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An Introduction to Geometric Valuation Theory

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Valuations on the field of rational functions of an algebraic variety can be though of as generalized orders of vanishing at the points on this variety. Valuation theory has developed much in recent years, with new applications which make use of the space of all valuations of such a field of rational functions, which is a projective limit of algebraic varieties. Among other things, valuation theory provides a combinatorial approach to some problems of singularity theory such as resolution of singularities in certain cases. The lecture will present an introduction to valuation theory and some of its applications, with a geometrical approach. Prerequisites are some familiarity with basic commutative algebra, in particular graded rings, normalization and completion, and a knowledge of basic algebraic geometry, preferably including blowing-ups. Some knowledge of toric geometry will also be useful.