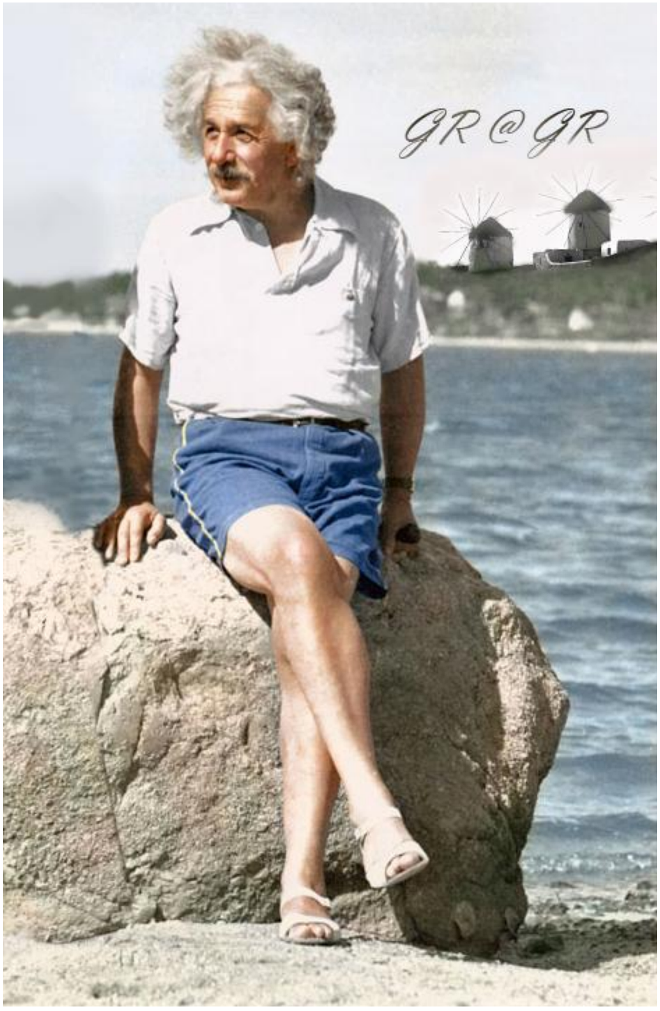
NEB16

GR@GR



Mykonos, September 17-20, 2014

Program

1ST DAY – September 17

WEDNESDAY 17 SEPTEMBER	9:00-9:15	*NEB16 Conference Inauguration*
	9.15-10.00	Bojowald Martin *Results and applications of canonical effective methods in quantum theories*
	10.00-10.45	Ferrari Valeria *Universal relations for neutron stars*
	10.45-11.05	Coffee break
	11.05-11.50	Rezzolla Luciano *Binary neutron stars: what we understand and what we don't*
	11.50-12.35	Bergshoeff Eric *New Developments in Three-Dimensional Gravity*
	12.35-15.00	Lunch Break
		SESSION A
	15.00-15.30	Laguna Pablo *Learning about the final state in binary black hole mergers from the gravitational wave peak luminosity*
	15.30-16.00	Shoemaker Deirdre *Numerical Relativity's Preparation for Gravitational Wave Detection of BBHs*
	16.00-16.20	Bauswein Andreas *Revealing the high-density equation of state via gravitational-wave observations*
	16.20-16.40	Kucaba Marcin *Gravitational waves background from rotating neutron stars for Advanced Virgo/Ligo and ET detectors*
	16.40-17.10	Coffee break
	17.10-17.30	Buchman Sasha *Concepts for a gravitational wave antenna for 2020*
	17.30-17.50	Frajuca Carlos *The Schenberg GW detector vibration systems*
	17.50-18.10	Tsokaros Antonios *Binary neutron star initial data with COCAL*
	18.10-18.30	Agathos Mihalis *TIGER: A model-independent way of testing the strong-field dynamics of GR with gravitational waves*
	18.30-18.50	Dionysopoulou Kyriaki *General-Relativistic Resistive-MHD simulations of Binary Neutron Stars*
	18.50-19.10	Antoniadis John *Tests of Fundamental Physics with Binary Pulsars*
		SESSION B
	15.00-15.30	Plionis Manolis *Precision Cosmology using HII galaxies*
	15.30-16.00	Contopoulos Ioannis *"EDOHS" GRBs as potential Standard Candles for Cosmology*

WEDN 17 SEPT	16.00-16.20	Frusciante Noemi *Effective Field Theory of Dark Energy: a Dynamical Analysis*
	16.20-16.40	Saltas Ippocratis *Scalar anisotropic stress as a signature of tensor wave propagation*
	16.40-17.10	Coffee break
	17.10-17.30	Magalhaes Nadja *General relativistic effects on the rotation curves of galaxies*
	17.30-17.50	Salgado Marcelo *f(R) cosmology and the equation of state of geometric darkenergy*
	17.50-18.10	Grammenos Theofanis *On the energy of a Schwarzschild black hole surrounded by dark energy*
	18.10-18.30	Pouri Athina *Precision growth index using the clustering of cosmic structures and growth data*

2ND DAY – September 18

THURSDAY 18 SEPTEMBER	9.00-9.45	Lattimer James *Experimental, Observational and Theoretical Constraints on the Properties of Neutron Stars*
	9.45-10.30	Kalogera Vicky *Review of Astrophysics results from LIGO*
	10.30-15.30	Tour to Delos
	SESSION A	
	15.30-16.00	Gondek-Rosinska Dorota *A new view on differentially rotating neutron stars in GR*
	16.00-16.30	Yazadjiev Stoytcho *Neutron stars in modified gravity*
	16.30-16.50	Studzinska Anna *The effect of equation of state on properties of differentially rotating neutron stars in GR*
	16.50-17.10	Iosif Panagiotis *Accuracy of the IWM-CFC approximation in differentially rotating relativistic stars*
	17.10-17.40	Coffee break
	17.40-18.10	Sotani Hajime *Possible constraint on nuclear saturation parameters via neutron star observations*
	18.10-18.30	Doneva Daniela *f-mode instabilities in rapidly rotating neutron stars*
	SESSION B	
	15.30-15.50	Zarikas Vasilios *Cosmic coincidence problem and Galaxies*
	15.50-16.10	Pravda Vojtech *Universal spacetimes*
	16.10-16.30	Pravdova Alena *On the Goldberg-Sachs theorem in higher dimensions*
	16.30-16.50	Terzis Petros *Lie point and variational symmetries in minisuperspace Cosmology*
	16.50-17.40	Coffee break
	17.40-18.10	Batakis Nikolaos *First exact Geon found is a nonsingular monopole, propagating as a primordial gravitational pp-wave*
	18.10-18.40	Aliferis Georgios *Primordial black holes and efficient electroweakbaryogenesis with small CP angle*
	SESSION C	
	15.30-16.00	Christodoulakis Theodosios *Canonical Quantization of the Reissner-Noerdstrom geometry via Noether symmetries*
	16.00-16.30	Kanti Panagiota *Cosmological Solutions in Dilaton-Gauss-Bonnet Theory*

