korte
Chairman
Program Committee

Technical Reports & Working Papers

UNIVERSITY OF MARYLAND
Department of Management Science & Statistics
College of Business and Management
College Park, MD 20742

B. Stewart and B. Golden, *"Computing Effective Subscriber Bus Routes,"* WP80-002.

B. Golden and R. Wong, *"Capacitated Arc Routing Problems,"* WP80-003.

A. Assad, *"Solving Linear Multicommodity Flow Problems,"* WP80-004.

W. Widhelm, *"Extensions and Unification of Linear Goal Programming Models,"* WP80-005.

L. Brodin and B. Golden, *"Classification in Vehicle Routing and Scheduling,"* WP80-006.

B. Golden and L. Bodin, *"Network Analysis,"* WP80-007.

S. Gass, *"Linear Programming: A Review for the Encyclopedia of Statistical Sciences,"* WP80-008.

A. Assad, *"A Class of Train Scheduling Problems,"* WP80-009.

L. Levy, B. Golden and A. Assad, *"The Fleet Size and Mix Vehicle Routing Problem,"* WP80-011.

A. Assad, M. Ball, L. Bodin and B. Golden, *"Combined Distribution Routing and Scheduling In A Large Commercial Firm,"* WP80-013.

T. Sexton and L. Bodin, *"The Single Vehicle Many to Many Routing and Scheduling Problem with Desired Delivery Times,"* WP80-014.

E. Baker, L. Bodin and M. Fisher, *"The Development and Implementation of A Heuristic Set Covering Based System For Air Crew Scheduling,"* WP80-015.

B. Golden, L. Levy and R. Dahl, *"Two Generalizations of the Traveling Salesman Problem,"* WP80-016.

UNIVERSITY OF PITTSBURGH
Graduate School of Business
Pittsburgh, PA 15260

Jerrold H. May, *"Linearly Constrained Pseudo-Newton Method,"* WP-360.

George Kimeldorf, Jerrold H. May and Allan R. Sampson, *"Concordant and Discordant Monotone Correlations and their Evaluation by Nonlinear Optimization,"* WP-412.

UNIVERSITY OF SOUTHAMPTON
Faculty of Mathematical Studies
Highfield, Southhampton, SO9 5NH
England

W. Forster, *"On a New Convergence Criterion for Pivoting Algorithms Derived from the Hopf Conjecture and Utilizing a Novel Theorem by E. Sperner,"* Preprint No. 53.

STANFORD UNIVERSITY
Department of Operations Research
Stanford, CA 94305

Richard W. Cottle and Richard E. Stone *"On the Uniqueness of Solutions to Linear Complementarity Problems,"* Report 80-10.

Richard W. Cottle, *"Minimal Triangulation of the 4-Cube,"* Report 80-23.

James C. Bean, *"An Additive Algorithm for the Multiple Choice Integer Program,"* Report 80-26.

GEORGIA INSTITUTE OF TECHNOLOGY
Atlanta, GA. 3-332

C.E. Blair and R.G. Jeroslow, *"The Value Function of an Integer Program,"* W.P. series M.S. 80-5, College of Management.

G.E. Monahan, *"Optimal Stopping in a Partially Observable, Binary-valued Markov Chain with Costly Perfect Information,"* M.S. 80-9, College of Management.

G.E. Monahan, *"Optimal New Product Advertising,"* M.S. 80-8, College of Management.

G.E. Monahan, *"A Survey of Partially Observable Markov Decision Processes: Theory, Models, and Algorithms,"* M.S. 80-7, College of Management.

K.T. Phelps with C.J. Colbourn, M.J. Colbourn and V. Rodl, *"Coloring Steiner Quadruple Systems,"* School of Mathematics.

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G. van der Laan and A.J.J. Talman, *"Labelling Rules and Orientation: On Sperner's Lemma and Brouwer Degree,"* DP8023.

Journals & Studies

Richard W. Cottle has announced the following contents of **Mathematical Programming**, Volume 20, Numbers 1 and 2:

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S. P. Han, *"Variable Metric Methods for Minimizing a Class of Nondifferentiable Functions."*

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MPS CALENDAR

1981

March 16-20: "Optimization: Theory & Algorithms", Confolant (Miremont, Puy-de-Dôme) France, co-organized by J.-B. Hiriart-Urruty, W. Oettli, and J. Stoer. For information and registration contact one of the organizers. Data for Professor Hirriart-Urruty are: Département de Mathématiques Appliquées, Université de Clermont-Ferrand II, B.P. 45, 63170 Aubière; Telephone (73) 26-41-10.

April 6-8: "International Congress on Mathematical Programming", Rio de Janeiro, Brazil. Contact: Professor Milton Kelmanson, Caixa Postal 1507 - CEP 20100, Rio de Janeiro, R.J., Brazil. Sponsored by Sociedade Brasiliera de Pesquisa Operacional and the MPS.

May 13-14: "Optimization Days", Université du Quebéc à Montréal. Contact: Professor Efim Galperin, Département de mathématiques, Université du Québec à Montréal, C.P. 8888 Succ. "A", Montréal, Québec, Canada H3C 3P8; telephone 514-282-3221. Sponsored by the Canadian Applied Mathematics Society, the IEEE Control Systems Society, SIAM, and the MPS.

