

## Bonn Symposium Highlights

A highly successful XI MPS Symposium at the University of Bonn in August attracted over 700 participants from 50 countries. **Bernhard Korte**, program chairman, along with co-chairmen **Achim Bachem** and **Martin Grötschel** and the program committee, conducted a smoothly run meeting which included the presentation of over 600 papers on a full range of mathematical programming topics.

Opening ceremonies on Monday morning featured the awarding of the Dantzig and Fulkerson Prizes. **M.J.D. Powell** and **R.T. Rockafellar** shared the first George B. Dantzig Prize in mathematical programming, and three Fulkerson prizes were awarded for recent research on the ellipsoid method and proofs of the van der Waerden conjecture. Soviet mathematicians **D.B. Iudin**, **A.S. Nemiorovskii**, and **L.G. Khachiyan** shared one Fulkerson prize; the team of **M. Grötschel**, **L. Lovász** and **A. Schrijver** received another; and the third went to **G.P. Egorychev** and **D.I. Falikman** for their independent results on the van der Waerden problem. (See accompanying articles by **Ronald Graham** and **Roger Wets**.)



**George B. Dantzig**

The opening ceremonies included a lecture by **George Dantzig**, "Reminiscences on the Origins of Linear Programming," and the Fulkerson prize lecture by **Lazlo Lovász**.

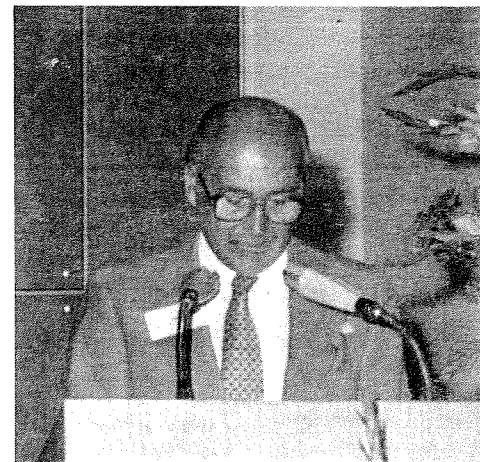
The varied social program was highlighted by a reception on Monday, a classical concert on Tuesday evening, and a six-hour boat trip and buffet on the Rhine Wednesday evening.



**Program Chairman Bernhard Korte**

The business meeting of the Society on Thursday included a special service award for **Michel L. Balinski**, founding editor of the Mathematical Programming journal and the Mathematical Programming Studies series.

The site of the 1985 Symposium is undecided as yet. The MPS Symposium Advisory Committee is actively seeking interested parties. **Jean-Louis Goffin** (McGill) is the committee chairman.



**MPS Chairman Jean Abadie**

### New MPS Officers

The Bonn meeting saw various changes in the officers of the Society. **Phil Wolfe** was replaced as Vice-Chairman by **Alex Orden**, who will become Chairman next August, at which time **Jean Abadie** will become Vice-Chairman. New Council-Members-At-Large took office: **Don Goldfarb**, **Jean-Louis Goffin**, **Jan Lenstra**, and **Martin Beale**. **Al Williams**, the newly elected Treasurer, who normally would not have assumed his duties until next August, agreed to take office immediately, at the Council's request, because of the resignation of **Manfred Padberg**.

**Mike Held** resigned as Chairman of the Publications Committee and will be replaced by **Jan Lenstra**. Mike will be replacing **Tom Magnanti** as a Co-Editor of the JOURNAL. Tom Magnanti will be resigning in order to become Editor-In-Chief of the ORSA Journal.

**Karla Hoffman** replaced **Rick Jackson** as Chairman of COAL, and **Jan Telgen** will be replacing Karla as Editor of the COAL Newsletter.

—Michael Held  
—Executive Committee

# The Fulkerson Prizes...

The Delbert Ray Fulkerson Prize in Discrete Mathematics was established in 1977 by friends of the late Ray Fulkerson. It is sponsored jointly by the Mathematical Programming Society and the American Mathematical Society and is awarded for outstanding papers in the area of discrete mathematics.

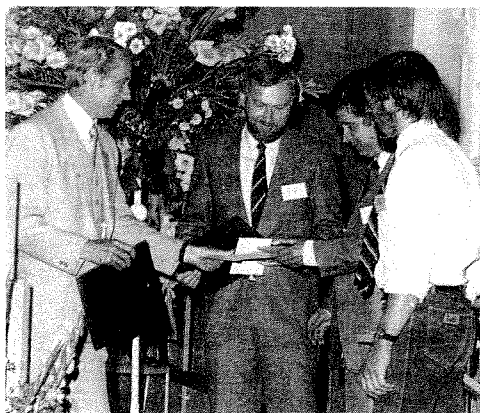
The guidelines for the Fulkerson Prize require that in order to be eligible, a paper must have been published during the six calendar years preceding the International Mathematical Programming Symposium at which it is awarded. They also specify that up to three prizes may be awarded in each three year period between consecutive Symposia, and, in the case of joint authorship, the prize will be shared.

