Wednesday, 12th July 2023	
9:30 – 10:20	Marcus Khuri (Stony Brook University) *The Mass-Angular Momentum Inequality for Multiple Black Holes, Singular Harmonic Maps, and Stationary Vacuum Spacetimes* We will show how the asymptotic analysis of certain singular harmonic maps gives rise to the mass-angular momentum inequality for multiple black holes. If time permits, we will also discuss how these maps produce exotic solutions to the stationary vacuum equations in higher dimensions.
10:25 – 10:55	Carlos Peon Nieto (Univerzita Karlova and Universidad de Salamanca) *Characterizations of Kerr-de Sitter and related spacetimes in arbitrary dimensions* Using the asymptotic initial value problem for Lambda positive Einstein metrics [Anderson '05][Anderson, Cruściel '05][Kamiński '21] we give a semi-global (i.e. "near" null-infinity) characterization of the arbitrary dimensional Kerr-de Sitter family of metrics [Gibbons et al. '05] in terms of their asymptotic data. The asymptotic data generalizes into a bigger class of Kerr-de Sitter-like data, naturally equipped with a topological structure, in such a way that the entire class connects with Kerr-de Sitter data via a limit or an analytic extension. This implies limits or analytic extensions of the corresponding spacetime metrics, which we are able to identify, defining the Kerr-de Sitter-like class of metrics. We obtain all such metrics explicitly. Moreover, these metrics turn out to also be characterized by the Kerr-Schild form with certain prescribed asymptotics. Our result generalizes, from a different perspective, a previous four dimensional analysis [Mars, Senovilla '15] [Mars et al. '16, '17].
10:55 – 11:30	Coffee break
11:30 – 12:20	Jerzy Lewandowski (University of Warsaw) *Symplectic charges in the Yang-Mills theory of the normal conformal Cartan connection: applications to gravity* It is known that a source-free Yang-Mills theory with the normal conformal Cartan connection used as the gauge potential gives rise to equations of motion equivalent to the vanishing of the Bach tensor. We investigate the conformally invariant protosymplectic potential current obtained from this theory and find that on the solutions to the Einstein field equations, it can be decomposed into a topological term derived from the Euler density and a part proportional to the potential of the standard Einstein-Hilbert Lagrangian. The pullback of our potential to the asymptotic boundary of asymptotically de Sitter spacetimes turns out to coincide with the current obtained from the holographically renormalized gravitational action. This provides an alternative derivation of a symplectic structure on scri without resorting to holographic techniques. We also calculate our current at the null infinity of asymptotically flat spacetimes and in particular show that it vanishes for variations induced by the BMS symmetries. In addition, we calculate the Noether currents and charges corresponding to gauge transformations and diffeomorphisms.
12:25 – 12:55	Włodzimierz Piechocki (National Centre for Nuclear Research, Poland) *Quantum Oppenheimer-Snyder model of black hole* We quantize the Oppenheimer-Snyder model of black hole using the integral quantization method. We treat spatial and temporal coordinates on the same footing both at classical and quantum levels. Our quantization resolves or smears the singularities of the classical curvature invariants. Quantum trajectories with bounces can replace singular classical ones. The considered quantum black hole may have finite lifetime. As a byproduct, we obtain the resolution of the gravitational singularity of the Schwarzschild black hole at quantum level.
12:55 – 14:45	Lunch break
14:45 – 15:35	Andrew Waldron (University of California Davis) *Supergeometry and Measurement Theory* Einstein had a predilection for the seemingly deterministic properties of classical systems---God does not play dice. Moreover, supergeometries are typically associated with quantum mechanical models of intrinsically spinning systems. In this talk supersymplectic structures will be applied to a probabilistic treatment of classical mechanics. In particular, we show how classical systems with discrete degrees of freedom can be described in terms of supersymplectic geometries.
15:35 – 16:00	Coffee break
16:00 – 17:00	Roger Penrose (University of Oxford) *The Conformal Geometry of the Universe* The idea of conformal geometry has proved to be useful in the study of Einstein's General Theory of Relativity. For example, the future-asymptotic behaviour of massless fields such as electromagnetism and gravity can be studied by introducing a conformal future-boundary to an asymptotically flat space-time. In which case the boundary turns out to be a null 3-surface. In the cosmological context with a positive Λ this boundary surface is space-like. At the other end of the temporal scale we can apply the opposite trick to the Big Bang where conformally stretching it out can be considered to provide a space-like smooth boundary to the Universe picture. A deeper understanding of the special nature of the Big Bang can be obtained by examining it from the perspective of conformal geometry, according to which the Big-Bang singularity, unlike those in black holes, becomes non-singular. In conformal geometry, big and small become equivalent, and the Big Bang may be taken as conformally non-singular. Moreover, the extremely hot and dense Big Bang is conformally similar to the extremely cold and rarefied remote future, so that our Big Bang can be regarded as the conformal continuation of a previous "cosmic aeon", leading to the picture of conformal cyclic cosmology (CCC) whereby the entire universe consists of a succession of such cosmic aeons, each of whose big bang is the conformal continuation of the remote expanding future of a previous aeon. Certain strong observational signals, provide some remarkable support for this CCC picture.
17:00 – 18:00	Poster session Tymon Frelik (University of Warsaw) *The Geometry of the Three-Edge Snake* Zhangwen Guo (University of Vienna) *BGG operators and the standard cotractor calculus on path geometry* Julien Heyd (Paris-Saclay University) *2-dimensional surfaces in R4* Wojciech Kamiński (University of Warsaw) *On classification conformal anomaly* Marcin Nowicki (Poznan University of Technology) *Linearization of mechanical control systems* Gabriel Sánchez-Pérez (University of Salamanca) *Transverse metric expansion at a general null hypersurface* Petr Vlachopulos (Masaryk University) *Cheeger constant of curved tubes in space forms* Michał Andrzej Wasilewicz (University of Vienna) *Relative BGGs for manifolds with one Legendrean subbundle* Lenka Zalabová (University of South Bohemia in České Budějovice) *Conformal Killing Trajectories*