Invited & Contributed Talks

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
9:00 – 9:50	**Registration**	**Tuschmann**	**Pulemotov**	**Wylie**	**Vezzoni**
10:00 – 10:30	**Registration**	**Galaz-García**	**Gilkey**	**Will**	**Jablonski**
10:30 – 11:00	**Registration**	COFFEE	COFFEE	COFFEE	COFFEE
11:00 – 11:50	**Registration**	**Wilking**	**Chiossi**	**Nikolayevsky**	**Fino**
12:00 – 12:30	**11:30 Böhm**	**Vittone**	**Ovando**	**Henry**	**Wolf**
12:30	LUNCH	LUNCH	LUNCH	LUNCH	ASADO
14:30 – 15:00	**Kerr**	**Mainkar**		**Gornet**	
15:05 – 15:35	**Payne**	**Deré**		**Sandoval**	
15:40 – 16:10	**Sa Earp**	**de Borbón**		**del Barco**	
16:10 – 17:00	COFFEE	COFFEE		COFFEE	
17:00 – 17:20	**Adelstein**	**Barros**		**Subils**	
17:20 – 17:40	**Mützel**	**Wanderley**		**Riaño-Riaño**	
17:40 – 18:00	**Ray**	**Origlia**		**Gozzi**	
18:00 – 18:20	**Pengitore**	**Herrera**		**Tsartsaflis**	
18:20 – 18:40	**Stolarski**	**Guajardo**		**Buttsworth**	
20:30	DINNER	DINNER	DINNER	DINNER	

Schedule of Courses

	MONDAY	TUESDAY	WEDNESDAY
9:00 – 10:30	Registration	**Emilio Lauret**	**Ramiro Lafuente**
10:30 – 11:00	COFFEE	COFFEE	COFFEE
11:00 – 12:30	**11:30 Plenary**	**Silvio Reggiani**	**Emilio Lauret**
12:30	LUNCH	LUNCH	LUNCH
14:30 – 16:00	**Marcos Salvai**	**Guillermo Henry**	**Silvio Reggiani**
16:00 – 17:00	COFFEE	COFFEE	COFFEE
17:00 – 18:30	**Laura Barberis**	**Marcos Salvai**	**Guillermo Henry**
18:30 – 20:00	**Ramiro Lafuente**	**Laura Barberis**	
20:30	DINNER	DINNER	DINNER

Laura Barberis
Universidad Nacional de Córdoba & CONICET
Introduction to Kähler geometry

Guillermo Henry
Universidad de Buenos Aires & CONICET
Scalar curvature and the Yamabe constant

Ramiro Lafuente
Westfälische Wilhelms-Universität Münster
Ricci solitons

Emilio Lauret
Universidad Nacional de Córdoba & CONICET
An introduction to spectral geometry

Silvio Reggiani
Universidad Nacional de Rosario & CONICET
Dynamical aspects of geodesics on the sphere

Marcos Salvai
Universidad Nacional de Córdoba & CONICET
Detecting submanifolds of minimum volume with calibrations

Speakers

The following abstracts are presented in alphabetical order by author

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Ian Adelstein
Trinity College
The G-invariant spectrum and non-orbifold singularities
20-minute talk: MONDAY 17:00 - 17:20

This work is joint with Mary Sandoval. We consider the G-invariant spectrum of the Laplacian on an orbit space M/G where M is a compact Riemannian manifold and G acts by isometries. When such an orbit space is isometric as a metric space to an orbifold we show that the respective G-invariant and orbifold spectra are equivalent. We generalize the Sunada-Pesce-Sutton technique to the G-invariant setting to produce pairs of isospectral non-isometric orbit spaces. One of these spaces is isometric to an orbifold with constant sectional curvature whereas the other admits non-orbifold singularities and therefore has unbounded sectional curvature. We conclude that constant sectional curvature and non-orbifold singularities are inaudible properties of the G-invariant spectrum.

Julio César Barros
Universidad Nacional de Río Cuarto
Level Sets of the Normal Sections on Isoparametric Hypersurfaces
20-minute talk: TUESDAY 17:00 - 17:20

The present talk is devoted to the study of the level sets of the polynomials that defines the normal sections on the homogeneous isoparametric hypersurfaces in spheres. We present some new results about homogeneous isoparametric hypersurfaces in spheres, whose number of distinct curvatures is less than or equal four.
Since it is required for our study, we give also explicit expressions for these polynomials.

