

Lectures on
Convex Polytopes, Gröbner Bases and Monomial Ideals

by Takayuki Hibi ¹

In the current trends of commutative algebra, the role of combinatorics is distinguished and indispensable. Half a century ago, combinatorics of the modern theory of convex polytopes had created a fascinating research area in commutative algebra.

In the series of my talks, first, the historical background of how combinatorics was introduced into the community of commutative algebra in the late 1970s will be reviewed, and second, an overview of the influence of the Gröbner basis theory in commutative algebra via toric rings and toric ideals in the early 1990s will be surveyed. Finally, the prominent topics of monomial ideals and toric rings in the quarter century since the late 1990s will be discussed. A tentative schedule of the series of my talks is as follows:

- Face enumeration of convex polytopes
- Cohen–Macaulay complexes and triangulations
- A quick introduction to Gröbner bases
- Hibi rings and Hibi ideals
- Castelnuovo polytopes

No special knowledge on combinatorics and Gröbner bases will be required to understand my talks. However, it is desirable for the audience to be familiar with Cohen–Macaulay rings together with linear resolution.

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