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**Flag Varieties:
An Interplay
of Geometry,
Combinatorics,
and Representation
Theory**
Second Edition
V. Lakshmibai, *Northeastern
University, Boston, MA*, and
Justin Brown, *Northeastern
University, Boston, MA*

Flag varieties are important geometric objects. Because of their richness in geometry, combinatorics, and representation theory, flag varieties may be described as an interplay of all three of these fields.

This book gives a detailed account of this interplay. In the area of representation theory, the book presents a discussion on the representation theory of complex semisimple Lie algebras as well as the representation theory of semi-simple algebraic groups; in addition, the representation theory of symmetric groups is also discussed. In the area of algebraic geometry, the book gives a detailed account of the Grassmannian varieties, flag varieties, and their Schubert subvarieties. Because of the root system connections, many of the geometric results admit elegant combinatorial description, a typical example being the description of the singular locus of a Schubert variety. This discussion is carried out as a consequence of standard monomial theory (abbreviated SMT). Thus, the book includes SMT and some important applications—singular loci of Schubert varieties, toric degenerations of Schubert varieties, and the relationship between Schubert varieties and classical invariant theory.

In the second edition, two recent results on Schubert varieties in the Grassmannian have been added. The first result gives a free resolution of certain Schubert singularities. The second result is about certain Levi subgroup actions on Schubert varieties in the Grassmannian and derives some interesting geometric and representation-theoretic consequences.

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