The Fulkerson Prize Committee, consisting of Richard Karp, Victor Klee and Ronald Graham (Chairman) elected to award three Fulkerson Prizes at the 11th Mathematical Programming Society Symposium held in Bonn during August 23-27, 1982. The recipients and the respective papers cited for the awards are listed below in chronological order of publication.

One prize is awarded jointly to D. B. Iudin and A. S. Nemirovskii for their paper, *Informational Complexity and Effective Methods of Solution for Convex Extremal Problems*, *Ekonomika i Mat. Metody*, 12 (1976), 357-369, and to L. G. Khachiyan for his paper, *A Polynomial Algorithm in Linear Programming*, *Dokl. Akad. Nauk SSSR* 244 (1979), 1093-1096. One prize is awarded jointly to G. P. Egorychev for his paper, *The Solution of van der Waerden's Problem for Permanents*, *Dokl. Akad. Sci. SSSR* 258 (1981), 1041-1044 and to D. I. Falikman for his paper, *A Proof of the van der Waerden Conjecture on the Permanent of a Doubly Stochastic Matrix*, *Mat. Zametki* 29 (1981), 931-938. One prize is awarded to M. Grötschel, L. Lovász and A. Schrijver for their paper, *The Ellipsoid Method and Its Consequences in Combinatorial Optimization*, *Combinatorica*, (1981), 169-197.

It is appropriate here to make a few remarks concerning the work for which the awards were made. Among the many discrete optimization problems in operations research, none has been more thoroughly investigated than that of linear programming. Yet in spite of this effort, up until 1979, the computational complexity of linear programming had defied classification

into either being solvable in polynomial-time or of being NP-complete. Indeed, there were some researchers who felt that linear programming was a good candidate for an example of a problem which was not in P (the class of problems solvable by polynomial-time algorithms) and not NP-complete. (The reader unfamiliar with these concepts can find an excellent discussion in the book by M. R. Garey and D. S. Johnson, *Computers and Intractability: A Guide to the Theory of NP-Completeness*, W. H. Freeman and Company, San Francisco, 1979). It is known that such problems must exist if  $P \neq NP$ . What Khachiyan's paper provided was a proof that linear programming in fact belonged to P, thus resolving an important theoretical issue that had plagued researchers for years. His results were based on an



Graham awarding prize to Grötschel, Lovász, and Schrijver.

adaptation of the ellipsoid method for convex optimization first described in the cited paper of Iudin and Nemirovskii. This algorithm for linear programming is radically different from the standard (and highly effective) simplex algorithm and does not depend directly on the linearity of either the constraints or the objective function. It should be pointed out that the theory developed by Iudin, Nemirovskii and Khachiyan, rests firmly on the pioneering work done by the Soviet mathematician N. Z. Shor in the late '60's and early '70's.

Although the ellipsoid method is not (yet) a serious competitor to the simplex algorithm for the solution of everyday linear programming problems, (and it was not designed to be) it has proved to be an extremely potent tool in the arsenal of combinatorial optimizers. In the cited paper of Grötschel, Lovász and Schrijver, the

ellipsoid method is applied to provide the first time polynomial algorithms for the basic problems of minimizing submodular functions and finding maximum independent sets in perfect graphs, as well as providing relatively "easy" unified proofs of the polynomial solvability of a number of other combinatorial optimization problems. Equally important, Grötschel, Lovász and Schrijver also show that a wide variety of optimization problems and their corresponding (apparently simpler) "separation" problems are actually computationally equivalent. While there is not space here to go into these important ideas any further, it seems clear that their power is just beginning to be tapped. For an excellent in-depth survey of all aspects of the ellipsoid method the reader should consult: R. G. Bland, D. Goldfarb, and M. J. Todd, *The Ellipsoid Method: A Survey*, *Operations Research* 29, (1981) 1039-1091.

The papers of Egorychev and Falikman each present elegant and surprisingly simple proofs of the notorious "permanent" conjecture of van der Waerden. This conjecture, which had resisted the efforts of mathematicians for nearly 50 years, asserted that the permanent of any  $n$  by  $n$  doubly stochastic matrix (i.e., having nonnegative entries and all row and column sums equal to 1) is always at least as large as  $n!/n^n$ . The strong form of the conjecture (also proved by Egorychev) was that the unique matrix achieving this value has all entries equal to  $1/n$ . In a sense, both proofs have their roots in an earlier paper of Marcus and Newman, *On the Minimum of the Permanent of a Doubly Stochastic Matrix*, *Duke Math. J.* 26 (1959), 61-72, and both rely on a key lemma which turns out to be a special case of the Alexandrov inequalities for mixed discriminants of quadratic forms (although Falikman's proof is completely self-contained). An excellent overview of the two proofs has recently appeared in: J. C. Lagarias, *The van der Waerden Conjecture: Two Soviet Solutions*, *AMS Notices* 29, (1982), 130-133.