THUR 18 SEPT	16.30-16.50	Coutant Antonin *Unitary and non-unitary transitions around a cosmological bounce*
	16.50-17.10	Pranzetti Daniele *CFT/gravity correspondence on the isolated horizon*
	17.10-17.40	Coffee break
	17.40-18.10	Zampeli Adamantia *Canonical quantisation of a scalar field in aRobertson-Walker background via conditional symmetries*
	18.10-18.30	Gomes Henrique *Conformal geometrodynamics regained: gravity from duality*
	18.30-18.50	Kanatchikov Igor *Pracanonical quantization approach to quantum gravity*

20.30- Dinner at St John’s restaurant

3RD DAY – September 19

FRIDAY 19 SEPTEMBER	9.00-9.45	Lüst Dieter *Non-Associative Geometry and Double Field Theory*
	9.45-10.30	Pullin Jorge *Quantum field theory on a quantum space-time: Hawking radiation and the Casimir effect*
	10.30-10.50	Coffee break
	10.50-11.35	Shibata Masaru *Binary neutron star merger: Gravitational waves and electromagnetic counter parts*
	11.35-12.20	Barack Leor *Gravitational self-force: orbital mechanics beyond the geodesic approximation*
	12.20-15.00	Lunch Break
	SESSION A	
	15.00-15.20	Dzhunushaliev Vladimir *Modified f(R) gravities from the quantum part of metric*
	15.20-15.40	Herdeiro Carlos *Kerr black holes with scalar hair*
	15.40-16.00	Vega Ian *Rotating black holes in three-dimensional Horava gravity*
	16.00-16.20	Cvitan Maro *Gravitational Chern-Simons terms in D>3*
	16.20-16.40	Kofinas Georgios *Teleparallel equivalent of Gauss-Bonnet gravity*
	16.40-17.10	Coffee break
	17.10-17.30	Stein Leo *Rapidly rotating black holes in dynamical Chern-Simons gravity: Decoupling limit solutions and breakdown*
	17.30-17.50	Tsoukalas Minas *Bi-scalar Extensions of Horndeski Theories and Black Holes*
	17.50-18.10	Vernieri Daniele *Gravity with Auxiliary Fields*
	SESSION B	
	15.00-15.20	Martinez Cristian *Mass of asymptotically anti-de Sitter hairy spacetimes*
	15.20-15.40	Krueger Christian *Seismology of adolescent neutron stars: Accounting for thermal effects and crust elasticity*
	15.40-16.00	Wisniewicz Mateusz *Stability of orbits around rapidly rotating neutron stars in LMXBs*
	16.00-16.20	Szkudlarek Magdalena *Numerical simulations of differentially rotating strange quark stars in GR*
	16.20-16.40	Cuadros-Melgar Bertha *Galileon Black Holes Stability Revisited*

F R I D 19 S E P	16.40-17.10	Coffee break
	17.10-17.30	Kraniotis Georgios *Gravitational lensing and frame dragging of light in the Kerr-Newman and the Kerr-Newman-(anti) de Sitter black hole spacetimes*
	17.30-17.50	Astorino Marco *Pair creation of rotating black holes*
	17.50-18.10	Apostolatos Theocharis *I-Love-Q and other universalities about neutron stars*
	18.10-18.30	George Pappas *Why I-Love-Q*

Hellenic Society on Relativity, Gravitation, and Cosmology ELECTIONS 19:00-20:30

4TH DAY – September 20

S A T U R D A Y 20 S E P T E M B	9.00-9.45	Maggiore Michele *Nonlocal gravity and dark energy*
	9.45-10.30	Calder Alan *Thermonuclear Supernovae as Probes of Cosmology*
	10.30-10.50	Coffee break
	10.50-11.35	Sotiriou Thomas *Black holes and scalar fields*
	11.35-12.20	Oriti Daniele *Quantum gravity from the atoms of space to cosmology*
	12.20-15.00	Lunch Break
	SESSION A	
	15.00-15.30	Benedetti Dario *Condensation in Causal Dynamical Triangulations*
	15.30-15.50	Markakis Charalambos *Existence & uniqueness of constants of motion in stationary axisymmetric gravitational fields*
	15.50-16.10	Lukes-Gerakopoulos Georgios *The motion of spinning particles in Kerr spacetime*
	SESSION B	
	15.00-15.30	Immirzi Giorgio *Spinors in Spinfoamtheory*
	15.30-15.50	Willison Steven *Gravity as a theory of curved surface dynamics*

POSTERS by:

Papadopoulos George: *Generation of Solutions of the Einstein Equations*

Palapanidis Konstantinos: *Equilibrium models of strongly-magnetized neutron stars*

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ABSTRACTS of CONTRIBUTED TALKS

Agathos Michalis

TIGER: A model-independent test of the strong-field dynamics of general relativity with gravitational wave signals from coalescing compact binaries

Abstract: The direct detection of gravitational waves with upcoming second-generation gravitational wave observatories such as Advanced LIGO and Advanced Virgo will allow us to probe the genuinely strong-field dynamics of general relativity (GR) for the first time. To this end we have developed a Bayesian data analysis pipeline called TIGER (Test Infrastructure for General Relativity), which uses compact binary coalescence events as laboratories to test GR. TIGER provides a model-independent test, in that it is not necessary to compare GR with any specific alternative theory to discover deviations; moreover, information from multiple detected signals can be combined so as to arrive at a stronger test. We first evaluate the method for the case of inspiraling binary neutron stars that will be observed with second-generation detectors, and show that TIGER is robust against a number of unmodeled fundamental, astrophysical, and instrumental effects. Next we consider ringdown signals and the third-generation Einstein Telescope, and demonstrate how TIGER will allow for more stringent tests of the no-hair theorem than any that have been proposed hitherto.

Aliferis George

Primordial black holes and efficient electroweak baryogenesis with small CP angle

Abstract: A cosmological scenario is presented that produces the observed baryon asymmetry, even for small CP violating angles, when there is early cosmic expansion with high energy modifications, as in Randall – Sundrum universe. Very small primordial black holes are likely to be produced with masses around the higher dimensional Planck scale. The Hawking radiation reheats a spherical region around the black hole to a high temperature. The electroweak symmetry is restored there. A domain wall is formed separating the region with the symmetric vacuum from the asymmetric region and electroweak baryogenesis takes place there. The phase transition does not need to be of first order. The black-holes's lifetime is prolonged because of accretion, resulting to strong efficiency of the baryon producing mechanism.

Apostolatos Theocharis

I-Love-Q and other universalities about neutron stars

Abstract: We found an interesting approximate universal relation among the multipole moments of compact stars irrespectively of their internal equation of state. This universality is discussed in parallel to the universal relations I-Love-Q of Yagi&Yunes. Neutron stars' gravitational field is ruled by an analogue of the no-hair theorem of black holes.

