Contributed abstracts:

Name: Dr. Malcolm Anderson (Male)
Affiliation: Universiti Brunei Darusslam

Abstract Title: Horizons, Singularities and Causal Structure of the Generalized McVittie Spacetimes

Abstract: The generalized McVittie spacetimes were introduced by Faraoni and Jacques in 2007 to model a spherical black hole embedded in a spatially-flat FLRW background spacetime. They include the non-accreting McVittie spacetimes and the accreting Sultana-Dyer solution as special cases, and in general must be interpreted as containing a background mixture of perfect fluids, or an imperfect fluid with heat flux, rather than a single perfect fluid.
Like the McVittie and Sultana-Dyer solutions, all generalized McVittie spacetimes (with the notable exception of the Schwarzschild and Schwarzschild-de Sitter metrics) terminate at a curvature singularity supported on a spacelike hypersurface with non-zero areal radius. In this talk I will discuss the properties of this singularity, and delineate the apparent horizons and asymptotic regions of the solutions. The picture that emerges is largely an elaboration of the structure recently outlined by Kaloper, Kleban and Martin (2010) for the original McVittie spacetime.

Name: Dr. Theocharis Apostolatos (Male)
Affiliation: University of Athens

Abstract Title: Searching for non-Kerr objects

Author List: Apostolatos T., Lukes-Gerakopoulos G., Contopoulos G.
Co-author Affiliation: Academy of Athens, Research Center for Astronomy

Abstract: By exploiting the new features of slightly nonintegrable, we propose a method to search for non-Kerr objects, by analysing the gravitational waves of small black holes orbitting around supermassive objects.

Name: Dr. Michele Armano (Male)
Affiliation: European Space Agency

Abstract Title: LISA Pathfinder, the Experiment and the Route to LISA

Author List: Michele Armano (on behalf of the LISA Pathfinder Science Working Team)

Abstract: LISA will be a joint ESA-NASA mission aimed at the direct detection of gravity waves. LISA Pathfinder (LPF) is a science and technology demonstrator to be

flown in 2012 by the European Space Agency in view of the LISA mission. As a scientific payload, the LISA Technology Package on board LPF will be the most precise geodesics explorer flown as of today, both in terms of displacement and acceleration sensitivity. The challenges embodied by LPF make it a unique mission, paving the way towards the space-borne detection of gravitational waves with LISA. We will summarize the basics of LISA and LPF, and the progress made in preparing its effective implementation in flight. We'll give an overview of the experiment philosophy and assumptions to carry on the measurements. We\'ll report on the mission plan and hardware design advances and on the progress on detailing measurements and operations. Some light will be shed on the related data processing algorithms.

Name: Dr. Anastasios Avgoustidis (Male)
Affiliation: University of Cambridge

Abstract Title: Constraints on cosmic opacity and beyond the standard model physics from cosmological distance measurements

Author List: A. Avgoustidis, C. Burrage, J. Redondo, L. Verde & R. Jimenez
Co-author Affiliation: DESY, Max Planck Munich, Barcelona

Abstract: I will present recent constraints on cosmic opacity, obtained by combining SN Type Ia data with the latest measurements of the Hubble expansion at redshifts between 0 and 2. Various models of beyond the standard model physics that predict violation of photon number conservation contribute to cosmic opacity and can be equally constrained. I will discuss a number of such models involving axion-like particles, chameleons, and mini-charged particles, and will present constraints on the relevant coupling/mass parameters.

Name: Dr. Ahmad Al Badawi (Male)
Affiliation: Al-Hussein bin Talal University

Abstract Title: Search for Gravitational waves Through Polarization vector of the electromagnetic wave upon encountering with Gravitational Sandwich Wave

Abstract: We have analyzed the exact behavior of the polarization vector of a linearly polarized electromagnetic shock wave upon crossing a gravitational sandwich wave, by using Einstein\'s theory of general relativity. The Faraday rotation in the polarization vector of the electromagnetic field is induced in this nonlinear collision. We have showed that the Faraday's angle highly depends on both the electromagnetic parameter and the width of the gravitational sandwich wave.

Name: Dr. Ioannis Bakas (Male)
Affiliation: University of Patras

Abstract Title: "Instantons of Horava-Lifshitz gravity."

Abstact: Instanton solutions of Horava-Lifshitz gravity are described in terms of eternal solutions of certain geometric flow equations on 3-manifolds. They are complete spaces with finite Euclidean action. Special examples include instantons with SU(2) isometry, which are classified in all generality and they are compared to analogous solutions of Euclidean Einstein gravity. Some novel properties of Horava-Lifshitz gravitational instantons are highlighted.

Name: Dr. Cosimo Bambi (Male)
Affiliation: IPMU, The University of Tokyo

Abstract Title: Violation of the Carter-Israel conjecture and its astrophysical implications

Abstract: According to the cosmic censorship conjecture, all the singularities produced by the collapsing matter must be hidden behind an event horizon. In 4D general relativity, it means that the final product of the collapse is a Kerr-Newman black hole (Carter-Israel conjecture). Nevertheless, there are arguments suggesting that such a conclusion may be wrong. In this talk I discuss the possibility that the Carter-Israel conjecture can be violated and how it can be tested by future astrophysical observations. In particular, I show that, if the final product is not a black hole, around the object there may be regions with repulsive gravitational force and the formation of powerful outflows.