The presentations of the Fulkerson Prizes took place during the opening day ceremonies of the Symposium. Unfortunately, due to last minute circumstances beyond their control, none of the recipients from the Soviet Union were able to be present.

—Ronald Graham

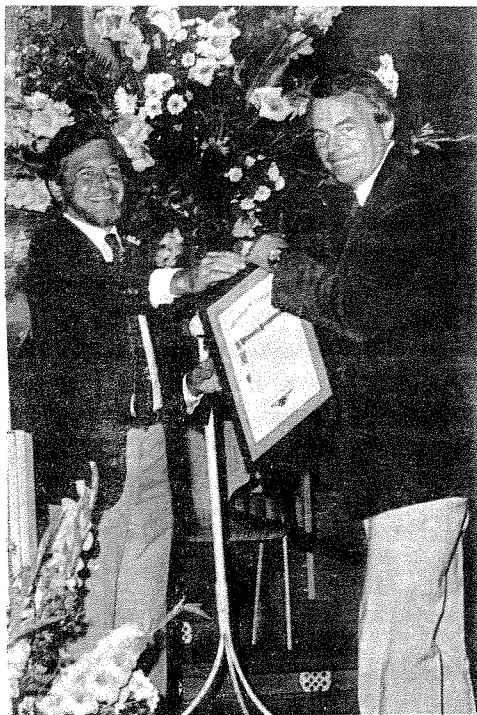
# ...and The Dantzig Awards

Since the opening ceremonies of the recent MPS Symposium marked the first presentation of the **George B. Dantzig Prize** for mathematical programming, I would like to describe the Prize itself and how it came about.

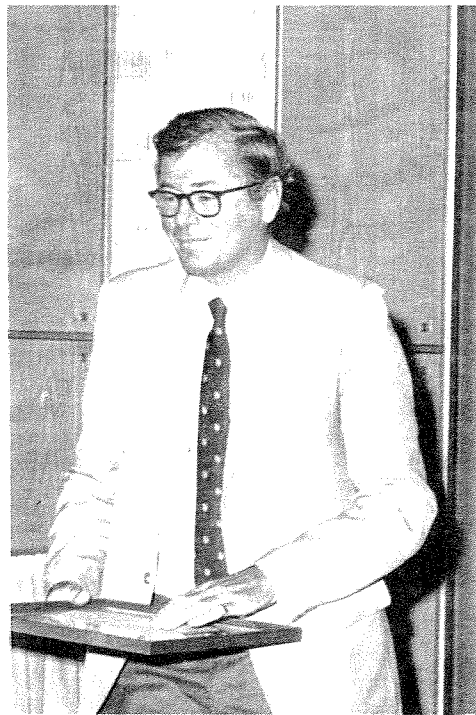
A Prize that would at the same time honor Professor Dantzig and stimulate the development of Mathematical Programming was originally thought of as a way to mark Professor Dantzig's 65th birthday, by **Richard Cottle, Ellis Johnson, Richard Van Slyke, and myself**. We were four of Professor Dantzig's first students and our objective was to make the first award at the 1979 Montreal meeting. In order not to be unduly delayed we started quite early, sometime in 1976.

When the suggestion of a Prize was made to the Mathematical Programming Society, it was immediately and enthusiastically endorsed. Also a large number of members of the Society indicated their support by pledging substantial contributions to the Prize fund. However at the time the Mathematical Programming Society was not incorporated and this created some problems with receiving donations. Legal advice was sought and after various delays it was decided to seek, in addition to Mathematical Programming Society, the sponsorship of SIAM (the Society of Industrial and Applied Mathematics). The Prize specifications required some adjustments to accommodate both Societies, in order to make them share in the administration of the Prize. This is why, for example, the Prize, which is to be given every three years, will be awarded every third time at a SIAM National Meeting with the Mathematical Programming Symposium hosting the ceremony the other times. Both **Phil Wolfe**, then Chairman of Mathematical Programming Society and **Ed Block**, Managing Director of SIAM, have been most supportive during these negotiations.

Equipped with two sponsoring societies, a checking account, funds generously donated by old and new friends of Professor Dantzig, and prize specifications, a Prize committee consisting of **Martin Beale, John Dennis, Philip Wolfe** and myself was appointed. The prize specifications were, on purpose, somewhat vague about the precise criteria to be met by the winner(s). The intent was to leave the Prize committee as much latitude as possible in their choice of a



Roger Wets and R.T. Rockafeller



M.J.D. Powell

laureate or laureates, in order to enable them to conform their choice to the spirit of the Prize. The drafters of the document had been quite clear:

1. The contributions of the laureate(s) should be of a comprehensive (or global) nature. The work should have theoretical repercussions, computational impact and lead to significant applications; all of this very much in keeping with the overall flavor of Professor Dantzig's own contributions.