Christoph Böhm
Westfälische Wilhelms-Universität Münster
Immortal homogeneous Ricci flows
50-minute talk: MONDAY 11:30 - 12:20

We show that any sequence of type III blow downs of an immortal homogeneous Ricci flow solution subconverges to an expanding Ricci soliton. Applications to Einstein solvmanifolds and solvsolitons will be given. This is joint work with Ramiro Lafuente.

Timothy James Buttsworth
The University of Queensland
The Prescribed Ricci Curvature Problem on Three-Dimensional Unimodular Lie Groups
20-minute talk: THURSDAY 18:20 - 18:40

Let G be a three-dimensional unimodular Lie group, and let T be a left-invariant symmetric $(0,2)$-tensor field on G. We provide the necessary and sufficient conditions on T for the existence of a pair (g,c) consisting of a left-invariant Riemannian metric g and a positive constant c such that $\mathrm{Ric}(g) = cT$, where $\mathrm{Ric}(g)$ is the Ricci curvature of g.
We also discuss the uniqueness of such pairs and show that, in almost all cases, there exists at most one positive constant c such that $Ric(g) = cT$ is solvable for some left-invariant Riemannian metric g.

Simon G. Chiossi
Universidade Federal da Bahia
Spinorial equations for special geometries
50-minute talk: WEDNESDAY 11:00 - 11:50

The spin formalism is a natural setting for treating many Riemannian G-manifolds of low dimension, G being a special Lie group, for it allows to extend previous knowledge and provides a nice and uniform picture. The talk will present joint results with Salamon, Agricola-Friedrich-Hoell, and focus on the cases $G = SU(3)$ and G_2.

Martín de Borbón
Universidad Nacional de San Luis
Blow-up limits of Kähler-Einstein metrics with cone singularities
30-minute talk: TUESDAY 15:40 - 16:10

The talk is about degenerations of non-collapsed sequences of Kähler-Einstein metrics on a complex surface with cone singularities along smooth complex curves. This topic has some similarities with the well-stablished theory of Anderson for the case of smooth metrics on 4-manifolds. The new feature is the behavior of the metrics as the curve degenerates. I will talk about the possible tangent cones on the limit spaces, the blow-up limits and the relations to algebraic geometry.

Viviana Jorgelina del Barco
Universidade Estadual de Campinas
Nondegenerate $(0,2)$-tensors on nilradicals of parabolic subalgebras
30-minute talk: THURSDAY 15:40 - 16:10

Simple Lie algebras, their real forms, parabolic subalgebras, and nilradicals of these parabolic subalgebras have been considered by many authors as candidates to find specific geometric structures giving rise to invariant geometric structures on the corresponding Lie groups and their quotients.

The aim of this presentation is to analyze existence of nondegenerate (0,2)-tensors on these Lie algebras; in particular invariant symmetric and closed skew-symmetric (0,2)-tensors which correspond to bi-invariant metrics and left-invariant symplectic structures at the Lie group level. Among the above candidates, it is well known that semisimple Lie algebras do not admit symplectic structures [3] and Borel subalgebras admitting symplectic structures have been described in [1]. The Killing form on semisimple Lie algebras gives an invariant symmetric nondegenerate bilinear form.

In this talk we focus on the family of nilradicals of parabolic subalgebras. We introduce tools which allow us to give the explicit list of the symplectic nilradicals and those nilradicals admitting invariant metrics. As a first step we find properties which are obstructions for a Lie algebra to admit such tensors. These are cohomological in the skew symmetric case and structural in symmetric one. Afterwards, we prove that almost every nilradical satisfies these obstructions, thus obtaining only few nilradicals admitting invariant tensors. The root system of the simple Lie algebra related to the parabolic subalgebra is fundamental to prove the results.

The presentation is a summary of the results in [2] and [4].

References

[1] Alekseevsky, D. and Perelomov, A., *Poisson and symplectic structures on Lie algebras. I.*, J. Geom. Phys., **22** (3) (1997), 191–211.

[2] Cagliero, L. and del Barco, V., *Nilradicals of parabolic subalgebras admitting symplectic structures*, Differ. Geom. Appl. 46 (2016) 1-13.

[3] Chu, B., *Symplectic homogeneous spaces.*, Trans. Am. Math. Soc., **197** (1974), 145–159.

