1077-46-1641　　　　**J William Helton***, Bill Helton, Math Dept., UC San Diego, La Jolla, CA 92093.
　　　　　　　　　Noncommutative Inequalities.

The talk will cover aspects of inequalities for non-commutative functions on free *-algebras. At this point we have:

　　A. Free algebra versions of the classical real algebraic geometry description, or positivstellensatz, of when one polynomial p is positive on the domain where another, q, is positive. Recently a surprise is that if the domain defined by q is convex, then the positivstellensatz representation for p holds in a form which is as nice as it could possibly be and with no technical assumptions;

　　B. Classifications of convex rational functions, varieties and open sets. There are shockingly few;

　　C. A limited picture of free convex hulls and projections of free semi-algebraic sets;

　　D. Some theory of changes of variables to achieve non-commutative convexity;

　　E. Other.

　　The work originates in trying to develop some theory for studying the matrix inequalities which are ubiquitous in linear engineering systems and control. The talk will select a topic from the list above and will be co-ordinated with the speaker's collaborators who are in attendence. (Received September 20, 2011)