2. The winner(s) should preferably be "young". This word however was never defined but the age of 40-45 had sometimes been mentioned as a possible upper limit.

When the Prize Committee finally met and was confronted with these guidelines, it realized that in the field of mathematical programming, it is unusual for a single contribution or method excluding the simplex method, to have this global character prescribed by the Prize specifications. In order to preserve their intent, it became clear that in our field it was the total impact of a researcher's work that had to be taken into account: his published work, naturally, but also his other contributions to this scientific community. This is what guided the Prize Committee towards these choices.

The first George B. Dantzig Prize is awarded jointly to **Michael J. D. Powell** and

**R. Tyrell Rockafellar** for their work in nonlinear optimization and for the scientific leadership they have provided the mathematical programming community.

The citation for **Michael J. D. Powell** reads: "On this 23rd day of August 1982, for his pioneering work in the numerical optimization of nonlinear functions done at the outset in collaboration with R. Fletcher, and for his scholarship in recognizing, and leadership in championing, the work of others".

The citation for **R. Tyrell Rockafellar** reads: "On this 23rd day August 1982, for his key contributions to the theory of nonlinear optimization, in particular for the development of the general duality framework and its applications, and for his work on subdifferentiability in the convex and nonconvex case".

—Roger J.B. Wets

---

## OPTIMA

Donald W. Hearn, Editor  
 Achim Bachem, Associate Editor  
 Ann Stone, Editorial Assistant  
 Published by the Mathematical Programming Society and Information Services of the College of Engineering, University of Florida.  
 Composition by Lessie McKoy, and Mechanical Production by Dick Dale. \*

# CALENDAR

Maintained by the Mathematical Programming Society (MPS)

This Calendar lists meetings specializing in mathematical programming or one of its subfields in the general area of optimization and applications, whether or not the Society is involved in the meeting. (These meetings are not necessarily "open".) Any one knowing of a forthcoming meeting not listed here is urged to inform Dr. Philip Wolfe, IBM Research 33-221, POB 218, Yorktown Heights, NY 10598, U.S.A.; Telephone 914-945-1642, Telex 137456.

Some of these meetings are sponsored by the Society as part of its world-wide support of activity in mathematical programming. Under certain guidelines the Society can offer publicity, mailing lists and labels, and the loan of money to the organizers of a qualified meeting. For further information address the Treasurer of the Society, Dr. A. C. Williams, Mobil Corporation, 150 East 42d Street, New York, New York 10017, U.S.A.; Telephone 212-883-7678.

Substantial portions of meetings of other societies such as SIAM, TIMS, and the many national OR societies are devoted to mathematical programming, and their schedules should be consulted.

1982

December 7-10: 21st IEEE Conference on Decision and Control, Orlando, Florida, U.S.A. Contact: Professor William S. Levine, Department of Electrical Engineering, University of Maryland, College Park, MD 20742, U.S.A.

1983

March 28-31: NETFLOW83, International Workshop on Network Flow Optimization Theory and Practice, Pisa, Italy. Contact: Dr. Claudio Sandi, IBM Scientific Center, Via S. Maria 67, 56100 Pisa, Italy; telephone 50-47383.

April 5-10: 15th Conference "Mathematical Optimization", Sellin/Rügen, German Democratic Republic. Contact: Dr. R. Hansel, Sektion Mathematik, Humboldt-Universität zu Berlin, 1086 Berlin, German Democratic Republic; telephone 203 2239.

June 20-21: IFAC Workshop on Applications of Nonlinear Programming to Optimization and Control, San Francisco, California, U.S.A. Abstract deadline February 1, 1983. Contact: Herbert E. Rauch, Lockheed 52-56/205, Palo Alto Research Laboratory, 3251 Hanover Street, Palo Alto, CA 94304, U.S.A.; Telephone 415-493-4411, Extension 45677.

July 4-15: Summer School on Combinatorial Optimisation, Dublin. Contact: Secretariat, Summer School on Combinatorial Optimisation, National Institute for Higher Education, Glasnevin, Dublin 9, Ireland.

July 11-15: 3d IFAC/IFORS Symposium "Large Scale Systems: Theory and Applications", Warsaw. Deadline for abstracts, 15 February 1982. Contact: Dr. Z. Nahorski, 3d IFAC/IFORS LSSTA, Systems Research Institute, Polish Academy of Sciences, ul. Newelska 6, 01-447 Warszawa, Poland; Telex 812397 ibs pl, Telephones 364103, 368150.

