

# Symplectic Reflection Algebras

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## ABSTRACT

If we're given a finite group  $G$  acting on a finite dimensional vector space  $V$  we could double things up and study the action of  $G$  on  $V + V^*$ . At first sight this might not look too exciting, but it soon becomes obvious that we've added a new dimension! Indeed  $V+V^*$  has a symplectic form which  $G$  preserves so we come to ( $G$ -equivariant) questions in symplectic algebraic geometry and differential operators on  $V$ . In 2002 Etingof and Ginzburg associated a family of "symplectic reflection algebras" to  $V$  and  $G$ , which encoded much of this doubled action. We will discuss these algebras and the role they have played in answering a basic question in algebraic geometry and confirming a nice conjecture in combinatorics and classical invariant theory. We will also explain a principal theorem that is missing at the moment. This gap is the fault of the rigidity of non-commutative algebra.