Astorino Marco

Pair creation of rotating black holes

Abstract: An exact and regular solution, describing a couple of charged and spinning black holes, is generated in an external electromagneticfield, via Ernst technique, in Einstein-Maxwell gravity. A wormhole instantonic solution interpolating between the two black holes is constructed to discuss, at the semi-classical level, the quantum process of creation rate, in an external magnetic field, of this charged and spinning black hole pair.

Barack Leor

Gravitational self-force: orbital mechanics beyond the geodesic approximation

Abstract: The fundamentally simple question of motion in a gravitationally-bound two-body system is a longstanding open problem of General Relativity. When the mass ratio is small, the problem lends itself to a perturbative treatment, whereby corrections to the geodesic motion of the smaller object (due to radiation reaction, internal structure, etc.) are accounted for order by order in the mass ratio, using the effective notion of a "gravitational self-force". The prospect for observing gravitational waves from compact objects inspiralling into massive black holes has in the past two decades motivated a program to obtain a rigorous formulation of the self-force and compute it for astrophysically interesting systems. I will review the general theory of gravitational self-force in curved spacetime, describe how this theory is being implemented today in actual calculations, and discuss current frontiers. I will show results from recent calculations of some gauge-invariant post-geodesic effects (including the finite-mass correction to the precession rate of the

periastron), and highlight the way in which these calculations allow us to make a fruitful contact with post-Newtonian theory and with Numerical Relativity.

Batakis Nikolaos

First exact Geon found is a nonsingular monopole, propagating asa primordial gravitational pp-wave

Abstract: Geons are particle-like electrovacua. The concept is well-defined, but it still lacks a properfirst example. Emerging as such is a self-confined exact 2-parameter pp-wave non-Diracmonopole G with Q/r^2 ($r \geq r_0$) non-zero NUT-like charge $\kappa|Q| = 2r_0$ as diameter, independently scaled mass, and spin. Gcannot have Ricci-flat limits, spacetime or Dirac-string singularities (but Dirac's quantizationcondition holds), nor actual EM charge Q (by $\partial G = 0$). G/2 as S_Q geon has actual charge Qconfined by topology on a round $S^2[r_0]$ of $\partial S_Q \neq 0$, a physical singularity. G and S_Q offer exact analytic models in particle physics and cosmology, notably for primordial gravitationalwaves and pre-galactic dynamics.

Bauswein Andreas

Revealing the high-density equation of state via gravitational-wave observations

Abstract: By means of hydrodynamical simulations we explore the equation-of-state dependence of neutron-star mergers and their gravitational-wave signal. The oscillation frequency of the forming postmerger remnant sensitively depends on the stellar properties of neutron stars. A measurement of this dominant gravitational-wave postmerger frequency by the upcoming gravitational-wave detectors accurately determines neutron-star radii. In addition, we discuss a possibility to infer the maximum mass of nonrotating neutron stars by the detection of the main postmerger frequency. Also the radius of the maximum-mass configuration can be deduced. The same approach tightly constrains the maximum central density of neutron stars, and thus the highest density that can stably exist in the universe.

Benedetti Dario

Condensation in Causal Dynamical Triangulations

Abstract: I will present some new results that help us understand the condensation phenomenon in causal dynamical triangulations. The latter underlies the emergence of a macroscopic universe of finite time extension, and I will show how it can be explained by means of a minisuperspace model of Horava-Lifshitz gravity.

Bergshoeff Eric

New Developments in Three-Dimensional Gravity

Abstract: In this presentation I will give an overview of the latest developments in higher-derivativethree-dimensional gravity. Using a so-called `Chern-Simons-like' formulation I will discuss old models such as Topologically Massive Gravity and New Massive Gravity as well as a new model called `Minimal Massive Gravity'. The latter model leads to a peculiar way of coupling gravity to matter which might have applications in four spacetime dimensions.

Bojowald Martin

Results and applications of canonical effective methods in quantum theories

Abstract: This talk briefly reviews the general method of computing effective equations by analyzing the back-reaction of moments of a state on expectation values, and then describes recent applications. The latter include quantum cosmology and the quantum nature of space(-time), non-associative quantum structures, and effective potentials.

Calder Alan

Thermonuclear Supernovae as Probes of Cosmology

Abstract: Type Ia supernovae are bright stellar explosions distinguished by light curves that can be calibrated to allow for their use as distance indicators for cosmological studies. Contemporary research investigates how properties of the progenitor system that follow from the host galaxy such as composition and age influence the brightness of an event with the goal of better understanding and assessing the intrinsic scatter in the brightness. We present the results from ensembles of simulations in the single-degenerate paradigm addressing the influence of age and metallicity on the brightness of an event and compare our results to observed trends in brightness with age and color of the host galaxy.

Christodoulakis Theodosios

Canonical Quantization of the Reissner-Noerdstrom geometry via Noether symmetries

Abstract: A valid mini-superspace action for the Reissner-Noersdrom black hole is reached by considering the radial distance as the independent dynamical variable. The Noether symmetries of the action are used a) at the classical level, to completely integrate the equations of motion via algebraic determination of the solution, and b) at the quantum level, as supplementary conditions on the wave-function sattisfying the Wheeler-deWitt quadratic constraint. The resulting wave-functions, when treated semi-classically in a Bohm-like scheme, seem to avoid the classical curvature singularity residing at r=0.

Contopoulos Ioannis

"EDOHS" GRBs as potential Standard Candles for Cosmology

Abstract: We investigate a particular subclass of gamma-ray bursts whose prompt X-ray emission lasts for a few hundred seconds and shows a clear exponential decay over more than four orders of magnitude. We associate them with the electromagnetic spindown of the black hole that forms during the core collapse of a supermassive star. Their characteristic spindown timescale is inversely proportional to the square of the magnetic flux accumulated through their horizon. We show that these objects give-off roughly the same amount of energy in X-rays, and therefore, they may form standard candles for Cosmology.

Coutant Antonin

Unitary and non-unitary transitions around a cosmological bounce

Abstract: In this presentation, I will discuss the notion of time and unitarity in the vicinity of a bounce in quantum cosmology, that is, a turning point for the scale factor. Our work follows from the Vilenkin approach to the interpretation of the solutions of the Wheeler-DeWitt equation. In this approach, unitarity is defined through the conserved current and is by nature an approximate concept. In minisuperspace it amounts to using the scale factor as a time variable. A unitary evolution is recovered when the latter becomes semiclassical enough. Unfortunately, WKB methods drastically fail near a turning point and the scale factor cannot play the role of time in scenarios with a bounce or a recollapsing phase for the universe. In this work, we extend the Vilenkin interpretation to these cases by using momentum representation. For this, we investigate the dynamics of matter transitions when using its conjugate momentum as a time. In a first part, we describe the precise conditions so as to recover unitarity, and hence, a consistent notion of probability. In a second part, we discuss a simple model in the vicinity of a bounce and present how to extend the analysis to more general models, such as Loop Quantum Cosmology.

