

**Sturmfels, Bernd; Zelevinsky, Andrei V.**

**Maximal minors and their leading terms.** (English) Zbl 0776.13009

*Adv. Math.* 98, No. 1, 65-112 (1993).

The authors study the Newton polyhedra of the polynomial given by the product of all maximal minors of a  $m \times n$  matrix of indeterminates  $X = (x_{ij})$ . It is a polytope in  $\mathbb{R}^{mn}$ . The description of this polytope is well known in the following cases:

If  $m = n$  it is the Birkhoff polytope of doubly stochastic  $n \times n$  matrices. – If  $m = 2$  it is the convex hull in  $\mathbb{R}^{2n}$  of all  $n!$  matrices obtained from  $\begin{pmatrix} n-1 & n-2 & \dots & 1 & 0 \\ 0 & 1 & \dots & n-2 & n-1 \end{pmatrix}$  by permuting columns.

The description of this polytope is really difficult and interesting. The authors give some motivations and applications.

Reviewer: [M.Morales \(Saint-Martin-d'Herès\)](#)

**MSC:**

- 13C40** Linkage, complete intersections and determinantal ideals
- 13F20** Polynomial rings and ideals; rings of integer-valued polynomials
- 14M25** Toric varieties, Newton polyhedra, Okounkov bodies
- 14M12** Determinantal varieties
- 14N10** Enumerative problems (combinatorial problems) in algebraic geometry

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**Keywords:**

maximal minors of matrix of indeterminates; Newton polyhedra

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