Foreword 2004: the *Annals* edition

The publication of this new edition of *Algorithmic Graph Theory and Perfect Graphs* marks twenty three years since its first appearance. My original motivation for writing the book was to collect and unify the topic to act as a spring board for researchers, and especially graduate students, to pursue new directions of investigation. The ensuing years have been an amazingly fruitful period of research in this area. To my great satisfaction, the number of relevant journal articles in the literature has grown tenfold. I can hardly express my admiration to all these authors for creating a success story for algorithmic graph theory far beyond my own imagination.

The world of perfect graphs has grown to include over 200 special graph classes. The Venn diagrams that I used to show some of the inclusions between classes in the First Generation, for example Figure 9.9 (on page 212), have yielded to Hasse diagrams for the Second Generation, like the one from Golumbic and Trenk [2004] reprinted in Figure 13.3 at the end of this edition.

Perhaps the most important new development in the theory of perfect graphs is the recent proof of the Strong Perfect Graph Conjecture by Chudnovsky, Robertson, Seymour and Thomas, announced in May 2002. News of this was immediately passed on to Claude Berge, who sadly passed away on June 30, 2002.

On the algorithmic side, many of the problems which were open in 1980 have subsequently been settled, and algorithms on new classes of perfect graphs have been studied. For example, tolerance graphs generalize both interval graphs and permutation graphs, and coloring tolerance graphs in polynomial time is important in solving scheduling problems where a measure of flexibility or tolerance is allowed for sharing or relinquishing resources when total exclusivity prevents a solution.

At the end of this new edition, I have added a short chapter called

Epilogue 2004 in which I survey a few of my favorite results and research directions from the Second Generation. Its intension is to whet the appetite.

Six books have appeared recently which cover advanced research in this area. They have thankfully relieved me from a pressing need to write my own encyclopedia sequel. They are the following, and are a must for any graph theory library.

- A. Brandstädt, V.B. Le and J.P. Spinrad, "*Graph Classes: A Survey*", SIAM, Philadelphia [1999], is an extensive and invaluable compendium of the current status of complexity and mathematical results on hundreds on families of graphs. It is comprehensive with respect to definitions and theorems, citing over 1100 references.
- P.C. Fishburn, "*Interval Orders and Interval Graphs: A Study of Partially Ordered Sets*", John Wiley & Sons, New York [1985], gives a comprehensive look at the research on this class of ordered sets.
- M.C. Golumbic and A.N. Trenk, "*Tolerance Graphs*", Cambridge University Press [2004], is the youngest addition to the perfect graph bookshelf. It contains the first thorough study of tolerance graphs and tolerance orders, and includes proofs of the major results which have not appeared before in books.
- N.V.R. Mahadev and U.N. Peled, "*Threshold Graphs and Related Topics*", North-Holland [1995], is a thorough and extensive treatment of all research done in the past years on threshold graphs (chapter 10 of my book), threshold dimension and orders, and a dozen new concepts which have emerged.
- T.A. McKee and F.R. McMorris, "*Topics in Intersection Graph Theory*", SIAM, Philadelphia [1999], is a focused monograph on structural properties, presenting definitions, major theorems with proofs and many applications.
- W.T. Trotter, "*Combinatorics and Partially Ordered Sets*", Johns Hopkins, Baltimore [1992], is the book to which I referred at the bottom of page 136. It covers new directions of investigation and goes far beyond just dimension problems on ordered sets.

Algorithmic Graph Theory and Perfect Graphs has now become the classic introduction to the field. It continues to convey the message that intersection graph models are a necessary and important tool for solving real-world problems. Solutions to the algorithmic problems on these special graph classes are continually integrated into systems for a large variety of application areas, from VLSI circuit design to scheduling, from resource allocation to physical mapping of DNA, from temporal reasoning in artificial intelligence to pavement deterioration analysis. On the mathematical side, perfect graph classes have provided rich soil for deep theoretical results. In short, it remains a stepping stone from which the reader may embark on one of many fascinating research trails.

Martin Charles Golumbic
Haifa, Israel