Cuadros-Melgar Bertha

Galileon Black Holes Stability Revisited

Abstract: The issue of stability of a certain kind of galileon black hole is considered in a different approach. Using perturbations we determine the behavior and frequencies of stable modes as well as the conditions for stability.

Cvitan Maro

Gravitational Chern-Simons terms in D>3

Abstract: I'll talk about the consequences of adding the gravitational Chern-Simons terms to existing covariant action (e.g. to Einstein-Hilbert) in certain D>3 cases. In particular about the consequences on the solutions, black hole solutions, the definition and the value of the black hole entropy.

Dionysopoulou Kyriaki

General-Relativistic Resistive-MHD simulations of Binary Neutron Stars

Abstract:

Doneva Daniela

f-mode instabilities in rapidly rotating neutron stars

Abstract: The oscillations of rapidly rotating neutron stars can become unstable due to the emission of gravitational waves, that is the so-called Chandrasekhar-Friedman-Schutz (CFS) instability. This could lead to strong gravitational radiation that is potentially observable by the ground based detectors. The f-modes can become CFS unstable for very rapid rotation, but on the other hand they are an efficient gravitational wave emitter. That is why we will present results for the f-modes of rapidly rotating neutron stars and the conditions under which the associated CFS instability can develop.

Ferrari Valeria

Review of Astrophysics results from LIGO

Abstract: In recent years some relations among the moment of inertia, the quadrupole moment and the tidal deformability of neutron stars have been shown to exist, which are approximately independent of the equation of state. We will discuss the origin of these relations, their range of validity, and provide examples of how they could be used.

Frajuca Carlos

The Schenberg GW detector vibration systems

Abstract: A spherical gravitational wave (GW) detector has a heavy ball-shaped mass which vibrates when a GW passes through it. Such motion is monitored by transducers and the respective electronic signal is digitally analysed. One of such detectors, SCHENBERG, will have resonant frequencies around 3.2 kHz. ”Mário Schenberg” is a spherical resonant-mass gravitational wave detector weighting 1.15ton, being built in the Department of Materials at the University of São Paulo. The sphere with 65cm in diameter will be made of a copper-aluminum alloy with 6% Al. This work simulates the sphere seismic isolation, the connection from the dilution refrigerator to sphere and the microwave cabling to find the attenuation in the vibration noise obtained by attenuators mounted in the connections. This study is made in finite element modeling. The attenuation found for the seismic isolation was 10-26, the attenuation for connection from the dilution refrigerator found was 10-23. The results allow the detection of gravitational waves as these noise vibration in the sphere are below the sphere thermal noise.

Frusciante Noemi

Effective Field Theory of Dark Energy: a Dynamical Analysis

Abstract: The Effective Field Theory approach has been recently applied to the cosmic acceleration issue. It is a model independent framework that encompasses all single scalar field Dark Energy (DE) and Modified Gravity (MG) models, which describes the evolution of the background cosmology and of perturbations with a finite number of functions of time introduced at the level of the action. I will present a thorough investigation of the viability of the three background functions by means of a dynamical analysis. In particular, I will show you a set of variables transforming the non-autonomous system of equations into an infinite-dimensional one characterized by a significantly recursive structure that corresponds to increasingly general models of DE/MG. This machinery serves different purposes. It offers a general scheme for performing dynamical analysis of DE/MG models within the model independent framework of EFT; the general

results, obtained with this technique, can be projected into specific models. It also can be used to determine appropriate ansatze for the three EFT background functions when studying the dynamics of cosmological perturbations in the context of large scale structure tests of gravity, using the EFTCAMB/EFTCosmoMC package.

Gomes Henrique

Conformal geometrodynamics regained: gravity from duality

Abstract: There exist several ways of constructing general relativity from `first principles': Einstein's original derivation, Lovelock's results concerning the exceptional nature of the Einstein tensor from a mathematical perspective, and Hojman-Kuchař-Teitelboim's derivation of the Hamiltonian form of the theory from the symmetries of spacetime, to name a few.

Here I propose a different set of first principles to obtain general relativity in the canonical framework without presupposing spacetime in any way. I first require consistent propagation of scalar spatially covariant constraints. I find that up to a certain order in derivatives (four spatial and two temporal), there are large families of such consistently propagated constraints. Then I look for pairs of such constraints that can gauge-fix each other and form a theory with two dynamical degrees of freedom per *space* point. This demand singles out the ADM Hamiltonian either in i) CMC gauge, with arbitrary (finite, non-zero) speed of light, and an extra term linear in York time, or ii) a gauge where the Hubble parameter is conformally harmonic.

Gondek-Rosinska Dorota

A new view on differentially rotating neutron stars in GR

Abstract: Differential rotation can play an important role in e.g. the dynamical stability of the remnant formed in the coalescence of binary neutron stars. Depending on the degree of differential rotation and the stiffness of an equation of state the merger remnant can collapse to a black hole or be temporarily supported by rotation against collapse. I will present a new investigation on the structure of differentially rotating neutron stars, using a well tested, multi-domain relativistic spectral code (Ansorg, Gondek-Rosinska, Villain, 2009). The high level of accuracy and stability of the code enables us for the first time the classification of differentially rotating neutron stars in general relativity. We have found various types of configurations which were not considered in previous works, mainly due to

numerical limitations. The maximum allowed mass for the new types of configurations and moderate degree of differential rotation can be even 2-4 times higher than the maximum mass of non-rotating NSs with the same EOS. Obtained results give a new view on properties of differentially rotating neutron stars and are the starting point to study in a systematic way their stability.

Grammenos Theofanis

On the energy of a Schwarzschild black hole surrounded by dark energy

Abstract: Energy-momentum localization is studied for a four-dimensional Schwarzschild black hole surrounded by dark energy in the form of quintessence. The calculations are performed by using the Landau–Lifshitz and the Weinberg energy-momentum complexes. It is found that all the momenta vanish, while the energy depends on the mass M of the black hole, the state parameter w_q and a normalization factor c. The special case $w_q = -2/3$ and some limiting cases are examined.

Herdeiro Carlos

Kerr black holes with scalar hair

Abstract: Black holes are one of the most fascinating predictions of the General Theory of relativity. According to the conventional picture that emerged in the 1970s as a corollary of the uniqueness theorems, black holes are extremely constrained objects, determined only by a few global charges. For instance, two black holes with the same total mass and angular momentum must be precisely equal, in sharp contrast with stars. Such simplicity of black holes became immortalized in John Wheeler's mantra "Black holes have no hair". In this talk, I will discuss a novel mechanism that allows black holes to have 'hair' and challenges the standard paradigm. Some possible astrophysical consequences will be addressed.

