UNIVERSITY OF CALIFORNIA
RIVERSIDE

DEPARTMENT OF MATHEMATICS

COLLOQUIUM

Dr. Alan Weinstein
UC Berkeley

"Special subspaces in symplectic and Poisson geometry"

This talk will be a survey of problems, methods, and results in the linear algebra of symplectic (and Poisson, and presymplectic) vector spaces.

In a vector space V carrying a symplectic (i.e.~nondegenerate, skew-symmetric) bilinear form ω, each subspace A has a {\bf symplectic orthogonal} space A^ω consisting of those elements v for which $\omega(v,w)=0$ whenever $w\in A$. Subspaces for which the intersection of A with A^ω is equal to A, A^ω, or $\{0\}$ are especially important; they are called {\bf isotropic}, {\bf coisotropic}, or {\bf symplectic} respectively. When the first two conditions hold (i.e. $A = A^\omega$), the subspace is called {\bf lagrangian}.

Linear maps $(V,\omega_V)\leftarrow (W,\omega_W) $ whose graphs in the product $(V \times W,\omega_V \times -\omega_W)$ are isotropic, coisotropic, or lagrangian play a special role; they are symplectic embeddings, Poisson submersions, or symplectic isomorphisms respectively. Subspaces of these types in the product which are {\em not} graphs of mappings turn out to be important as well. Those which are lagrangian are called {\bf canonical relations} or {\bf lagrangian correspondences} and are of particular importance as the morphisms in symplectic categories.

In a manifold M carrying a closed non-degenerate 2-form, submanifolds with tangent spaces of the distinguished types above are the subject of many interesting problems, both solved and unsolved. Even at the linear level, there are still important problems having to do with classification of (k-tuples of) subspaces, composition of relations, and quantization.

Although most of this talk will concern elementary approaches to these problems, there will also be some reference to methods of derived geometry, as well as to the representation theory of quivers.

Wednesday, May 11th, 2016
Surge 284
Tea Time 3:40 p.m.
Talk Begins 4:10 p.m.