1099-13-5 **Karen E Smith*** (kesmith@umich.edu), Math Dept, University of Michigan, Ann Arbor, MI 48109. *Characteristic p Tricks in Algebra, Geometry and Combinatorics.* Preliminary report.

Consider a commutative ring of prime characteristic p, such as a polynomial ring over the field $\mathbb{F}_p$ of p elements. For any two elements x and y, we can easily verify that $(x+y)^p = x^p + y^p$, because the binomial coefficients $\binom{p}{i}$ are all divisible by p for $0 < i < p$. This simple algebraic fact is remarkably powerful, often leading to deep theorems even about algebras over $\mathbb{Q}$ or $\mathbb{C}$ with surprisingly easy proofs. An early example is the Hochster Roberts theorem on the Cohen-Macaulayness of rings of invariants. In algebraic geometry, tricks involving p-th powers have led to strong vanishing theorems for line bundles on certain projective varieties. More recently, the Frobenius (or p-th power) map has been used to clarify the structure of certain cluster algebras, a new class of algebra with combinatorial structure introduced by Fomin and Zelevinsky in order to understand total positivity and canonical bases in a variety of contexts. In this talk, we hope to introduce the magic of the p-th power map to non-experts, with examples drawn from commutative algebra, algebraic geometry, and combinatorics. (Received February 06, 2014)