Immirzi Giorgio

Spinors in Spinfoam theory

Abstract:

Iosif Panagiotis

Accuracy of the IWM-CFC approximation in differentially rotating relativistic stars

Abstract: We determine the accuracy of the conformal flatness (IWM-CFC) approximation for the case of single, but strongly differentially rotating relativistic stars. We find that for the fastest rotating and most relativistic polytropic models, the deviation from full general relativity is below 5% for integrated quantities and below 10% for local quantities, such as the angular velocity. Furthermore, we study the deviation of the IWM-CFC approximation from full general relativity by evaluating and comparing different error indicators. We find that for the models that are not near the maximum mass, a simple error indicator constructed from local values of the metric potentials is more indicative of the accuracy of the IWM-CFC approximation than an error indicator that is based on the Cotton-York tensor. Furthermore, we construct a simple, linear empirical relation that allows for the estimation of the error made by the IWM-CFC approximation and which only involves the flattening of the star due to rotation and the minimum value of the lapse function. Thus, in any numerical simulation involving rotating relativistic stars, one can readily know the deviations from full general relativity due to the IWM-CFC approximation.

Kalogera Vicky

Review of Astrophysics results from LIGO

Abstract: A review of the key astrophysics results from Initial LIGO will be presented followed by the anticipated results from Advanced LIGO. The focus will be on recent development work on physical parameter estimation and extraction of astro-information from binary in spirals (sky location, distance, masses, and spins).

Kanti Panagiota

Cosmological Solutions in Dilaton-Gauss-Bonnet Theory

Abstract: We consider a variant of the Einstein-Dilaton-Gauss-Bonnet theory where the scalar field has a general coupling function to the higher-curvature Gauss-Bonnet term. By allowing for the traditional Ricci term to be either present in or absent from the theory, we look for viable cosmological solutions. We demonstrate that the theory without the Ricci term yields viable solutions in a much easier way than the complete theory. We present a variety of solutions that include either inflationary-type or singularity-free solutions.

Kofinas Georgios

Teleparallel equivalent of Gauss-Bonnet gravity

Abstract: A discussion of the teleparallel equivalent of Einstein gravity and of other teleparallel theories is given. The teleparallel equivalent term of Gauss-Bonnet gravity is presented in arbitrary dimensions, as well as a new class of modified gravities based on this term. A cosmological analysis of this theory is performed together with a stability analysis. For a non-minimal coupling of a scalar field with the torsion scalar a wormhole solution is presented.

Kraniotis Georgios

Gravitational lensing and frame dragging of light in the Kerr-Newman and the Kerr-Newman-(anti) de Sitter black hole spacetimes

Abstract: The null geodesics that describe photon orbits in the spacetime of a rotating electrically charged black hole (Kerr-Newman) are solved exactly including the contribution from the cosmological constant. We derive elegant closed form solutions for relativistic observables such as the deflection angle and frame dragging effect that a light ray experiences in the gravitational fields (i) of a Kerr-Newman black hole and (ii) of a Kerr-Newman-de Sitter black hole. We then solve the more

involved problem of treating a Kerr-Newman black hole as a gravitational lens, i.e. a KN black hole along with a static source of light and a static observer both located far away but otherwise at arbitrary positions in space. For this model, we derive the analytic solutions of the lens equations in terms of Appell and Lauricella hypergeometric functions and the Weierstraß modular form. The exact solutions derived for null, spherical polar and non-polar orbits, are applied for the calculation of frame dragging for the orbit of a photon around the galactic centre, assuming that the latter is a Kerr-Newman black hole. We also apply the exact solution for the deflection angle of an equatorial light ray in the gravitational field of a Kerr-Newman black hole for the calculation of bending of light from the gravitational field of the galactic centre for various values of the Kerr parameter, electric charge and impact factor. In addition, we derive analytic expressions for the Maxwell tensor components for a Zero-Angular-Momentum-Observer (ZAMO) in the Kerr-Newman-de Sitter spacetime.

Krueger Christian

Seismology of adolescent neutron stars: Accounting for thermal effects and crust elasticity

Abstract: We study the spectrum of compact stars in the framework of General Relativity, where our focus lies in developing a formalism which comprises the many different physical properties of a neutron star (according to the current state-of-the-art) and allows us to use the most up-to-date data straightaway. Our results represent the first step in this direction. We use a modern, realistic equation of state including composition gradients and density discontinuities. We evolve the temperature distribution in the interior of the neutron star in time and use the temperature profiles in order to account for thermal pressure in the perturbations. We use the temperature evolution to study the effect of thermal pressure on the different oscillation modes over time. Secondly, we simulate the formation of the solid part of the crust, for which we have derived a new set of perturbation equations and we extract the frequencies of the crustal shear modes.

Kucaba Marcin

Gravitational waves background from rotating neutron stars for Advanced Virgo/Ligo and ET detectors

Abstract: Rotating neutron stars are likely sources of gravitational radiation for Advanced Virgo and Ligo detectors. We calculated the gravitational waves background produced by the neutron stars in the Milky Way. To determine the signal we adopt a realistic model of the population of neutron stars taking into account the evolution of the rotation period and the magnetic field of each star. The position and velocity of each pulsar is obtained by calculating its motion in the gravitational potential of the Galaxy. We analyse the intensity in the sky and the spectrum of gravitational background. The background will cause a daily variation of the noise level. Our results show that the high frequency signal is determined by the closest objects. We discuss the observability of such signal.

Laguna Pablo

Prompt Accretion in Tidal Stellar Disruptions by Massive Black Holes

Abstract: A bright flare followed at late times by a $t^{-5/3}$ decay in luminosity are expected to be the generic signatures of a tidal disruption event. They are produced when the stellar debris returns to the vicinity of the massive black hole, self-intersects and eventually forms an accretion disk.

In the canonical scenario of a solar-type star disrupted by a million solar mass black hole, the time elapsing between the disruption of the star as it passes periapsis and the formation of the accretion disk could be years. I will present results from a new class of tidal disruption events of solar-type stars in which the flare and disk formation take place promptly after disruption, with the accretion remaining super-Eddington throughout this process. The new class involves ultra-close encounters with intermediate mass black holes. I will discuss how these events could potentially be used as the smoking gun for the identification of intermediate mass black holes.

Lattimer James

Experimental, Observational and Theoretical Constraints on the Properties of Neutron Stars

Abstract: General relativity and measured neutron star masses provide important contraints on neutron star properties and also give a direct link between neutron star

radii and the symmetry energy of the nuclear interaction. Many experimental quantities, such as binding energies, neutron and proton matter distributions, and vibrational modes such as dipole resonances, for nuclei can strongly constrain the properties of the symmetry energy. In addition, theoretical calculations of the properties of pure neutron matter, for which there have been significant recent advances, provide parallel constraints. These experimental and theoretical results are not only consistent with each other, but also strongly constrain properties of neutron stars, especially radii. Although measurements of neutron star radii are subject to a number of systematic uncertainties at present, results are available from a number of different observations and are tantalizingly in agreement with experimental and theoretical predictions. These consistencies should enhance the prospects for useful results from gravitational wave observations of neutron star-neutron star and black hole-neutron star mergers.