July 25-29: 11th IFIP Conference on System Modelling and Optimization, Copenhagen, Denmark. Deadline for abstracts, 31 December 1982. Contact: Professor P. Thoft-Christensen, Institute of Building Technology and Structural Engineering, Aalborg University Center, P.O. Box 159, DK-9100 Aalborg, Denmark.



# CONFERENCE NOTES

---

## Fourth Symposium on MP with Data Perturbations

The Fourth Symposium on Mathematical Programming with Data Perturbations was organized by **Tony Fiacco** and was held at The George Washington University on 17-19 May 1982. There were 28 registered participants representing six countries. The more than 20 presented papers included new results in LP sensitivity analysis, parametric semi-infinite programming and perturbation bounds. The symposium continues to provide an authoritative sampling of the state of the art in mathematical programming sensitivity and stability theory and applications.

Tutorials, a new feature for this meeting, were presented for the nonspecialist on Ekeland's Principle (**Jon Borwein**), (ii) Parametric Semi-Infinite Programming (**Bruno Brosowski**) and an LP-Sensitivity Analysis Tolerance Approach (**Richard Wendell**). A proceedings of selected papers will be edited by Fiacco for publication as a special issue of *Numerical Functional Analysis and Optimization*.

—Tony Fiacco

---

## Call For Papers Optimization Days 1983 Ecole Polytechnique Montreal, Quebec

This meeting is jointly organized by Ecole Polytechnique, McGill University, Concordia University, the Université de Montreal, Ecole des Hautes Etudes Commerciales and the Université du Quebec a Montreal.

Sessions will consist of invited and contributed talks. Papers presenting original developments as well as those of expository nature will be considered.

A 200-700 word summary (either in English or in French) which clearly defines the content of the paper should be forwarded by January 31, 1983 to Michael J. Polis or Richard Hurteau, Department of Electrical Engineering, Ecole Polytechnique, Campus de l'Université de Montreal, Case postale 6079, succursale "A", Montreal, Quebec H3C 3A7.

## Call for Papers Applied Discrete Mathematics M.I.T., June 27-29, 1983

A call for papers has been issued for the SIAM Symposium on the Applications of Discrete Mathematics, which will be held June 27-29, 1983, at the Massachusetts Institute of Technology.

Objectives of the symposium 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 applications of discrete mathematics. The symposium is intended to bring together researchers in the various fields of discrete mathematics with users of discrete mathematics in industry and government.

The deadline for abstracts is December 1, 1982. Standard abstract forms may be obtained from SIAM, 1405 Architects Building, 117 South 17th Street, Philadelphia, PA 19103.

Twelve invited speakers—seven from industry—will address the symposium. Some of the speakers will discuss recently developed techniques in integer, linear, and Boolean programming, network analysis, matroids and the foundations of combinatorial optimization, graphs and graph algorithms, coding theory, and complexity theory. Others will describe applications of techniques in these areas to switching networks, production scheduling, traffic phasing, cryptography, job assignments, computational complexity, electric power system planning, resource allocation, electronic signal processing, and pipeline networks.

At least three time segments will be scheduled for contributed papers and poster presentations.

The conference organizing committee consists of **Ronald L. Graham** of Bell Laboratories, **Peter L. Hammer** of the University of Waterloo, **Daniel J. Kleitman** of the Massachusetts Institute of Technology, and **Fred S. Roberts** of Rutgers University. Roberts is committee Chairman.

—Hugh B. Hair

## Summer School on Combinational Optimisation Dublin, July 4-15, 1983

A Summer School on Combinational Optimisation will be held in Dublin, Ireland, July 4-15, 1983. The invited speakers, **N. Cristofides**, **M.L. Fisher**, **M. Grötschel**, **R.M. Karp**, **E.L. Lawler**, **J.K. Lenstra**, **G.L. Nemhauser**, **M. Padberg**, **C.H. Papadimitriou**, **A.H.G. Rinnooy Kan**, and **L.E. Trotter, Jr.**, will each deliver an introductory lecture in his chosen area and a lecture devoted to recent research.

A limited number of contributed papers will complement the invited papers.

The venue for the school is the National Institute for Higher Education, Dublin, a new technical university.

The fee for attendance is IR£ 120. Meals, accommodations and travel are not included. For further information, contact Secretariat, Summer School on Combinational Optimisation, National Institute for Higher Education, Glasnevin, Dublin 9, IRELAND.

---

## Call for Papers IFIP Conference on System Modeling and Optimization Copenhagen, July 25-29, 1983

The aim of the 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 performances.

The conference will include several sessions on mathematical programming including theory, algorithms and applications.

Extended abstracts of papers for presentation on the conference should be submitted to the secretariat by December 31, 1982. They should be approximately 2 pages long, and should describe original unpublished results by their authors. Notification of acceptance will be by March 1, 1983.

Contact the conference director **P. Thoft-Christensen**, Institute of Building Technology and Structural Engineering, Aalborg University Centre, P.O. Box 159, DK-9100 Aalborg, Denmark.  
Telephone: International + 45 8 142333.