[4] del Barco, V., *Lie algebras admitting symmetric invariant and nondegenerate bilinear forms*, preprint arXiv:1602.08286.

Jonas Deré
Katholieke Universiteit Leuven Kulak
Which manifolds admit expanding maps?
30-minute talk: TUESDAY 15:05 - 15:35

In 1981, M. Gromov completed the proof that every manifold admitting an expanding map is, up to finite cover, homeomorphic to a nilmanifold. Since then it was an open question to give an algebraic characterization of the nilmanifolds admitting an expanding map. During my talk, I will start by introducing the basic notions of expanding maps and nilmanifolds. Then I explain how the existence of such an expanding map only depends on the covering Lie group and on the existence of certain gradings on the corresponding Lie algebra. One of the applications is the construction of a nilmanifold admitting an Anosov diffeomorphism but no expanding map, which is the first example of this type.

Anna Fino
Università degli Studi di Torino
Algebraic dimension of complex nilmanifolds
50-minute talk: FRIDAY 11:00 - 11:50

Let $a(M)$ be the algebraic dimension of a complex manifold M and $h(M)$ be the dimension of its space of holomorphic differentials. We show that, If M is a compact complex nilmanifold, then $a(M) \leq h(M)$. We use it to determine $a(M)$ when M has complex dimension 3 and also mention a relation with the Kähler rank of M. The talk is based on a joint paper with G. Grantcharov and M. Verbitsky.

Fernando Galaz-García
Karlsruher Institut für Technologie
Positive Ricci curvature and cohomogeneity two torus actions
30-minute talk: TUESDAY 10:00 - 10:30

Bazaikin and Matvienko showed that every closed, simply-connected smooth 4-manifold with an effective smooth action of the 2-torus admits an invariant metric with positive Ricci curvature. I will discuss how to extend this result to show that every closed, simply-connected smooth $(n+2)$-manifold with an effective smooth action of an n-torus admits an invariant metric of positive Ricci curvature.

Peter Gilkey
University of Oregon
Moduli spaces of Type $\mathcal{A}$ geometries
30-minute talk: WEDNESDAY 10:00 - 10:30

The homogeneous affine surfaces have been classified by Opozda (without torsion) and by Arias-Marco and Kowalski (with torsion); they fall into 3 families (Type $\mathcal{A}$, $\mathcal{B}$, and $\mathcal{C}$). The type $\mathcal{A}$ geometries are those where there is a coordinate atlas where the Christoffel symbols are (locally) constant.

We discuss moduli spaces related to these geometries both in the 2-dimensional and in the higher dimensional settings. This is joint work with M. Brozos-Vazquez, E. García-Río, and J.H. Park.

Ruth Gornet
University of Texas, Arlington
The Eta Invariant on Nilmanifolds
30-minute talk: THURSDAY 14:30 - 15:00

The eta invariant appears regularly in index theorems but is known to be computable only in certain examples of locally symmetric spaces of compact type. For general two-step nilmanifolds, the eigenvalues of the Dirac operator are presented as eigenvalues of matrices, with Kirrilov Theory the main too. This is analogous to the calculation of the Laplace spectrum by H. Pese. For general Heisenberg three-manifolds, the spectrum of the spin Dirac operator and the eta invariant are explicitly computed in terms of the metric, lattice, and spin structure data. There are continuous families of geometrically, spectrally different Heisenberg three-manifolds whose Dirac operators have constant eta invariant. We also show that the Dirac spectrum is symmetric about zero in Heisenberg manifolds of dimension 4m+1, which confirms that the eta invariant is automatically zero in these dimensions.

This work is joint with Ken Richardson, Texas Christian University.

Francisco José Gozzi
Universidade de São Paulo
A Note On Polar Representations
20-minute talk: THURSDAY 17:40 - 18:00

Polar representations of compact connected Lie groups are orbit equivalent to symmetric space representations as proven in a seminal work by J. Dadok.
The linear classification of polar representations was later completed by J. Eschenburg and E. Heintze in the irreducible case. It turns out that such representations are determined by the group and a principal isotropy subgroup, though this is no longer true in the reducible case. We show that any polar representation of a connected Lie group is determined by its history and dimension, the former term referring to the collection of isotropy subgroups that appear along a polar section. This is necessary for the reconstruction procedure of K. Grove and W. Ziller.

