1023-11-25 **Manjul Bhargava***, Department of Mathematics, Princeton University, Princeton, NJ 08544.
Gauss composition and generalizations.

In 1801 Gauss laid down a remarkable law of composition on "binary quadratic forms", i.e., expressions of the form $ax^2 + bxy + cy^2$ where a, b, c are integers. This discovery, known as *Gauss composition*, not only had a profound influence on elementary number theory but also laid the foundations for ideal theory and modern algebraic number theory.

In this talk, we will describe a new view of Gauss composition using (3-dimensional!) matrices and use it to show how Gauss's composition law is in fact only one of at least 14 such laws existing in nature. We will also discuss some of the recent applications of these "higher composition laws" to analytic number theory and to commutative and non-commutative ring theory.

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