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**Raman Sanyal, Frank Sottile** and **Bernd Sturmfels\*** ([bernd@math.berkeley.edu](mailto:bernd@math.berkeley.edu)),  
Department of Mathematics, University of California, Berkeley, CA 94720. *Orbitopes*.

An orbitope is the convex hull of an orbit of a real algebraic representation of a compact Lie group. The primary examples of such groups appearing in this lecture are the special orthogonal groups  $SO(n)$  and direct products of these. Orbitopes exhibit a rich geometric structure which connects three branches of mathematics: classical convexity, algebraic geometry and optimization theory. We present several interesting examples, including coadjoint orbitopes, Caratheodory orbitopes and Grassmann orbitopes. For each of these orbitopes we examine its algebraic boundary, its facial structure, and its representability as a spectrahedron or projection of a spectrahedron. (Received September 06, 2009)