Óscar Guajardo-Garza
Universidad Nacional Autónoma de México, Unidad Cuernavaca
Smooth Lie supergroups
20-minute talk: TUESDAY 18:20 - 18:40

I'll propose a classical approach to differential supergeometry, in the sense that the sheaf-theoretic approach replaced with concepts closer to classical differential geometry, viz. superalgebra bundles. After proving some results with this perspective I'll explore the group objects in the appropriate categories and show results concerning these Lie supergroups.

Guillermo Henry
Universidad de Buenos Aires & CONICET
Nodal solutions of the Yamabe equation and the second Yamabe constant
30-minute talk: THURSDAY 12:00 - 12:30

Let (M, g) be a closed Riemannian manifold of $\dim(M) = n \geq 3$. We say that $u \in C^\infty(M)$ is a solution of the Yamabe equation if there exists $\lambda \in \mathbb{R}$ such that u satisfies

$$a_n \Delta_g u + s_g u = c|u|^{\frac{4}{n-2}} u \tag{1}$$

where $a_n = 4(n-1)/(n-2)$ and s_g is the scalar curvature of (M, g). If u is a positive solution of the Yamabe equation, then $u^{\frac{4}{n-2}} g$ is a Riemannia metric of constant scalar curvature c. It is well know that there exists a positive solution of (1) if λ and the Yamabe constant of (M, g) have the same sign. A nodal solution of Yamabe equation is a solution of (1) which changes sign. The second Yamabe constant is defined by

$$Y^2(M, g) := \inf_{h \in [g]} \lambda_2(L_h) vol(M, h)^{\frac{2}{n}}$$

where $[g]$ is the conformal class of g and $\lambda_2(L_h)$ is the second eigenvalue of the conformal Laplacian of L_h. This constant is related with nodal solutions of the Yamabe equation (see [1]).

In this talk we are going to discuss some results about the asymptotic behaviour of the second Yamabe constant of a Riemannian product $(W \times N, g + th)$ $(t > 0)$. As a consequence, we are going to prove the existence of nodal solutions for $(W \times N, g + th)$ (provided t large enough). Also, we will discuss the existence of $G-$invariant nodal solutions, where G is a compact subgroup of the isometry group. The equivariant results are part of a work in progress joint with Farid Madani.

References

[1] B. Ammann, E. Humbert, *The second Yamabe invariant*, Journal of Functional Analysis **235** (2006), 377-412.

[2] G. Henry, *Second Yamabe constants on Riemannian products*, (2015) arXiv:1505.00981

Andrea Cecilia Herrera
Universidad Nacional de Córdoba
Parallel 2-forms and Killing Yano 2-forms in low dimensional Lie groups and some examples in flag manifolds
20-minute talk: TUESDAY 18:00 - 18:20

In the 70's, Gray and Hervella classified all the almost Hermitian manifolds (M, J, g). Their work is based on the descomposition in $U(n)$-irreducible components of a subspace W in $TM \otimes TM \otimes TM$ where $(\nabla\omega)$ belongs. Here, $\omega(x, y) = g(Jx, y)$, is the Kähler form .
We now consider (M, H, g) as above but now the condition $H^2 = -I$ is replaced by the weaker condition: H is skew symmetric. We are interested in manifolds with the extra condition $\nabla H = 0$ (parallel condition) or more generally with the weaker condition $(\nabla_x H)x = 0 \ \forall \ x \in \ TM$ (Killing-Yano condition). We find examples of these manifolds in Lie groups of dimension 2,3 and 4 and some examples in flag manifolds.

Michael Jablonski
University of Oklahoma
Maximal symmetry in solvmanifolds
30-minute talk: FRIDAY 10:00 - 10:30

We consider the question of which groups arise as isometry groups of solvmanifolds. For those solvable Lie groups which admit an invariant Einstein metric, we show the isometry group of the Einstein metric is maximal in the sense that it contains the isometry group of any other left-invariant metric. This work is joint with Carolyn Gordon.