Lukes-Gerakopoulos Georgios

The motion of spinning particles in Kerr spacetime

Abstract: We investigate the Mathisson-Papapetrou equations with two different spin supplementary conditions (SSC), namely the Tulczyjew SSC and the Newton-Wigner SSC. We compare these two cases analytically and numerically. For the Newton-Wigner SSC we compare the Mathisson-Papapetrou equations with the corresponding approximate Hamiltonian function provided in [Barausse, Racine, and Buonanno, PRD, 80, 104025].

Lüst Dieter

Non-Associative Geometry and Double Field Theory

Abstract: In this talk I will discuss the emergence of non-commutativity and non-associativity within the context of non-geometric closed string backgrounds. It leads to a deformation of space which can be described by a non-trivial 3-bracket among functions, leading to a kind of volume uncertainty. In addition the role of non-associativity in conformal field theory as well as in double field theory will be discussed.

Magalhaes Nadja

General relativistic effects on the rotation curves of galaxies

Abstract: We found that when general relativity (GR) is used to fit rotation curves (RC) of galaxies there are physical consequences that are different from those obtained using Newtonian gravity. Using classical GR, we model a galaxy as low density baryonic dust in stationary, axially-symmetric rotation, for which case it has already been shown that non-linear gravitational effects play a significant role in the overall motion of matter. The RC fits obtained were used to determine the mass densities as functions of galactocentric distances and heights, and yielded the galaxies' masses. As a first approximation to their morphologies, we discovered that new information about the galaxies can be obtained from their mass-density functions. Our approach is exemplified with the galaxies NGC 2403, UGC 128 and NGC 2903. We applied available astronomical information about them to illustrate how the approach can be used to investigate other galaxies. The surprisingly good results support and extend previous investigations and indicate that general relativity is necessary in the

Maggiore Michele

Nonlocal gravity and dark energy

Abstract: We discuss a recently developed approach to infrared modifications of GR, in which a mass term is introduced as a coefficient of nonlocal operators. We discuss conceptual aspects and cosmological consequences of the proposal. Such nonlocal theories, involving retarded propagators, must be understood as effective classical theories derived from some more fundamental (and local) QFT. The theory only involve a mass parameter m, which replaces the cosmological constant in LCDM, and is highly predictive. At the background level, after fixing m so as to reproduce the observed value of Ω_M, we get a pure prediction for the equation of state of dark energy as a function of redshift, which turns out to be on the phantom side. We discuss the cosmological perturbations for this model and provide a detailed comparison with data. The nonlocal model provides a good fit to supernova data and predicts deviations from General Relativity in structure formation and in weak

lensing at the level of 3-4%, therefore consistent with existing data but readily detectable by future surveys.

Markakis Charalambos

Existence & uniqueness of constants of motion in stationary axisymmetric gravitational fields

Abstract: The motion of test particles in stationary axisymmetric gravitational fields is generally nonintegrable unless a non-trivial constant of motion, in addition to energy and angular momentum along the symmetry axis, exists. The Carter constant, associated with a rank-2 Killing tensor in Kerr–de Sitter spacetime, is the only example known to date. Proposed astrophysical tests of the black hole no-hair theorem often involve integrable gravitational fields more general than the Kerr family, but the existence of such fields has been a matter of debate. To elucidate this problem, we study its Newtonian analogue by systematically searching for constants of motion polynomial in the momenta. We obtain a uniqueness theorem for rank-2 Killing tensors and a non-existence theorem for rank-4 Killing tensors in stationary axisymmetric gravitational fields. We discuss aspects of such Newtonian models as surrogates of their relativistic counterparts.

Martinez Cristian

Mass of asymptotically anti-de Sitter hairy spacetimes

Abstract: In the standard asymptotic expansion of four dimensional static asymptotically flat spacetimes, the coefficient of the first subleading term of the lapse function can be identified with the mass of the spacetime. Using the Hamiltonian formalism we show that, in asymptotically locally anti-de Sitter spacetimes endowed with a scalar field, the mass can read off in the same way only when the boundary conditions are compatible with the asymptotic realization of the anti-de Sitter symmetry. Since the mass is determined only by the spatial metric and the scalar field, the above effect appears by considering not only the constraints, but also the dynamic field equations, which relate the spatial metric with the lapse function. In particular, this result implies that some prescriptions for computing the mass of a hairy spacetime are not suitable when the scalar field breaks the asymptotic anti-de Sitter invariance.

Oriti Daniele

Quantum gravity from the atoms of space to cosmology

Abstract: We discuss recent developments in the group field theory (GFT) approach to quantum gravity, a promising reformulation of loop quantum gravity and spin foam models. After introducing the formalism, we discuss the issue of connecting micro- and macro-physics in quantum gravity, and summarise results on the renormalisation of GFT models and their phase transitions. We focus on the idea of continuum space as a GFT condensate and of a "geometrogenesis" transition in the early universe, and present a derivation of effective cosmological dynamics directly from the fundamental quantum gravity dynamics of these models, inspired by these ideas. Indeed, it leads to a generalisation of quantum cosmology, incorporating several features of the fundamental theory, akin to hydrodynamics in Bose condensates.

Palapanidis Konstantinos

Poster: Equilibrium models of strongly-magnetized neutron stars

Papadopoulos Demetrios

Poster: Generation of Solutions of the Einstein Equations

Pappas Georgios

Why I-Love-Q

Abstract: One of the big unknowns of neutron stars structure is the equation of state (EoS) of nuclear matter in densities above the nuclear. The technical difficulties so far have prevented us from having an accurate combined measurement of the mass, the rotation and the radius of a neutron star, something that would help determine the

actual neutron star EoS. Additionally, our uncertainty of the EoS has been consider to be a discouraging factor in using neutron star structure as a testing ground for theories of gravity. Recent investigations though have shown that there are some properties of neutron stars that are insensitive to the specifics of the EoS, i.e., they are approximately EoS independent or approximately Universal. In this talk we will present the results of some recent work on why some of these properties exhibit this approximately universal behaviour.

Plionis Manolis

Precision Cosmology using HII galaxies

Abstract:

Pouri Athina

Precision growth index using the clustering of cosmic structures and growth data

Abstract: We utilize the clustering properties of the Luminous Red Galaxies (LRGs) and the growth rate data provided by the various galaxy surveys in order to constrain the growth index (γ) of the linear matter fluctuations. We perform a standard x^2-minimization procedure between theoretical expectations and data, followed by a joint likelihood analysis. We find a value of γ=0.56±0.05 perfectly consistent with the expectations of the ΛCDM model, and Ω_{m0}=0.29±0.01 in very good agreement with the latest Planck results. Our analysis provides significantly more stringent growth index constraints with respect to previous studies as indicated by the fact that the corresponding uncertainty is only ~0.09γ. We also allow γ to vary with redshift and we find that our analysis alleviates the degeneracy and obtain more stringent constraints with respect to other recent studies.