# Technical Reports & Working Papers

## THE JOHNS HOPKINS UNIVERSITY

Operations Research Group  
Ames Hall (Mail Room 419)  
Baltimore, MD 21218

C. ReVelle, J.L. Cohon and D. Shobry, "Multiple Objectives in Facility Location: A Review," 81-01.

A.J. Goldman, "Reflections on Modeling and Model Assessment," 81-03.

J.L. Cohon, T.W. Eagles, T.S. Margulies and C.S. ReVelle, "Population Cost Tradeoffs for Nuclear Reactor Siting Policies," 81-04.

J.A. Filar, "Semi-Antagonistic Equilibrium Points and Action Costs," 82-01.

J. Current, C. ReVelle and J. Cohon, "Multiobjective Design of Transportation Networks," 82-02.

R.H. Byrd, A.J. Goldman and M. Heller, "Recognizing Unbounded Integer Programs," 82-03.

## WASHINGTON STATE UNIVERSITY

Department of Pure and Applied Mathematics  
Pullman, WA 99164-2930

Robert Mifflin, "Stationarity and Superlinear Convergence of an Algorithm for Univariate Locally Lipschitz Constrained Minimization," July 1982.

## CORNELL UNIVERSITY

School of Operations Research and Industrial Engineering  
Upson Hall  
Ithaca, NY 14853

M. Grötschel and W.R. Pulleyblank, "Weakly Bipartite Graphs and the Max-Cut Problem," TR 511.

Y. Ikura and G.L. Nemhauser, "Simplex Pivots on the Set Packing Polytope," TR 513.

M.J. Todd, "Large-Scale Linear Programming: Geometry, Working Bases and Factorizations," TR 520.

W.F. Lucas and K. Michaelis, "Finite Solution Theory for Coalitional Games," TR 521.

W.F. Lucas, K. Michaelis, S. Muto and M. Rabie, "A New Family of Finite Solutions," TR 522.

W.F. Lucas, K. Michaelis, S. Muto and M. Rabie, "Detailed Proofs for a Family of Finite Solutions," TR 523.

M.J. Todd, "A Linear System that Can be Used in Sparse Piecewise-Linear Homotopy Algorithms," TR 525.

M.J. Todd, "Piecewise-Linear Homotopy Algorithm for Sparse Systems of Nonlinear Equations," TR 527.

J. Bloom, "Long Range Generation Planning Using Generalized Benders' Decomposition," TR 528.

L.J. Billera and B. Munson, "Polarity and Inner Products in Oriented Matroids," TR 529.

M. Grötschel and G.L. Nemhauser, "A Polynomial Algorithm for the Max-Cut Problem on Graphs Without Long Odd Cycles," TR 537.

G. Chang and G.L. Nemhauser, "The  $k$ -Domination and  $k$ -Stability Problems on Graphs," TR 540.

J. Bloom, "Integrating Production Planning and Energy Management Models Using Decomposition Methods," TR 542.

G. Chang and G.L. Nemhauser, "R-Domination on Block Graphs," TR 543.

## UNIVERSITY OF ALBERTA

Faculty of Business  
Edmonton, AB, TGG 2G1  
CANADA

S. Schaible, "Bicriteria Quasiconcave Programs," March 1982.

S. Schaible, "Bibliography in Fractional Programming," May 1982.

## UNIVERSITY OF IOWA

College of Business Administration  
Iowa City, Iowa 52242

R. Jagannathan and S. Schaible, "Duality in Generalized Fractional Programming via Farkas' Lemma," W.P. No. 82-8, March 1982.

## UNIVERSITY OF AMSTERDAM

Institute of Actuarial Science and Econometrics  
Jodenbreestraat 23  
1011 NH Amsterdam  
The Netherlands

W.H.M. Zijm, "The Optimality Equations in Multichain Denumerable State Markov Decision Processes with the Average Cost Criterion: The Bounded Cost Case," AE 2/82.

A. Schrijver, "Proving Total Dual Integrality with Cross-free Families - A General Framework," AE 5/82.

W.H.M. Zijm, "Continuous-time Dynamic Programming Models," AE 7/82.

R. Jonker and A. Volgenant, "Non-optimal Edges for the Symmetric Traveling Salesman Problem," AE 10/82.

G. Kindervater, A. Volgenant, G. de Leve, and V. van Gijlswijk, "On Dual Solutions of the Linear Assignment Problem," AE 11/82.

A. Schrijver, "Duality and Combinatorial Optimization," (in Dutch), AE N4/82.

A. Schrijver, "Submodular Functions," AE N5/82.

P. Fris and A. Volgenant, "Solving the Traveling Salesman Problem in Basic," AE N9/82.

## MATHEMATICS RESEARCH CENTER

610 Walnut Street  
Madison, Wisconsin 53706

L.B. Rall, "Solution of Finite Systems of Equations by Interval Iteration," 2271.