Megan Kerr
Wellesley College
Submanifolds of Einstein solvmanifolds
30-minute talk: MONDAY 14:30 - 15:00

In a 2011 paper, H. Tamaru finds new examples of Einstein solvmanifolds, as submanifolds of noncompact symmetric spaces. His method uses parabolic subalgebras of semisimple Lie algebras to build solvable subalgebras by restricting to a subset Λ' of the set Λ of simple roots in order to generate a subalgebra. The corresponding submanifold, with the inherited inner product, is called an *attached* solvmanifold. Tamaru proves that the Ricci curvature is inherited, unchanged. Thus whenever the original solvmanifold is Einstein, the attached subsolvmanifold is also Einstein.
We explore the criteria needed in order for Tamaru's method to be extended to more general Einstein solvmanifolds. (Joint work with T. Payne.)

Meera G. Mainkar
Central Michigan University
Metric 2-step Nilpotent Lie Algebras associated with Graphs
30-minute talk: TUESDAY 14:30 - 15:00

We consider a class of metric 2-step nilpotent Lie algebras associated with simple graphs. First we classify singularity properties of the Lie algebra in terms of the corresponding graph. We then give a necessary and sufficient condition on the graph for the associated Lie algebra to be Heisenberg-like. The density of closed geodesics property has been studied previously for different classes of 2-step nilpotent Lie algebras. In this talk, we will discuss conditions on the graph and on a lattice of the 2-step nilpotent Lie group associated with the graph for which the nilmanifold has a dense set of smoothly closed geodesics.
This work is joint with Rachelle DeCoste and Lisa DeMeyer

Björn Mützel
Dartmouth College
The Jacobian variety of Riemann surfaces with short simple closed geodesics
20-minute talk: MONDAY 17:20 - 17:40

To any compact Riemann surface of genus $g > 1$ one may assign a principally polarized abelian variety of dimension g, the Jacobian of the Riemann surface. The Jacobian is a complex torus and we call a Gram matrix of the lattice of a Jacobian a period Gram matrix. We give explicit estimates for the entries of the period Gram matrix with respect to a suitable homology basis, if the Riemann surface contains a short simple closed geodesic γ and study this matrix, if the geodesic is pinched.

Yuri Nikolayevsky
La Trobe University
Rank one Einstein extensions of Riemannian manifolds
50-minute talk: THURSDAY 11:00 - 11:50

Given a Riemannian space N of dimension n and a field D of symmetric operators on N, we define the extension M of N by D to be the Riemannian manifold of dimension $n+1$ obtained from N by a construction similar to extending a Lie group by a derivation of its Lie algebra. We find the conditions on N and D which imply that the extension M is Einstein. In particular, we show that D has constant eigenvalues, and the set of eigenvalues satisfies the restrictions similar to those in the homogeneous case. We give a characterisation of Einstein extension for particular eigenvalue types of D, and a complete classification of Einstein extensions of dimension four – all of them are Einstein solvmanifolds. We study the case when N is a Lie group and under some additional assumptions show that if the extension M is Einstein, it is a solvmanifold.
This is a joint work with D. Alekseevsky

Marcos Miguel Origlia
Universidad Nacional de Córdoba
Construction of locally conformal geometric structures on solvmanifolds
20-minute talk: TUESDAY 17:40 - 18:00

In this talk we study left invariant locally conformal symplectic (LCS) and locally conformal Khler (LCK) structures on solvable Lie groups. Beginning with an LCS (or LCK) Lie algebra and a suitable representation, we give a construction of an LCS (or LCK) structure in the semidirect product of the Lie algebra with the representation space. Finally we study the existence of lattices in the associated simply connected Lie group in order to obtain a solvmanifold equipped with these geometric structures.

Gabriela Ovando
Universidad Nacional de Rosario & CONICET
Isometries on pseudo-Riemannian nilmanifolds
30-minute talk: WEDNESDAY 12:00 - 12:30

We study the isometry group of a 2-step nilpotent Lie group equipped with a pseudo-Riemannian metric which is invariant by translations on the left. As in the Riemannian situation the key is to understand the group of isometries fixing the identity element. It was proved that this group could be different to the group of orthogonal automorphisms, even for non-degenerate center. We investigate such group and propose a description in low dimensions.

Tracy Payne
Idaho State University
The Ricci Flow for Homogeneous Spaces from the Perspective of Evolutionary Game Theory
30-minute talk: MONDAY 15:05 - 15:35

We use evolutionary game theory to analyze the Ricci flow for homogeneous spaces. We start with a brief review of evolutionary game theory. We show that the Ricci flow for homogeneous spaces is the replicator dynamic for a linear or quadratic game. We relate game-theoretic notions to geometric notions; for example, soliton metrics correspond to Nash equilibria. We generalize a well-known formula for computing soliton metrics for homogeneous spaces. We propose using other game dynamics beside the replicator dynamic to define geometric evolution equations. The Ricci flows for several specific classes of homogeneous spaces are analyzed using these methods.

