PROGRAM

	Monday	Tuesday	Wednesday	Thursday	Friday
11:00	Coffee	Coffee	Coffee	Coffee	Coffee
11:30	Vicente Cortés	Georgios Papadopoulos	Calin Lazaroiu	Alessandro Tomasiello	Luis Álvarez-Cónsul
15:00	Dietmar Klemm	Antonio Otal	Gianluca Inverso	Mario García	Thomas Mohaupt
16:00	Coffee	Coffee	Coffee	Coffee	Coffee
16:30	David Chow	Magdalena Larfors	Ulf Gran	Alessio Marrani	Andrea Santi
18:30	Reception				Reception

TALKS

Monday

CORTES SUAREZ, Vicente: Department of Mathematics, University of Hamburg

Global results in special geometry: a survey

I will review results obtained in various collaborations over the last years concerning the completeness of metrics occurring as scalar geometries in N=2 supergravity. In particular, I will explain how to construct new complete quaternionic Kähler manifolds (of negative scalar curvature) based on these results.

KLEMM, Dietmar: Università degli Studi di Milano, Dipartimento di Fisica

Black holes and attractors in abelian gauged supergravity

We consider N=2 supergravity in four dimensions, coupled to an arbitrary number of vector- and hypermultiplets, where abelian isometries of the quaternionic hyperscalar target manifold are gauged. Using a static and spherically or hyperbolically symmetric ansatz for the fields, a

one-dimensional effective action is derived whose variation yields all the equations of motion. By imposing a sort of Dirac charge quantization condition, one can express the complete scalar potential in terms of a superpotential and write the action as a sum of squares. This leads to first-order flow equations, that imply the second-order equations of motion.
We then use these first-order equations to derive black hole solutions with running hyperscalars, and to discuss the attractor mechanism in these theories.

CHOW, David: University of Crete

Killing-Yano symmetries of black holes

Symmetry is a crucial aid in discovering exact solutions. Hidden symmetries corresponding to Killing tensors are useful when there are fewer isometries, such as for rotating black holes in supergravity. I will discuss the presence of these symmetries in known solutions and some physical consequences.

Tuesday

PAPADOPOULOS, Georgios: King's College London

On the status of classification of supergravity backgrounds: successes and open problems

I shall review the progress that has been made towards classifying backgrounds that preserve a fraction of spacetime supersymmetry focusing in 10 and 11 dimensions. In particular, I shall describe the methods used and some of the results so far. I shall also present some applications like the understanding of AdS solutions and near horizon black hole geometries. I may also report on the use of global methods from analysis and topology to answer some of these classification questions.

OTAL, Antonio: Universidad de Zaragoza

Invariant solutions to the Strominger system on solvmanifolds

After reviewing some previous results concerning invariant solutions of the Strominger system, we present a 6-dimensional compact solvmanifold that provides many invariant solutions, in particular with respect to the Chern connection ∇^c, with non-flat instanton and

positive α . Furthermore, invariant solutions to the heterotic equations of motion with respect to the Bismut connection ∇^+ , non-flat instanton and α > 0 are obtained.

LARFORS, Magdalena: Uppsala University

On the moduli spaces of heterotic domain wall vacua

4D maximally symmetric N=1 vacua of the heterotic string require the internal manifold to be conformally balanced. These manifolds include, but are not restricted to, Calabi-Yau manifolds: they are complex SU(3) structure manifolds but need not be Kahler. While maximally symmetric 4D vacua are good starting points for the construction of phenomenologically interesting models, they are not the only possibilities. 4D domain wall vacua, that preserve N=1/2 SUSY, have recently been shown to allow maximally symmetric solutions once non-perturbative effects are included in the construction.

In this talk, we will discuss the moduli spaces of manifolds of these types. We will start by reviewing the moduli space of N=1 compactifications, with a particular focus on the effects of the heterotic vector bundle. After this review, we will present new results on moduli spaces for seven-dimensional manifolds with integrable G_2 structure, which are of relevance for heterotic domain wall vacua. Specifically, we will discuss the infinitesimal moduli space of integrable G_2 structure manifold with instanton bundles.

This talk is based on 1409.7539 and work in progress.

Wednesday

LAZAROIU, Calin: Institute for Basic Science, Center for Geometry and Physics

Real Lipshitz structures, real pinor bundles and Dirac operators

I show that real pinor bundles (understood as real vector bundles admitting a global Clifford multiplication) can be defined o a pseudo-Riemannian manifold if and only if the later admits a so-called real Lipschitz structure. I describe the classification of such structures as well as the topological obstructions for their existence, some of which have never been considered before. This allows for a fully general treatment of Dirac operators on such bundles.

INVERSO, Gianluca: Nikhef, Amsterdam

The exceptional form of massive IIA supergravity

Exceptional structures in supergravity theories play a prominent role in determining their geometric properties. They are rendered most evident in frameworks such as exceptional field theory, which is known to capture the maximal ten- and eleven-dimensional supergravities. The only exception is massive IIA, which is often expected to require some form of non-geometry to be implemented in EFT. I will show that there is instead a fully geometric implementation of the Romans mass in EFT in terms of a deformation of the latter, and describe the general framework to construct these new EFT's.

