Abstracts

Sam Evens (University of Notre Dame)
The Gelfand-Zeitlin system and K-orbits on the flag variety
Abstract: I will discuss the interplay between orbits of $\mathrm{GL}(n-1)$ on the variety of flags in n-dimensional space and a complex analogue of the Gelfand-Zeitlin system that was studied by Kostant and Wallach. This is based on joint work with Mark Colarusso.

Allen Knutson (Cornell University)
Interval rank varieties and Grassmannian Schubert calculus
Abstract: There is a stratification of the Grassmannian, with strata indexed by affine permutations, that is natural from the point of view of Poisson, totally non-negative real, and characteristic p geometry. Nonetheless we will look at a slightly coarser stratification by "interval rank varieties" that is better-behaved under inclusion of smaller Grassmannians into larger. Our main result is a combinatorial formula for the (equivariant K-) homology classes of these varieties, and a geometric derivation thereof extending Vakil's "geometric Littlewood-Richardson rule", which handled only the case of Schubert varieties intersected with opposite Schubert varieties.

Conan Leung (Chinese University of Hong Kong)
Coisotropic A-branes in SYZ mirror symmetry
Abstract: We explain the role of coisotropic branes in mirror symmetry. Then we showed that it is invariant under SYZ mirror transformation in the semi-flat case.

Dragan Milicic (University of Utah)
Geometry, n-homology and discrete series
Abstract: Using D-module techniques one can calculate n-homology of modules over the enveloping algebra of a semisimple Lie algebra. We shall discuss one such formula and its application to calculation of n-homology of (limits of) discrete series. This is a joint work with Wilfried Schmid.

Victor Mouquin (University of Hong Kong)
On a Poisson structure on products of flag varieties
Abstract: Let G be a connected, complex semisimple Lie group equipped with the standard multiplicative Poisson structure, and B a Borel subgroup of G. We introduce a Poisson structure on $(G/B)^n$, which is defined using a very particular Lagrangian splitting of $\mathfrak{d}^n$, where $\mathfrak{d}$ is the double Lie algebra of G. The maximal torus H of G acts diagonally on $(G/B)^n$ by Poisson diffeomorphisms, and we describe the H-orbits of symplectic leaves. This work was motivated by understanding a natural Poisson structure on Bott-Samelson resolutions of the flag variety G/B. It is an ongoing joint work with J.-H. Lu.

Tudor Ratiu (École Polytechnique Fédérale de Lausanne)
The geometric nature of the Flaschka transformation
Abstract: The Flaschka transformation, introduced historically in the study of the Toda lattice, is shown to have a symplectic geometric meaning, establishing a symplectic diffeomorphism between certain coadjoint orbits and magnetic cotangent bundles. The example of the Flaschka transformation for the finite Toda lattice systems associated to an arbitrary Dynkin diagram is treated in detail as is the case of certain coadjoint orbits of semidirect product Lie groups with special emphasis of the Euclidean group.

Mathieu Stienon (Pennsylvania State University)
Poincaré-Birkhoff-Witt isomorphisms and L-infinity algebras associated to Lie pairs
Abstract: We unveil strong homotopy Lie algebras generated by the Atiyah classes relative to a Lie pair (L, A) of algebroids. In particular, we prove that the quotient L/A of such a pair admits an essentially canonical homotopy module structure over the Lie algebroid A, which we call Kapranov module.

Aissa Wade (Pennsylvania State University)
An odd-dimensional counterpart of generalized complex geometry
Abstract: Thirteen years ago, Nigel Hitchin introduced generalized complex geometry which has been developed since then. Generalized complex structures on an even-dimensional manifold M are generalizations of symplectic and complex structures on M. They can be viewed as complex structures on the vector bundle $TM \oplus T^*M$. In this talk, we will discuss their odd-dimensional analogues, called generalized contact structures. Although these new geometric objects provide a natural framework for a generalization of contact structures, there is a sharp contrast with generalized complex geometry. Non-trivial examples can be constructed using a Boothby-Wang construction type.

Ping Xu (Pennsylvania State University)
Holomorphic Poisson manifolds and symplectic realizations
Abstract: For a complex manifold X, it is well known that T^*X is a holomorphic symplectic manifold. The complex manifold X can be seen as a (rather trivial) holomorophic Poisson manifold when endowed with the zero Poisson bracket. The canonical projection from T^*X to X is a Poisson map and X is embedded as a Lagrangian submanifold of T^*X (by the zero section). In this talk, I will show that a similar phenomenon holds when the Poisson bracket on X is not trivial.

Ting Xue (University of Helsinki)
Nilpotent orbits and Springer representations
Abstract: Via an explicit geometric construction, the Springer correspondence relates nilpotent orbits in the Lie algebra of a connected reductive algebraic group to irreducible representations of its Weyl group. The theory works uniformly for Lie algebras over complex numbers and in finite characteristics except for certain bad primes. It is important to understand the theory at all primes, for example, for the purposes of number theory. We extend the theory of Springer correspondence to bad characteristics. A crucial ingredient is the classification of nilpotent coadjoint orbits in bad characteristics. We also discuss a partition of the nilpotent varieties into nilpotent pieces, which have nice properties independently of the characteristic of the base field.

Milen Yakimov (Louisiana State University)
Poisson unique factorization domains in Lie theory
Abstract: We will describe a general theory of Poisson unique factorization domains which is a ring theoretic notion for the Poisson prime ideals of a Poisson algebra. With its help one constructs cluster algebra structures on axiomatic families of Poisson algebras which include various families of coordinate rings of varieties that come from Lie theory. Two applications of this technique resolve 1) the problem of whether the coordinate rings of double Bruhat cells equal the cluster algebras of Berenstein, Fomin and Zelevinsky and 2) the problem for constructing maximal green sequences for those cluster algebras. The latter notion was introduced by Keller in relation to dilogarithm identities and Donaldson-Thomas invariants. This is a joint work with Ken Goodearl (UCSB).

Yunxin Zhang (University of Hong Kong)
Characterization of standard model in rational homogeneous spaces by means of VMRT-structure
Abstract: In a series of works, Jun-Muk Hwang and Ngaiming Mok have developed a geometric theory of uniruled projective manifolds, especially those of Picard number 1, relying on the study of *varieties of minimal rational tangents* (VMRT) from both algebro-geometric and G-structure perspective. Basing on this theory, Ngaiming Mok and Jaehyun Hong studied the standard embedding between two rational homogeneous spaces (RHS) associated to a long simple root which are of different dimensions. In this talk, we investigate the complex submanifold S sitting in an RHS $X = G/P$ such that S inherits a geometric structure from X defined by the VMRT of a standard one $X_0 = G_0/P_0$ through linear intersection in the tangent space of each point. We give a characterization of the pairs (X_0, X) such that S is nothing other than the standard X_0 itself. We say such kind of pair is *rigid*. Note that all the RHS involved in this article are associated to a long simple root. Since we directly study a submanifold $S \subset X$, which may not come from the image of any holomorphic embedding.