May 21-22: "Third Symposium on Mathematical Programming with Data Perturbations", The George Washington University, Washington, D.C., U.S.A. Deadline for submission of abstracts, 1 March 1981. Contact: Professor Anthony V. Fiacco, Department of Operations Research, School of Engineering and Applied Science, The George Washington University, Washington, D.C. 20052, U.S.A.; telephone 202-676-7511.

June 10-12: "Conference on the Applications of Discrete Mathematics", Rensselaer Polytechnic Institute, Troy, New York, U.S.A. (a SIAM Special Conference, immediately following the SIAM National Meeting in Troy June 8-10). Deadline for abstracts of contributions, 2 March 1981. Contact: Mr. H.B. Hair, SIAM, 117 South 17th Street, Philadelphia, PA 19103, U.S.A.; telephone 215-564-2929.

July 13-24: "NATO Advanced Research Institute on Nonlinear Optimization", Cambridge, England. Contact: Professor M.J.D. Powell, Department of Applied Mathematics and Theoretical Physics, University of Cambridge, Silver Street, Cambridge CB3 9EW, England. Sponsored by the MPS.

July 20-24: "Eighth British Combinatorial Conference", Swansea, England. Contact: A.D. Keedwell, Department of Mathematics, University of Surrey, Guildford, Surrey GU2 5XH, U.K.

July: "Stochastic Programming", Budapest, Hungary. Contact: Bolyai János Mathematical Society, Budapest VI, Anker köv 1-3, I. Em. III, Hungary.

August 24-28: "CO81: Conference on Combinatorial Optimization", Stirling, Scotland. Contact: Professor L. Wilson (CO81), Department of Computing, Stirling University, Scotland, U.K.

August 31-September 4: "Tenth IFIP Conference on System Modeling and Optimization", New York City, U.S.A. Deadline for submission of abstracts, 15 February. Contact: 10th IFIP Conference, Polytechnic Institute of New York, 333 Jay Street, Brooklyn, NY 11201, U.S.A.; telephone 212-643-2305.

October 19-20: Second Mathematical Programming Symposium Japan, Kyoto, Japan. Contact: Professor Toshihide Ibaraki, Department of Applied Mathematics and Physics, Faculty of Engineering, Kyoto University, Sakyo-ku, Kyoto, Japan 606.

October 19-22: "International Symposium on Optimum Structural Design" (Eleventh Naval Structural Mechanics Symposium), Tucson, Arizona, U.S.A. Contact: Dr. Erdal Atrek, Dept. of Civil Engineering, Building 72, University of Arizona, Tucson, AZ 85721, U.S.A.

August 23-28: Eleventh International Symposium on Mathematical Programming in Bonn, Federal Republic of Germany. Contact: Institut für Ökonometrie und Operations Research Universität Bonn, Nassestraße 2, 5300 Bonn 1, Federal Republic of Germany; Telex 886657 unibo b, Telephone (02221) 739285. Official triennial meeting of the MPS. (Note: The International Congress of Mathematicians will be held August 11-19 in Warsaw, Poland.)

THIRD SYMPOSIUM ON MATHEMATICAL PROGRAMMING WITH DATA PERTURBATIONS

May 21-22, 1981
The George Washington University
Washington, D.C., U.S.A.

Symposium Organizer:
Professor Anthony V. Fiacco

The Institute of Management Science and Engineering and the Department of Operations Research, School of Engineering and Applied Science, The George Washington University, will sponsor the Third Symposium on Mathematical Programming with Data Perturbations at the University's Marvin Conference Center on Thursday and Friday, 21 and 22 May 1981. This symposium is designed to bring together practitioners who use mathematical programming optimization models and who have to deal with questions of sensitivity analysis, with academic and other research workers who are developing tools applicable to these problems.

The abstract deadline was 1 March, 1981. Direct all inquires to:
Professor Anthony V. Fiacco
Department of Operations Research
School of Engineering and Applied Science
The George Washington University
Washington, D.C. 20052
(202) 676-7511

CREST Summer School
June 15-26, 1981
Bergamo, Italy

A CREST summer school on "Design of Numerical Algorithms for Parallel Processing" will be held at the University of Bergamo, Italy, June 15-26, 1981. Inquiries to:

Enrico Cavalli
Instituto Di Matematica
Istituto Universitario Di Bergamo
Via Salvecchio, 19
24100 Bergamo, Italy

SYMPOSIUM ON NETWORK FLOWS

August 9 - 14, 1981
The Johns Hopkins University
Baltimore, Maryland

This symposium is sponsored by the Johns Hopkins University Department of Mathematical Sciences and the Johns Hopkins Press as the fifth Distinguished Lecture Series in the Mathematical Sciences. Principal speaker Darwin Klingman will deliver a series of instructional lectures on optimization algorithms and data structures for network flow problems. Other invited and contributed papers to be arranged; some travel/subsistence support possible. For information contact Alan J. Goldman, Mathematical Sciences Department, The Johns Hopkins University, Baltimore, MD 21218.

–A.J. Goldman

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