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Guest Editors' Foreword

It has been said that the greatest writers spend all of their lives working on the same novel. Similarly, many excellent mathematicians devote their best years to studying a particular group of problems. However, very few of them have the ability, courage, and luck to create a whole new discipline. László Fejes Tóth is one of these.

In the 1940s he started to explore the structural properties of two- and three-dimensional packings and coverings with disks, spheres, and other convex sets. Apart from some scattered results by Thue and Kershner, all previous work in this area concerned lattice packings and lattice coverings. Lattices play a fundamental role in number theory and in the geometry of numbers, but restricting investigations to lattice arrangements appeared to be an artificial exercise from a geometric point of view. Fejes Tóth's idea was that the solution of many extremal problems would remain the same if this restriction were dropped. For example, he showed that a densest packing of congruent copies of a centrally symmetric convex set in the plane is necessarily lattice-like. In a similar spirit he proved that most regular polytopes can be obtained as the unique solution to a suitable "natural" optimization problem, in the same way that the regular hexagonal honeycomb is, in a certain well-defined sense, the most economical structure to house bees. This area of geometry can be regarded as the "genetics" of symmetric objects.

In 1953 Fejes Tóth summarized his results in the seminal book, *Lagerungen in der Ebene, auf der Kugel und im Raum* that appeared in the prestigious series of Springer-Verlag: Die Grundlehren der Mathematischen Wissenschaften. It is hard to overestimate the impact of this monograph. As C. A. Rogers wrote, "until recently, the theory of packing and covering was not sufficiently well developed to justify the publication of a book devoted exclusively to it. After the publication of L. Fejes Tóth's book in 1953, there would be no need for a second work on the subject. . . ."

László Fejes Tóth was a high-school teacher for many years. Perhaps that is why he loves simply stated problems that have an aesthetic appeal and can be explained to a layman. In fact, he is a master of raising such questions, and he knows exactly who the right people are to tell them to. Because of these special abilities, his straightforward, modest style, and his warm personality, he has become one of the most influential discrete geometers of our time. The solution of most of his problems

requires ingenious new ideas or powerful techniques from various branches of mathematics. Many of his problems have remained unsolved in spite of persistent attacks by outstanding mathematicians.

The editors of this volume have been strongly influenced by László Fejes Tóth. We have learned from his lectures and from his approach to mathematics. We have benefited greatly from his challenging questions and from many stimulating discussions with him that have shaped our mathematical thinking.

It has been a pleasure to edit this volume, but it has been a difficult task, too. In the spring of 1993 we invited discrete geometers to submit research papers to a Fejes Tóth Festschrift. We were overwhelmed by the enthusiastic response of the mathematical community. We received over 50 manuscripts, and it was a pleasure to see the many exciting new results in this field. In the spirit of László Fejes Tóth's works, most of these papers had a strong intuitive appeal. The difficulty lay with the space limitations and with the decision that had to be made—which of the papers to include in the volume. We are grateful to the Editors-in-Chief of *Discrete & Computational Geometry* and to Springer-Verlag for offering to publish this collection in the first place, and for offering to make additional space available when it became clear that more papers should be included than originally planned. The following papers dedicated to Professor Fejes Tóth were accepted for publication in the Festschrift but—for technical reasons that have nothing to do with their quality—they will appear in a future regular issue of the journal:

Y. S. Kupitz and M. A. Perles: Extremal theory for convex matchings in convex geometric graphs.

K.-P. Nischke and L. Danzer: The construction of inflation rules based on n-fold symmetry.

László Fejes Tóth's mathematics and body both defy time. At the age of 80, he gets up every morning at 6 o'clock. After completing 30 minutes of intensive gymnastics, he runs 2 miles. We wish him many happy returns with this collection of articles!

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