Mark Andrew Pengitore
Purdue University
Effective separability of lattices in nilpotent Lie groups
20-minute talk: MONDAY 18:00 - 18:20

We give the precise asymptotic behavior of residual finiteness for cocompact lattices in connected, simply connected nilpotent Lie groups

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Artem Pulemotov
University of Queensland
The Ricci iteration on homogeneous spaces
50-minute talk: WEDNESDAY 9:00 - 9:50

The Ricci iteration is a discrete analogue of the Ricci flow. Introduced in 2007, it has been studied extensively on Kähler manifolds, providing a new approach to uniformisation. In the talk, we will define the Ricci iteration on compact homogeneous spaces and discuss a number of existence, convergence and relative compactness results. This is largely based on joint work with Yanir Rubinstein (The University of Maryland).

Allie D. Ray
Trinity College
The Steklov Spectrum on Orbifolds
20-minute talk: MONDAY 17:40 - 18:00

We begin by discussing some classical results about geometric properties of manifolds determined by the Laplace and Steklov spectrum. After introducing the concept of an orbifold, we will then look at how these results transfer (or fail to transfer) to the orbifold setting, specifically to the setting of compact 2-dimensional orbifolds.

Richar Fernando Riaño-Riaño
Universidad de los Andes
Submanifolds and Holonomy
20-minute talk: THURSDAY 17:20 - 17:40

In 1994 was formulated the following conjeture, like a possible generalization of the rank rigidity theorem for homogeneous submanifolds : An Irreducible and full homogeneous submanifolds of the sphere, different from a curve, such that the normal holonomy group is not transitive must be an orbit of an s-representation, motevated by that we do a brief introduction to the submanifolds and the relation with the normal holonomy group, and the most recent advances in this geometrical conjeture.

Henrique Nogueira de Sá Earp
Universidade Estadual de Campinas
G_2 *instantons over quintic Milnor links*
30-minute talk: MONDAY 15:40 - 16:10

Every quintic Milnor link K on a real 9-sphere is a nontrivial Sasakian circle fibration over a Calabi-Yau 3-fold. It admits a canonical co-closed G_2-structure reflecting locally the Calabi-Yau geometry, which induces a natural Yang-Mills theory with many important features of the torsion-free case, such as a Chern-Simons formalism, topological energy bounds and a deformation theory of index 0. In particular, we obtain G_2-instantons on bundles over K from Hermitian Yang-Mills connections over the quintic Calabi-Yau, thus relating in a concrete example the well-known Donaldson-Thomas invariant with a conjectural G_2-instanton count.

Mary R. Sandoval
Trinity College
Leaf Spaces of Singular Riemannian Foliations and Applications to Spectral Geometry
30-minute talk: THURSDAY 15:05 - 15:35

In this talk, we examine the leaf spaces of singular Riemannian foliations and their isometries. In particular, we will review recent results from the literature on smooth isometries of the leaf spaces of singular Riemannian foliations. These leaf spaces include many familiar settings for spectral problems, including manifolds, orbifolds, orbit spaces of G-manifolds, the transverse space of regular Riemannian foliations, as well as more general settings. We also present new results showing that these leaf space isometries preserve the spectrum of the Laplacian on functions on the leaf space, and give insight into the spectral theory of orbifolds, and other leaf spaces of wider interest.

Maxwell Edward Stolarski
The University of Texas at Austin
Steady Ricci Solitons on Complex Line Bundles
20-minute talk: MONDAY 18:20 - 18:40

I'll provide a brief survey of examples of Ricci solitons and then outline the construction of new steady Ricci solitons on the total space of complex line bundles over a Fano Kahler-Einstein base with first Chern class proportional to that of the base. The construction produces cohomogeneity one solitons when the base manifold is homogeneous. These soliton metrics are typically non-Káhler except in the case of the canonical line bundle.

Mauro Subils
Universidad Nacional de Rosario & CONICET
Parabolic geometries and H-type Lie algebras
20-minute talk: THURSDAY 17:00 - 17:20

We classify the Lie algebras of Heisenberg type that are nilradicals of parabolics subalgebras of semisimple Lie algebras, deduce that every simple non-compact Lie Group determines a unique parabolic geometry of that type, and study some of its properties.

