Meeting: 1004, Bowling Green, Kentucky, ZHANG, Invited Address

1004-16-5 **James J. Zhang***, University of Washington. *Searching for quantum projective spaces.*

The 3-dimensional elliptic algebra was discovered by M. Artin and W. Schelter in 1986; together with J. Tate and M. Van den Bergh they finished the classification of regular algebras of global dimension three in 1991. These regular algebras give rise to noncommutative projective planes $q\mathbb{P}^2$s. The subject of noncommutative algebraic geometry has been developed rapidly since the work of Artin and his coauthors. Quantum projective spaces and quantum algebras have been studied extensively and have been related to physics and several areas of mathematics such as algebra, combinatorics, geometry, statistics and topology.

One central question in noncommutative algebraic geometry is to understand all quantum projective n-spaces $q\mathbb{P}^n$s for $n \geq 3$. This is the first step towards understanding all noncommutative spaces since most of interesting quantum spaces are subspaces of $q\mathbb{P}^n$. The project of searching for $q\mathbb{P}^3$s was started even before the classification of $q\mathbb{P}^2$s. Many researchers have directly contributed to this project. Several new methods and objects such as quantum groups and A_∞-algebras have been used in the study of $q\mathbb{P}^3$. In addition to $q\mathbb{P}^3$s, higher dimensional $q\mathbb{P}^n$s have been appearing more and more recently. These noncommutative spaces are closely related to several objects in noncommutative differential geometry developed by A. Connes' school. For example, quantum spheres can be identified properly with subspaces of $q\mathbb{P}^n$s. Mathematical physicists would also like to have more noncommutative Calabi-Yau spaces, which are a special kind of subspaces of $q\mathbb{P}^n$s for $n \geq 4$.

We will report successes and difficulties in the search of $q\mathbb{P}^n$s. (Received October 12, 2004)