Pranzetti Daniele

CFT/gravity correspondence on the isolated horizon

Abstract: A quantum isolated horizon can be modeled by an SU(2) Chern-Simons theory on a punctured 2-sphere. We show how a local 2-dimensional conformal symmetry arises at each puncture inducing an infinite set of new observables localized at the horizon which satisfy a Kac-Moody algebra. By means of the isolated horizon boundary conditions, we represent the gravitational fluxes degrees of freedom in terms of the zero modes of the Kac-Moody algebra defined on the boundary of a punctured disk. In this way, our construction encodes a precise notion of CFT/gravity correspondence. The higher modes in the algebra represent new non-geometric charges which can be represented in terms of free matter field degrees of freedom. When computing the CFT partition function of the system, these new states induce an extra degeneracy factor, representing the density of horizon states at a given energy level, which reproduces the Bekenstein's holographic bound for an imaginary Immirzi parameter.

Pravda Vojtech

Universal spacetimes

Abstract: Universal spacetimes solve vacuum equations of all gravitational theories with the Lagrangian being a polynomial curvature invariant constructed from the metric, the Riemann tensor and its derivatives of arbitrary order. Widely known examples of universal metrics are certain Ricci-flat pp waves. However, many other universal spacetimes exist. In this talk we present our recent results on universal spacetimes (based on arXiv:1311.0234, co-authors S. Hervik and A. Pravdova).

Pravdova Alena

On the Goldberg-Sachs theorem in higher dimensions

Abstract: In this talk we will discuss a generalization of the well-known four-dimensional Goldberg-Sachs theorem to the case of five and higher dimensions (collaborators: H. Reall, M. Ortaggio, V. Pravda, based on **arXiv:1205.1119 and arXiv:1211.2660**).

Pullin Jorge

Quantum field theory on a quantum space-time: Hawking radiation and the Casimir effect.

Abstract: Using the recently discovered exact solution to the quantum Einstein equations of loop quantum gravity for vacuum spherically symmetric space-times we study a quantum scalar field living on the quantum space-time. We discuss Hawking radiation and the Casimir effect between two concentric shells. The quantum space time eliminates all infinities of the quantum field theory and the usual results of quantum field theory in curved space time are reproduced.

Rezzolla Luciano

Binary neutron stars: what we understand and what we don't

Abstract: I will review the recent progress made in modelling binaries of compact stars and the role played by magnetic fields and the equation of state in their evolution. Special attention will be paid to highlighting how the progress of ab-initio fully relativitistic calculations can be used to explain several aspects of the phenomenology of short gamma-ray burst, but also how new observations on the X-ray afterglows represent new riddles for the theoretical modeling.

Salgado Marcelo

f(R) cosmology and the equation of state of geometric dark energy

Abstract: I shall briefly review the nonequivalent equations of state (EOS) of "geometric dark energy" that have been proposed recently in the literature within the framework of f(R) cosmology and discuss their differences, advantages and drawbacks. This issue is particularly important in view of the forthcoming experiments designed to determine with a better precision the EOS of dark energy which can lead us to a better understanding about its nature.

Saltas Ippocratis

Scalar anisotropic stress as a signature of tensor wave propagation

Abstract:

Shibata Masaru

Binary neutron star merger: Gravitational waves and electromagnetic counter parts

Abstract: The merger of binary neutron stars is one of most promising sources of gravitational waves. It is also a promising candidate for the central engine of short-hard gamma-ray bursts and a source of the strong transient electromagnetic signal that could be the counterpart of gravitational-wave signals. Numerical relativity is probably the unique tool for theoretically exploring the merger process, and now, it is powerful enough to provide us a wide variety of aspects of the binary-neutron-star merger. In this talk, I will summarize our current understanding of the entire merger event that is obtained by numerical-relativity simulations. In particular, I focus on the relation between the neutron-star equation of state and gravitational waves emitted during the late inspiral and merger phase, and observable electromagnetic signal that is likely to be emitted by the dynamical ejecta.

Shoemaker Deirdre

Numerical Relativity's Preparation for Gravitational Wave Detection of BBHs

Abstract:

Sotani Hajime

Possible constraint on nuclear saturation parameters via neutron star observations

Abstract: Neutron stars are often regarded as giant neutron-rich nuclei. This picture is especially relevant for low-mass neutron stars, where empirical nuclear masses and radii can be approximately expressed as a function of atomic mass number. It is, however, not straightforward to express masses and radii of neutron stars even in the low mass range where the structure is determined by a balance between the

pressure of neutron-rich nucleonic matter and gravity. Such expressions would be of great use given possible simultaneous mass and radius measurements. Here we successfully construct theoretical formulas for the masses and radii of low-mass neutron stars from various models that are consistent with empirical masses and radii of stable nuclei. In this process, we discover a new equation-of-state parameter that characterizes the structure of low-mass neutron stars. This parameter, which plays a key role in connecting the mass–radius relation of the laboratory nuclei to that of the celestial objects, could be constrained from future observations of low-mass neutron stars.

Sotiriou Thomas

Black holes and scalar fields

Abstract: I will discuss the role of scalar fields in the structure of black holes. I will start with standard scalar-tensor theories and move on to more general theories with scalar fields. I will also explore the phenomenology of scalar field perturbations in black hole spacetimes and argue that black holes might help us detect scalar fields.

Stein Leo

Rapidly rotating black holes in dynamical Chern-Simons gravity: Decoupling limit solutions and breakdown

Abstract: Rapidly rotating black holes are a prime arena for understanding corrections to Einstein's theory of general relativity (GR). Weconstruct solutions for rapidly rotating black holes in dynamical Chern-Simons (dCS) gravity, a useful and motivated example of a post-GR correction. We treat dCS as an effective theory and thus work in the decoupling limit, where we apply a perturbation scheme using the Kerr metric as the background solution. Using the solutions to the scalar field and the trace of the metric perturbation, we determine the regime of validity of our perturbative approach. We find that the maximal spin limit may be divergent, and the decoupling limit is strongly restricted for rapid rotation. Rapidly-rotating stellar-mass BHs can potentially be used to place strong bounds on the coupling parameter l of dCS. In order for the black hole observed in GRO J1655-40 to be within the decoupling limit we need $l \lesssim 22$ km, a value 7 orders of magnitude smaller than present Solar System bounds on dynamical Chern-Simons.

Studzinska Anna

The effect of equation of state on properties of differentially rotating neutron stars in GR

Abstract:

Szkudlarek Magdalena

Numerical simulations of differentially rotating strange quark stars in GR

Abstract: Strange quark stars are considered as a possible alternative to neutron stars as compact objects. We present first fully relativistic calculations of differentially rotating strange quark stars for broad ranges of stellar masses and the degree of differential rotation. A newly born, hot neutron star (or a strange star) formed in a supernova explosion is supposed to rotate differentially. Using a highly accurate, relativistic code we calculate main properties (e.g. allowed masses, radii, the stability parameters) of rigidly and differentially rotating strange quark stars. We show that the rotation may cause a significant increase of maximum allowed mass of a strange star, much larger than in the case of neutron stars. A compact star stabilized by differential rotation could be an important source of gravitational waves.