Ioannis Tsartsaflis
La trobe University
On the cohomology of filiform Lie algebras over $\mathbb{Z}_2$
20-minute talk: THURSDAY 18:00 - 18:20

We will talk about filiform Lie algebras over fields of characteristic two and we will calculate the cohomology with trivial coefficients of the infinite dimentional Lie algebra $\mathfrak{m}_0$: $[e_1, e_i] = e_{i+1}$ for $2 \leq i$ over $\mathbb{Z}_2$.

Wilderich Tuschmann
Karlsruher Institut für Technologie
Spaces and moduli spaces of metrics with lower curvature bounds
50-minute talk: TUESDAY 9:00 - 9:50

I will discuss connected and non-connectedness properties of spaces and moduli spaces of Riemannian metrics with nonnegative sectional and/or positive Ricci curvature on closed and open manifolds, and, in particular, the following result which is joint work with A. Dessai and St. Klaus:
In each dimension $4n + 3$, $n \geq 1$, there exist infinite sequences of closed smooth simply connected manifolds M of pairwise distinct homotopy type for which the moduli space of Riemannian metrics with nonnegative sectional curvature has infinitely many path components.

Luigi Vezzoni
Università degli Studi di Torino
The Calabi-Yau problem on fibrations and generalized Monge-Ampère equations
50-minute talk: FRIDAY 9:00 - 9:50

The Calabi-Yau equation is a PDEs system whose study goes back to the celebrated Calabi conjecture. Recently, Donaldson has described how the equation could be generalized in a natural way to the setting of 2-forms on 4-manifolds. Donaldson's program, if carried out, would lead to many new and important results in symplectic geometry. Given a 4-dimensional compact symplectic manifold (M, Ω) together an $\Omega-$compatible almost-complex structure J, the Calabi-Yau equation consists in

$$(\Omega + d\alpha)^2 = \mathrm{e}^F \, \Omega^2 \,, \quad Jd\alpha = d\alpha$$

where $F \in C^\infty(M)$ is given and α is a unknown 1-form. In contrast to the Kähler case, it is not known if the equation in the almost-complex setting has always a solution.

The talk focuses on the study of the Calabi-Yau equation in torus fibrations, when the initial datum F is invariant by the action of the fiber. It will be showed that in this case the equation reduces to a generalized Monge-Ampère equation on the basis having always a solution.

The last part of the talk will be about some resent advances on the problem in the Kodaira-Thurston manifold.

References

[1] E. Buzano, A. Fino and L. Vezzoni, The Calabi-Yau equation for T^2-bundles over a torus: the non-Lagrangian case, *Rend. Semin. Mat. Univ. Politec. Torino* **69** (2011), no. 3, 281–298.

[2] E. Buzano, A. Fino and L. Vezzoni, The Calabi-Yau equation on the Kodaira-Thurston manifold, viewed as S^1-bundle over a 3-torus, *J. Differential Geom.* **101** (2015), no. 2, 175–195.

[3] A. Fino, Y.Y. Li, S. Salamon and L. Vezzoni, The Calabi-Yau equation on 4-manifolds over 2-tori, *Trans. Amer. Math. Soc.* **365** (2013), no. 3, 1551–1575.

[4] L. Vezzoni, On the Calabi-Yau equation in the Kodaira-Thurston manifold, preprint.

Francisco Vittone
Universidad Nacional de Rosario & CONICET
Submanifolds and Holonomy in Complex Space Forms
30-minute talk: TUESDAY 12:00 - 12:30

The *Normal Holonomy Theorem*, proved by Olmos in [Ol90], asserts that the action of the restricted normal holonomy group on any normal space $\nu_p M$ of a submanifold M of a (real) space form is the holonomy representation of a Riemannian symmetric space. It has many important applications to the study of submanifolds of spaces with constant sectional curvature, specially in the theory of isoparametric submanifolds (see [BCO03]).