C.D. Ha, "An Algorithm for Structured, Large-Scale Quadratic Programming Problems," 2276.

J.C. Strikwerda, "A Generalized Conjugate Gradient Method for Non-Symmetric Systems of Linear Equations," 2290.

C. de Boer, R.-Q. Jia and A. Pinkus, "Structure of Invertible (Bi) Infinite Totally Positive Matrices," 2311.

O. Fujiwara, S.-P. Han and O.L. Mangasarian, "Local Duality of Nonlinear Programs," 2329.

N. Dyn and W.E. Ferguson Jr., "The Numerical Solution of a Class of Constrained Minimization Problems," 2340.

S. Friedland, "Simultaneous Similarity of Matrices," 2345.

P.L. Lions, "Bifurcation and Optimal Stochastic Control," 2350.

# TECHNICAL REPORTS & WORKING PAPERS. . . .

UNIVERSITE CATHOLIQUE DE LOUVAIN  
Center for Operations Research and Econometrics  
34 Voie Du Roman Pays.  
1348 Louvain-La-Neuve  
Belgium, 010/41.81.81

- M. Fisher and L.A. Wolsey, "On the Greedy Heuristic for Covering and Packing Problems," 8124.  
L.A. Wolsey, "An Analysis of the Greedy Algorithm for the Submodular (Set) Covering Problem," 8125.  
T.J. Van Roy and D. Erlenkotter, "A Dual-Based Procedure for Dynamic Facility Location," 8127.  
T.J. Van Roy, "Cross Decomposition for Integer Programming," 8134.  
M. Padberg and L.A. Wolsey, "Trees and Cuts," 8138.  
J.-P. Vial, "Strong and Weak Convexity of Sets and Functions," 8140.  
M. Padberg and L.A. Wolsey, "Fractional Covers for Trees and Matchings," 8141.  
F.V. Louveaux and Y. Smeers, "R-D Analysis of a New Technology by Stochastic Programming: The Case of Underground Gasification," 8143.  
P. Michel and J.-P. Vial, "An Analysis of Batch Production Systems via Optimal Control Theory," 8145.  
M. Conforti and G. Cornuejols, "Submodular Set Functions, Matroids and the Greedy Algorithm I: A Tight Worst-Case Bound," 8201.  
M. Conforti and G. Cornuejols, "Submodular Set Functions, Matroids and the Greedy Algorithm II: Some Generalizations of the Rado-Edmonds Theorem," 8204.  
G. Cornuejols, D. Hartvigsen and W. Pulleyblank, "The Traveling Salesman Problem in Graphs with 3-Edge Cutsets," 8212.  
P. Gille and E. Loute, "Updating the LU Gaussian Decomposition for Rank-One Corrections. Application to Linear Programming Basis Partitioning Techniques," 8213.  
B. Cornet, "Existence of Slow Solutions for a Class of Differential Inclusions," 8224.

UNIVERSITY OF MARYLAND  
College of Business and Management  
College Park, Maryland 20742

- Gheysens, "A More Compact Transformation of the Symmetric Multiple Traveling Salesman Problem with Fixed Charges," 82-014.  
Ball, Golden, Assad, and Bodin, "Planning for Truck Fleet Size in the Presence of a Common Carrier Option," 82-015.  
Assad, Golden, Dahl, and Dror, "Design of an Inventory/Routing System for a Large Propane-Distribution Firm," 82-016.  
Skiscim and Sanborn, "Some New Computational Experiments with the TSP," 82-018.  
Golden and Keating, "Determining a Forecast Horizon for Cash Flow Management," 82-019.  
Golden, Assad, Levy, and Gheysens, "The Fleet Size and Mix Vehicle Routing Problem," 82-020\*.  
Baker and Golden, "The Analysis of Network Optimization Algorithms: An Overview," 82-022.  
Provan and Ball, "Computing Network Reliability in Time Polynomial in the Number of Cuts," 82-023.  
Johnson, "Sign Patterns of Inverse Nonnegative Matrices," 82-025.  
Stewart, Golden, and Gheysens, "A Survey of Stochastic Vehicle Routing," 82-027.  
Gheysens, Golden, and Assad, "A Relaxation Heuristic for the Fleet Size and Mix Vehicle Routing Problem," 82-029.  
Wasil, Golden, and Assad, "Diverse Applications of An Expected Utility Comparison Approach," 82-031.  
Ball and Derigs, "An Analysis of Alternate Strategies for Implementing Matching Algorithms," 82-033.  
Hevner and Yao, "Network Database Design Methods," 82-034.

\*This is a revision of Working Paper MS/S 80-011.

## Journals & Studies



(This schedule of journal contents is subject to changes by the publisher.)