Terzis Petros

Lie point and variational symmetries in minisuperspace Cosmology

Abstract: The symmetry analysis of differential equations resulting from reparametrization n-variant Lagrangians quadratic in the velocities, i.e.

$$L = \frac{1}{2N} G_{\alpha\beta}(q^{\kappa})\dot{q}^{\alpha}\dot{q}^{\beta} - N\,V(q^{\kappa})$$

presented; such Lagrangians encompass all minisuperspace models. The infinitesimal criterion for the existence of symmetries is modified in order to take in account the constraint that is produced from the reparametrization invariance. The generators of the symmetries are the simultaneous conformal Killing fields of both the supermetric $G\alpha\beta$ and the potential V (with opposite conformal factors). In a

parametrization of the lapse N for which the potential becomes constant, the generators of symmetries become the Killing fields of the scaled supermetric along with its homothetic field. The presented theory can be applied to General Relativity, to f(R)–Gravity and to Scalar Tensor Gravity in order to find exact solutions of the corresponding equations. As an example we present a FLRW cosmology with a perfect fluid (with variable w) which satisfies all the major energy conditions and describes an expanding universe with both a decelerating and an accelerating phase.

Tsokaros Antonios

Binary neutron star initial data with COCAL

Abstract: COCAL is a new code aimed at computing equilibrium and quasi-equilibrium solutions for a variety of systems, like single or binary compact objects, a black hole surrounded by a toroidal disk and many others. It uses finite differences and is based on the Komatsu-Eriguchi-Hachisu method suitably adapted in order to accommodate binary systems, and particular boundary conditions. In this talk we will present our current efforts in producing a variety of binary neutron star initial data with COCAL.

Tsoukalas Minas

Bi-scalar Extensions of Horndeski Theories and Black Holes

Abstract: We study certain bi-scalar-tensor theories emanating from conformal symmetry requirements of Horndeski's four-dimensional action. The former scalar is a Galileon with shift symmetry whereas the latter scalar is adjusted to have a higher order conformal coupling. Employing techniques from local Weyl geometry certain Galileon higher order terms are thus constructed to be conformally invariant. The combined shift and partial conformal symmetry of the action, allow us to construct exact black hole solutions. The black holes initially found are of planar horizon geometry embedded in anti de Sitter space and can accommodate electric charge. The conformally coupled scalar comes with an additional independent charge and it is well-defined on the horizon whereas additional regularity of the Galileon field is achieved allowing for time dependence. Guided by our results in adS space-time we

then consider a higher order version of the BBMB action and construct asymptotically flat, regular, hairy black holes. The addition of the Galileon field is seen to cure the BBMB scalar horizon singularity while allowing for the presence of primary scalar hair seen as an independent integration constant along-side the mass of the black hole.

Vega Ian

Rotating black holes in three-dimensional Hořava gravity

Abstract: In this talk, I shall discuss black holes in the infrared sector of three-dimensional Hořava gravity. It is shown that black hole solutions with anti–de Sitter asymptotics are admissible only in the sector of the theory in which the scalar degree of freedom propagates infinitely fast. We derive the most general class of stationary, circularly symmetric, asymptotically anti–de Sitter black hole solutions. We also show that the theory admits black hole solutions with de Sitter and flat asymptotics, unlike three-dimensional general relativity. For all these cases, universal horizons may or may not exist depending on the choice of parameters. Solutions with de Sitter asymptotics can have universal horizons that lie beyond the de Sitter horizon.

Vernieri Daniele

Gravity with Auxiliary Fields

Abstract: I will consider the possibility of modifying gravity by adding auxiliary fields, so as to avoid adding extra degrees of freedom. I will argue that theories of this type can generically be rewritten as General Relativity with an effective stress-energy tensor that contains higher-order derivatives of the matter fields and vanishes in vacuum. This provides a very efficient parametrization of such theories that allows to study phenomenology and obtain constraints without knowing the exact field content. Known theories with auxiliary fields fit in this parametrization. Finally I will discuss how the presence of higher-order derivatives of the matter fields leads to very tight viability constraints.

Willison Steven

Gravity as a theory of embedded surfaces

Abstract: We consider a class of isometric embeddings which are perturbable, in the sense that they allow one to encode all the local degrees of freedom of General Relativity. We show that GR can be formulated as a nonlinear hyperbolic system (wave equation) for embedding coordinates, and suggest some physical applications and open problems.

Wisniewicz Mateusz

Stability of orbits around rapidly rotating neutron stars in LMXBs

Abstract:

Yazadjiev Stoytcho

Neutron stars in modified gravity

Abstract: The natural laboratories for investigation of the strong-field regime of gravity and for testing modified gravitational theories are the neutron stars. In our talk we will present some results about neutron stars, both static and rotating, in f(R) theories and in scalar-tensor theories of gravity. Especially we will focus on effects in modified gravity neutron stars that drastically change the structure of the stars in comparison with GR.

Zampeli Adamantia

Canonical quantisation of a scalar field in a Robertson-Walker background via conditional symmetries

Abstract: We study the quantisation via conditional symmetries of the Robertson-Walker metric with a scalar field in the minisuperspace approach for the cases (i) of all possible spatial curvatures $k = 0, \pm 1$ and massless field $V(\phi) = 0$ and (ii) flat

spatial curvature k = 0 and exponential potential V (ϕ) ~ $e^{\mu\phi}$. In this model conditional symmetries appear that reduce to the usual Killing symmetries of the supermetric in a particular parametrisation of the Lagrangian. The quantisation procedure according to the Dirac method for constrained systems is applied on the rescaled Lagrangian with constant potential with the conserved quantities related to the conditional symmetries promoted to operators in addition to the Hamiltonian and momentum constraint. The additional conditions imposed on the wave function simplify the procedure to find a solution of the Wheeler-DeWitt equation.

Zarikas Vasilios

The galactic core black hole mass density increase can explain the recent passage from a deceleration to an acceleration phase.

Abstract: The history of cosmological/astrophysical observations includes discoveries that challenged established theories of Physics. The accelerating expansion of the Universe is certainly one of the most surprising recent observations, implying according to most scientists that the universe is dominated by some form of “dark energy” with exotic physical properties, or that Einstein’s theory of gravity is modified on cosmological scales. The present talk will describe an unconventional but natural proposal for explaining both the cosmic acceleration and the coincidence problem. Based mainly on two sensible assumptions i.e. extra dimensions and unitarity of physical laws governing the black hole structure, it is possible to show that the resent passage from deceleration to acceleration can be possibly attributed to the recent rise of the galactic core black hole mass density. In a braneworld cosmology setup, it is well known that the leakage of energy towards the bulk results to cosmic acceleration. This work proves that is possible to create the observed amount of cosmic acceleration from the leakage of energy occurring unavoidably and naturally in the interiors of galactic cores where giant black holes are expected to exist. This leakage is associated with a negative pressure normal to the brane. This astrophysically produced negative dark pressure can explain both the cosmic acceleration and why the dark energy today has the observed value, which is of the same order of the matter density.