The main tool in its proof is the Ricci identity, making it almost impossible to adapt it to more general ambient spaces. In this talk we will summarize some recent results concerning the normal holonomy of submanifolds of *complex space forms*, comparing and contrasting the properties of the action of the normal holonomy group in real and complex geometry. We shall show that the Normal Holonomy Theorem holds in an important large class of submanifolds, namely the so called CR-submanifolds (cf. [DV1]). Finally we will present a Berger-type holonomy theorem which allows us to classify all the complex submanifolds of $\mathbb{C}^n$ or $\mathbb{C}P^n$ with non transitive normal holonomy that generalizes the results presented in [CDO11] (cf. [DV2]).

References

[BCO03] Berndt, J.; Console S. and Olmos, C. *Submanifolds and holonomy,* , 2nd. Ed., Chapman & Hall/CRC , (2016).

[CDO11] Console, S.; Di Scala A. J.; Olmos C. *A Berger type normal holonomy theorem for complex submanifolds*, Math. Ann (2011), 351, 187-214.

[DV1] Di Scala, A. J.; Vittone F. *The normal holonomy of CR-submanifolds* to appear in Osaka J. of Math. (Vol. 54 No.1, 2017)

[DV2] Di Scala, A. J.; Vittone F. *Mok's characteristic varieties and the normal holonomy group* arXiv:1503.01941 (2015)

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Gabriela Albuquerque Wanderley
Universidade Federal da Paraíba
A half-space theorem for graphs of constant mean curvature $0 < H < 1/2$ *in* $\mathbb{H}^2 \times \mathbb{R}$
20-minute talk: TUESDAY 17:20 - 17:40

We study a half-space problem related to graphs in $\mathbb{H}^2 \times \mathbb{R}$, where $\mathbb{H}^2$ is the hyperbolic plane, having constant mean curvature H defined over unbounded domains in $\mathbb{H}^2 \times \mathbb{R}$.

Burkhard Wilking
Westfälische Wilhelms-Universität Münster
Manifolds with almost nonnegative curvature operator
50-minute talk: TUESDAY 11:00 - 11:50

We show that n-manifolds with a lower volume bound v and upper diameter bound D whose curvature operator is bounded below by $-\varepsilon(n, v, D)$ also admit metrics with nonnegative curvature operator. The proof relies on heat kernel estimates for the Ricci flow and shows that various smoothing properties of the Ricci flow remain valid if an upper curvature bound is replaced by a lower volume bound nonnegative curvature operator.

Cynthia Will
Universidad Nacional de Córdoba & CONICET
Negative Ricci curvature on Lie groups with a compact Levi factor
30-minute talk: THURSDAY 10:00 - 10:30

The question of when a differentiable manifold admits a Riemannian metric with a particular sign of the curvature is a very natural one. For homogeneous Riemannian manifolds, the case of sectional curvature is quite restrictive and well understood. Concerning negative Ricci curvature, although a great progress has been made lately, specially in the solvable case, the general case seems to be far from being completely understood. In this talk, we will begin by introducing the known results on negative Ricci curvature in the homogeneous case, and then we will show some unexpected examples of Lie groups with compact Levi factor that admits a metric with negative Ricci curvature.

Joseph Wolf
University of California, Berkeley
Homogeneity for Riemannian Quotient Manifolds
30-minute talk: FRIDAY 12:00 - 12:30

Let M be a simply connected Riemannian homogeneous space and $N = \Gamma\backslash M$ a Riemannian quotient manifold. The Homogeneity Conjecture says that N is homogeneous if and only if all the elements of Γ are isometries of constant displacement. This conjecture is proved when M is Riemannian (or even Finsler) symmetric, in a number of settings where M has enough negative curvature to force bounded isometries to be trivial, and in several settings where M is a Riemannian normal homogeneous space. I'll describe some new results proving the conjecture for a class of homogeneous spaces that includes twistor spaces, and time permitting I'll summarize the current state of the conjecture.

William Wylie
Syracuse University
Manifolds with positive weighted curvature and symmetry
50-minute talk: THURSDAY 9:00 - 9:50

We give a new approach to the study of the geometry of Riemannian manifolds with smooth measure that takes a natural torsion free connection as the fundamental object of study. The connection defines notions of Ricci and sectional curvature bounds which are slightly different than ones previously considered. Many obstructions to metrics of positive curvature can be extended to these weighted curvatures. In this talk we'll focus on presenting the following result: A compact locally homogeneous manifold admits a measure with non-negative weighted Ricci curvature if and only if it admits a locally homogeneous metric of non-negative sectional curvature. The talk includes joint works with D. Yeroshkin and L. Kennard.