

HANDBOOK OF CONVEX GEOMETRY

VOLUME B

Edited by
P.M. Gruber
J.M. Wills

NORTH-HOLLAND

HANDBOOK OF CONVEX GEOMETRY

Volume B

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HANDBOOK OF CONVEX GEOMETRY

Volume B

Preface

One aim of this Handbook is to survey convex geometry, its many ramifications and its relations with other areas of mathematics. We believe that it will be a useful tool for the expert. A second aim is to give a high level introduction to most branches of convexity and its applications, showing the major ideas, methods and results. We hope that because of this feature the Handbook will act as an appetizer for future researchers in convex geometry. For them the many explicitly or implicitly stated problems should turn out to be a valuable source of inspiration. Third, the Handbook should be useful for mathematicians working in other areas as well as for econometrists, computer scientists, crystallographers, physicists and engineers who are looking for geometric tools for their own work. In particular, mathematicians specializing in optimization, functional analysis, number theory, probability theory, the calculus of variations and all branches of geometry should profit from the Handbook.

The famous treatise “Theorie der konvexen Körper” by Bonnesen and Fenchel presented in 164 pages an almost complete picture of convexity as it appeared around 1930. While a similarly comprehensive report today seems to be out of reach, the Handbook deals with most of the more important topics of convexity and its applications. By comparing the Handbook with the survey of Bonnesen and Fenchel and with more recent collections of surveys of particular aspects of geometric convexity such as the AMS volume edited by Klee (1963), the Copenhagen Colloquium volume edited by Fenchel (1967), the two green Birkhäuser volumes edited by Tölke and Wills (1979) and Gruber and Wills (1983), respectively, and the New York Academy volume edited by Goodman, Lutwak, Malkevitch and Pollack (1985), the reader may see where progress was made in recent years.

During the planning stage of the Handbook, which started in 1986, we got generous help from many prominent convex geometers, in particular Peter McMullen, Rolf Schneider and Geoffrey Shephard. The discussion of the list of contents and of prospective authors turned out to be difficult. Both of us are obliged to the authors who agreed to contribute to the Handbook. In the cooperation with them we got much encouragement and the professional contacts furthered our good personal relations with many of them. The manuscripts which we finally received turned out to be much more diverse than we had anticipated. They clearly exhibit the most different characters and scientific styles of the authors and this should make the volume even more attractive.

There are several researchers in geometric convexity whom we invited to contribute to the Handbook but who for personal, professional or other reasons – regretfully – were not able to participate. The reader will also note that one area or another is missing in the list of contents. Examples are elementary geometry of normed planes, axiomatic convexity, and Choquet theory, but this should not diminish the usefulness of the Handbook.

Some fields such as computational and algorithmic aspects or lattice point results are dealt with in several chapters. The subjects covered are organized in five parts which in some sense reflect the fact that convexity is situated between analysis, geometry and discrete mathematics. This organization clearly has some disadvantages but we think that it will be helpful for the reader who wants to orient himself.

In the editing of the Handbook we received much help, in particular from Dr. M. Henk, Dr. J. Müller, Professor S. Hildebrandt, Professor L. Payne and Professor F. Schnitzer. We are most grateful to Ms. S. Clarius and Ms. E. Rosta who typed about 1000 letters to the authors, to colleagues whom we asked for advice and to the Publishers. We most gratefully acknowledge the friendly cooperations and expert support of Dr. A. Sevenster and Mr. W. Maas from Elsevier Science Publishers.

Finally we should like to express our sincere hope that the readers will appreciate the great effort of so many prominent authors and will find the Handbook useful for their scientific work.

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