



*Institute for Operations Research and the Management Sciences*

1998

## JOHN VON NEUMANN THEORY PRIZE

The 1998 John von Neumann Theory Prize for contributions to the theory of operations research and management science is awarded by the Institute for Operations Research and the Management Sciences to

### Fred W. Glover

for his fundamental contributions to integer programming, networks, and combinatorial optimization.

His contributions to integer programming began with his dissertation at Carnegie-Mellon University in 1965, where he introduced surrogate constraints, and an improved data structure for implicit enumeration. In 1970, the surrogate constraint ideas led him to a family of facet generation algorithms for Gomory's group problem, now known as lifting procedures. His research in the early to mid 1970's led to the polyhedral annexation framework, fundamental in disjunctive programming. As with surrogates, lifting procedures, and convexity cuts, this framework became an important part of integer programming, withstanding the test of time for more than two decades in its impact on our ability to solve hard problems.

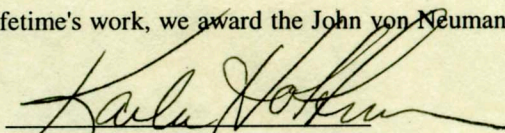
Starting in the 1970's, Fred and Darwin Klingman revolutionized the field of network optimization. They developed new data structures, algorithms, and computer implementations which vastly improved the speed and size capabilities of network codes. They specialized their primal, dual, and primal-dual procedures to important categories of network problems like transportation and assignment. In the best traditions of OR/MS, they pioneered many important applications, and played the major role in disseminating this technology to practitioners. In the 1980's they introduced the family of modeling concepts known as Netforms, and later published a seminal book on that topic. This approach includes elements of what we now call reformulation in optimization modeling. Fred has also provided results regarding reformulation of LP's as networks, and binary IP's as LP's.

Starting in the late 1970s, Fred developed the framework of the metaheuristic called Tabu Search, which has had an enormous impact on our abilities to solve hard combinatorial problems. Fred coined both "Metaheuristic" and "Tabu Search" in the same 1986 article that has spawned hundreds of Tabu-search-related applications throughout the world. In many areas, ranging from scheduling to financial planning to training neural networks, Tabu Search has solved or quickly obtained a high-quality solution for problems that were too difficult to tackle by other methods. The success of Tabu search relative to competing techniques like genetic algorithms and simulated annealing continues to grow.

Few researchers have provided theoretical frameworks which have had so great an impact, both on the development of further theory, and on the practice of OR/MS.

For the remarkable variety, high caliber, and enormous impact of his lifetime's work, we award the John von Neumann Theory Prize to Fred W. Glover.

April, 1998



Karla L. Hoffman, President