GRAN, Ulf: Fundamental Physics, Chalmers University

Dynamical symmetry enhancement near black hole horizons

In this talk I will sketch a general proof of the (super)symmetry enhancement occurring near black hole horizons, a phenomenon previously observed only on a case by case basis. I will also show that the symmetry algebra for all supersymmetric black hole horizons with non-trivial fluxes includes an sl(2,R) subalgebra.

Thursday

TOMASIELLO, Alessandro: Università di Milano-Bicocca

String theory geometry in various dimensions

I will review recent progress in the classification of supersymmetric solutions. Starting with an overview of the methods, I will show exhaustive results for AdS7, and less complete ones for lower dimensions. Along the way I will also mention some consequences for the classification of CFTs.

GARCIA FERNANDEZ, Mario: ICMAT, CSIC

Killing spinors in generalized geometry.

Generalized geometry was introduced by Hitchin in his study of non-degenerate 3-forms in dimension 6. Although it was not Hitchin's original motivation, generalized geometry has proved to be a very useful setting to understand recent developments in string theory and supergravity. In this talk, I will introduce the notion of killing spinor in generalized geometry. We will see that these natural objects encompass Calabi-Yau metrics and solutions of the

Strominger system of partial differential equations, thus providing a framework to understand the existence and moduli problem for this system of PDE. The strominger system describes flux compactifications of the Heterotic string and was proposed by Yau as a natural generalization of the Calabi problem in complex non-Kähler manifolds. Time permitting, I will discuss briefly a new class of heterotic compactifications (geometric U-folds) suggested by this framework. Based on joint work with Carl Tipler and Roberto Rubio (arXiv:1503.07562), and ongoing work with Carlos Shahbazi and Victor Vuletescu.

MARRANI, Alessio: Enrico Fermi Center

Almost Complex Structures for Symplectic Spaces and Non-Linear Symmetries of Black Hole Entropy

Freudenthal duality can be defined as an anti-involutive, non-linear map acting on symplectic spaces. After a general introduction on some aspects of extended (super)gravity theories in four dimensions and the structure of their U-orbits, I will consider their U-duality Lie groups "of type E7", and the corresponding notion of Freudenthal duality. I will elucidate and comment on the relation between the Hessian of the black hole entropy and the pseudo-Riemannian, rigid, para-special Kaehler metric of the pre-homogeneous vector spaces associated to the U-orbits. I will conclude with some hints for further current and future developments, including the extension to Abelian gaugings of supergravity (also in presence of hypermultiplets), exploiting the theory of (Jordan) C*-algebras.

Friday

ALVAREZ-CONSUL, Luis: ICMAT Madrid

Nielsen-Olesen Cosmic strings, the Einstein-Bogomol'nyi equations, and algebraic geometry

Y. Yang observed 20 years ago that the 2-sphere is the only compact orientable surface admitting solutions of the Einstein-Bogomol'nyi equations, coupling vortices with gravity, and obtained sufficient conditions for the existence of cosmic strings in this situation. In this talk, we will give an algebro-geometric interpretation of Yang's conditions, and explain why they are in fact necessary for the existence of solutions. The key ideas, coming from the theory of quotient spaces in symplectic geometry and algebraic geometry, will also enable us to find suitable generalizations of these equations to higher-genus compact Riemann surfaces. This is joint work with Mario García-Fernández and Óscar García-Prada.

MOHAUPT, Thomas: University of Liverpool

From Hessian geometry to supergravity solutions

Hessian geometry plays an important role in the scalar geometries of five- and four-dimensional N=2 vector multiplets coupled to supergravity, and as well in their reduction to three space-like dimensions using the r-map and c-map. This can be used to construct stationary five- and four-dimensional solutions by lifting solutions of the auxiliary three-dimensional Euclidean theory. We review this approach and illustrate its usefulness by discussing the example of a two-parameter family of Nernst brane solutions to gauged N=2 supergravity with general vector multiplet sector. Here `Nernst brane' refers to the fact that these solutions have a vanishing entropy density in the zero temperature limit.

SANTI, Andrea: Marie-Curie of INdAM at the University of Edinburgh

Killing superalgebras and filtered deformations

I will report on joint works with J. Figueroa-O'Farrill and P. de Medeiros on the algebraic structure of Lie superalgebras $g = g_{\bar{0}} \oplus g_{\bar{1}}$ generated by Killing spinors. I will explain how any g can be regarded as an appropriate deformation of a subalgebra of the Poincar'e superalgebra $p = V \oplus S \oplus so(V)$ and discuss two applications: the recovery of the classification of maximally supersymmetric bosonic backgrounds of d=11 supergravity by purely Lie algebraic means and the determination of the supersymmetry algebras of N=1 d=4 geometries admitting rigidly supersymmetric field theories. I will elucidate the role played in this approach by a certain Spencer cohomology group, which in both cases defines the relevant notion of Killing spinor.