### Volume 24 No. 2

- T. F. Coleman and A. R. Conn, "Nonlinear Programming via an Exact Penalty Function: Asymptotic Analysis".  
T. F. Coleman and A. R. Conn, "Nonlinear Programming via an Exact Penalty Function: Global Analysis".  
L. McLinden, "Polyhedral Extensions of Some Theorems of Linear Programming".  
M. Kojima and Y. Yamamoto, "Variable Dimension Algorithms: Basic Theory, Interpretations and Extensions of Some Existing Methods".  
M. J. Todd, "On the Computational Complexity of Piecewise-linear Homotopy Algorithms".  
J. M. Borwein, "A Note on the Existence of Subgradients".  
B. Kalantari and J. B. Rosen, "Penalty for Zero-One Integer Equivalent Problem".  
Y. Censor and A. Lent, "Cyclic Subgradient Projections".

### Volume 24 No. 3

- C. Lemarechal and R. Mifflin, "Global and Superlinear Convergence of an Algorithm for One Dimensional Minimization of Convex Functions".  
A. Auslender, "On the Differential Properties of the Support Function of the  $\epsilon$ -Subdifferential of a Convex Function".  
R. Euler, "Regular (2,2) Systems".  
J. S. Pang and D. Chan, "Iterative Methods for Variational and Complementarity Problems".  
J. R. Birge, "The Value of the Stochastic Solution in Stochastic Linear Programs with Fixed Recourse".  
J. Flachs, "Global Saddle-Point Duality for Quasiconcave Programs, II".  
M. G. Sklar and R. D. Armstrong, "Least Absolute Value and Chebychev Estimation Utilizing Least Squares Results".  
Y. Y. Sung and J. B. Rosen, "Global Minimum Test Problem Construction".  
J. M. Danskin, "A Lipschitz Constant Connected with Lemke's Closest-Point Principle".

### Volume 25 No. 1

- B. A. Murtagh and F. I. Soliman, "Subgradient Optimization Applied to a Discrete Nonlinear Problem in Engineering Design".  
A. Federgruen and P. Zipkin, "Solution Techniques for Some Allocation Problems".  
A. Kalliauer, "An Algorithm for Hierarchical Optimization of Large-Scale Problems with Nested Structure".  
T. J. Van Roy, "Cross Decomposition for Integer Programming".  
R. Grinold, "Convex Infinite Horizon Programs".  
S. A. Awoniyi and M. J. Todd, "An Efficient Simplicial Algorithm for Computing a Zero of a Convex Union of Smooth Functions".  
S. Zlobec, "Characterizing an Optimal Input in Perturbed Convex Programming".  
P. C. Jones, "A Note on the Talman, Van der Heyden Linear Complementarity Algorithm".  
R. B. Schnabel and Ph. L. Toint, "Forcing Sparsity by Projecting with Respect to a Non-Diagonally Weighted Norm".

# Gallimaufry

Harold W. Kuhn (Princeton) has been awarded a Guggenheim Fellowship for 1982-83... *Science* carried an article entitled "Mathematician Solves Simplex Problem" in the July 2, 1982 issue. The article concerned the result of **Stephen Smale** (Berkeley) on the average behavior of the simplex algorithm. Smale presented his results in a tutorial at the recent Bonn meeting...MPS Chairman **Jean M. Abadie** (Paris) has been elected to The Institute of Management Sciences Council... **Hugh Everett, III**, a pioneer in mathematical programming as developer of the generalized Lagrange multiplier technique, died of a heart attack July 19, 1982...**Masao Iri** (Japan) has been elected as a Vice-President of IFORS... **David Shanno**, formerly at the University of Arizona, has accepted a professorship at the University of California, Davis, effective July 1, 1982... **Imre Barany** from the Mathematical Institute of the Hungarian Academy of Sciences will be at CORE (Louvain) for the current year... **Lloyd Shapley** (RAND) is visiting CORE for Fall, 1982...COAL Newsletter No.7 was published in September... **Mordecai Avriel** (Technion) has been appointed to the recently established Abraham Tulin Chair in Operations Research... New MPS dues have been announced: 35 US dollars, 20 UK pounds, 72 Swiss francs, 230 French francs, 85 German marks, or 95 Dutch guilders... An unfortunate larceny of an IBM copy of a Schickard calculator (from the historical computer exhibition) occurred on the last day of the Bonn meeting. Anyone having information should contact the program committee. A reward of DM 2000 is offered for information leading to the return of the calculator.

**Achim Bachem**, associate editor of OPTIMA will handle book reviews and these will become a regular feature of the newsletter. Authors of recent and forthcoming books should notify their publishers to send review copies directly to him.

Deadline for the next OPTIMA is February 15, 1983.

OPTIMA  
303 Weil Hall  
College of Engineering  
University of Florida  
Gainesville, Florida 32611

FIRST CLASS MAIL