Differential Geometry
Géométrie différentielle
(Org: **Benoit Charbonneau** (Waterloo), **Spiro Karigiannis** (Waterloo) and/et **McKenzie Wang** (McMaster))

AILANA FRASER, UBC
Uniqueness theorems for free boundary minimal surfaces

Free boundary minimal surfaces in a ball in $\mathbb{R}^n$ or a space N^n of constant curvature are proper branched minimal immersions of a surface into the ball that meet the boundary orthogonally. Such surfaces have been extensively studied, and they arise as extremals of the area functional for relative cycles in the ball. They also arise as extremals of a certain eigenvalue problem. I will talk about recent joint work with R. Schoen showing that a free boundary minimal *disk* in a constant curvature ball of any dimension is totally geodesic. This extends to higher dimensions earlier three dimensional work of J. C. C. Nitsche and R. Souam. We also have a uniqueness result for free boundary minimal *annuli*, which we use to prove a sharp eigenvalue bound on the annulus. Finally, I will discuss joint work with M. Li showing that in general, the space of *embedded* free boundary minimal surfaces in the ball of *a fixed topological type* is compact.

MARCO GUALTIERI, University of Toronto
Log symplectic vs generalized complex geometry

I will describe a formalism analogous to Melrose's b-calculus which is applicable to the study of generalized complex manifolds as well as new variants which may exist on odd-dimensional manifolds. I will also explain how the formalism allows us to prove new results and constraints on generalized complex manifolds of generic type.

JACQUES HURTUBISE, McGill University
Poisson Surfaces and Integrable Systems

There is a remarkably simple classification of complex Poisson surfaces. What is more surprising is they seem to have a link to the commonly studied algebraically integrable systems, at least when the level sets of the Hamiltonians are Jacobians of curves. Until recently, there was, however, one class of surfaces that had no known corresponding integrable system. This is no longer the case. Joint with Indranil Biswas.

RUXANDRA MORARU, University of Waterloo
Generalized holomorphic bundles on non-Kaehler elliptic surfaces

In this talk, we examine generalized holomorphic bundles on non-Kaehler elliptic surfaces. When the generalized complex structure comes from the underlying complex structure on the surface, these bundles correspond to co-Higgs bundles; in this case, we also describe moduli spaces of stable co-Higgs bundles on these surfaces.

FRÉDÉRIC ROCHON, UQÀM
A Cheeger-Müller theorem on manifolds with cusps

The Cheeger-Müller theorem relates the R-torsion and analytic torsion on a closed manifold. On a manifold with conical singularities, Dar introduced in 1987 the intersection R-torsion, which is defined in terms of intersection cohomology, and asked if this could be related to the analytic torsion of some metric geometrically encapsulating the information about the singularities. In this talk, we will provide a positive answer to this question by relating the intersection R-torsion with the analytic torsion of a cusp metric. The strategy will be to start with a closed manifold and to pinch a hypersurface to obtain a cusp manifold. Computing what is happening to the R-torsion and analytic torsion under such a degeneration then gives the result. This is a joint work with Pierre Albin and David Sher.

REZA SEYYADALI, University of Waterloo
Extremal metrics on ruled manifolds

Consider a compact Kahler manifold with extremal Kahler metric and a Mumford stable holomorphic bundle over it. We show that, if the holomorphic vector field defining the extremal Kahler metric is liftable to the bundle and if the bundle is relatively stable with respect to the action of automorphisms of the manifold, then there exist extremal Kahler metrics on the projectivization of the dual vector bundle.

WILLIAM WYLIE, Syracuse University
Positive weighted sectional curvature

We propose a new generalization of positive sectional curvtaure we call positive weighted sectional curvature, which depends on the choice of a smooth vector field on a Riemannian manifold. The definition is motivated by the correspoinding notion of Ricci curvature for manifolds with density which was developed by Bakry-Emery and their collaborators. We show that many basic results for positive curvature also hold for positive weighted curvature. For example, positive weighted curvature is preserved by Riemannian submersions and Synge-type theorems hold. We also show that topological classifications results of Grove-Searle and Wilking on compact manifolds of high symmetry rank and positive curvature can be generalized to positive weighted curvature. This is joint work with Lee Kennard of UCSB.

XIANGWEN ZHANG, Columbia University
Minkowski formulae and Alexandrov's theorems in spacetimes

The classical Minkowski formulae for hypersurfaces is very important in the study of many problems in geometric analysis. I will talk about a generalization of those formulae with two important new features: codimension 2 submanifolds are considered instead of hypersurfaces, and the ambient manifold is Lorentzian. As applications, I will discuss some Alexandrov type theorems for spacelike submanifolds. This gives an analogue of the classical Alexandrov's theorem, which states that any closed embedded hypersurface of constant mean curvature in Euclidean space must be a round sphere. This is a recent joint work with M.-T. Wang and Y.-K. Wang.