Name: Dr. Spyros Basilakos (Male)
Affiliation: Academy of Athens, Research Center for Astronomy and Applied Mathematics

Abstract Title: Hubble expansion & formation of structures in time varying vacuum models

Author List: S. Basilakos, M. Plionis & J. Sola

Co-author Affiliation: Institute of Astronomy & Astrophysics, National Observatory of Athens, High Energy Physics Group, Dept. Estructura i Constituents de la Materia, Universitat de Barcelona,

Abstract: We investigate the properties of the FLRW flat cosmological models in which the vacuum energy density evolves with time, $\Lambda(t)$. Using different versions of the $\Lambda(t)$ model, we find that the main cosmological functions such as the scale factor of the universe, the Hubble expansion rate and the growth factor resemble those of the traditional Λ cosmology. In this context, we prove that the considered $\Lambda(t)$ models alleviate the cosmic coincidence problem. Finally, we derived the theoretically predicted dark-matter halo mass function and the corresponding distribution of

cluster-size halos for all the models studied. Their expected redshift distribution indicates that it will be difficult to distinguish the closely resembling vacuum models, using realistic future X-ray surveys of cluster abundances. However, cluster surveys based on the Sunayev-Zeldovich detection method give some hope to distinguish the closely resembling models at high redshifts.

Name: Dr. Andrew Beckwith (Male)
Affiliation: American institute of Beam energy propulsion (AIBEP.org)

Abstract Title 1: Cosmic deceleration parameter q(z) dependence upon gravitons? Implications for DM models

Abstract 1: In this paper Beckwith asks if DM and gravitons could also impact the cosmic acceleration of the universe, leading to an increase of acceleration one billion years ago, in a manner usually attributed to DE. Following Marcio E. S. Alves, Oswaldo D. Miranda, Jose C. N. de Araujo, 2009 Beckwith will high light what KK style gravitons, with a slightly different mass profile could mean in terms of DM

Abstract Title 2: Detection of Gravitational waves with semi classical features and cosmological implications of such semi classical models

Abstract 2: We argue in this document that initial vacuum state values possibly responsible for GW generation in relic conditions in the initial onset of inflation may have a temporary unsqueezed , possibly even coherent initial value, which would permit in certain models classical coherent initial gravitational wave states Furthermore, several arguments pro and con as to if or not initial relic GW should be high frequency will be presented, with the reason given why earlier string models did NOT favor low frequency relic GW from the big bang.

Name: Dr. Igor Bulyzhenkov (Male)
Affiliation: P.N. Lebedev Physical Institute

Abstract Title: Duality of chiral gravitational waves for pulsar period decay without net radiation

Abstract: Chiral pairs of dual gravitational waves locally warm accelerated bodies that explains the measured pulsar period decay without net radiation losses of energy. Gravitational wave self-heating and orbital period damping of a neutron star is more efficient for the free spiral motion around a giant companion than around a similar mass partner. This geodesic self-heating of massive bodies with constant thermo-gravimechanical energy-charges increases their brightness-to-charge ratio along radial falls in a galaxy.

Name: Dr. Ivan Cagnani (Male)

Affiliation: University of Bologna

Abstract Title: Galactically inertial space probes for the direct measurement of the metric expansion of the universe

Abstract: Astrometric data from the future GAIA and OBSS missions will allow a more precise calculation of the local galactic circular speed, and better measurements of galactic movements relative to the CMB will be obtained by post-WMAP missions (ie Planck). Contemporary development of high specific impulse electric propulsion systems (ie. VASIMIR) will enable the development of space probes able to properly compensate the galactic circular speed as well as the resulting attraction to the center of our galaxy. The probes would appear immobile to an ideal observer fixed at the center of the galaxy, in contrast of every other galactic object, which would appear moving according to their local galactic circular speed and their proper motions. Arranging at least three of these galactically static probes in an extended formation and measuring reciprocal distances of the probes over time with large angle laser ranges could allow a direct measurement of the metric expansion of the universe. Free-drifting laser-ranged targets released by the spacecrafts could also be used to measure and compensate solar system\'s induced local perturbations. For further reducing local efects and increase the accuracy of the results, the distance between the probes should be maximized and the location of the probes should be as far as possible from the Sun and any massive object (ie Jupiter, Saturn). Gravitational waves could also induce random errors but data from GW observatories like the planned LISA could be used to correct them.

Name: Dr. Thomas Cailleteau (Male)
Affiliation: LPSC Grenoble

Abstract Title: Observational consequences of Loop Quantum Cosmology

Abstract: Loop Quantum Cosmology (LQC) is the symmetry reduced version of Loop Quantum Gravity with tries to conciliate general relativity and quantum mechanics in a consistent, non-perturbative and background independent way. It provides an efficient framework to study the evolution of the universe beyond the classical Big Bang paradigm, in particular because the singularity is replaced by a bounce. In order to see if LQC can be tested by Cosmological Microwave Background (CMB) experiments like PLANCK or BPOL, we have investigated the propagation of primordial gravitational waves in a LQC-Universe whose content is dominated by a massive scalar field. We have show that this model naturally sets the initial conditions for inflation without any fine tuning. An analytical model was developed to compute the tensor power spectrum and was shown to agree very well with a full numerical simulation including both the background and the modes quantum-corrected evolution. I will conclude by underlining the constraints that can already be set by current cosmological observations.

Name: Dr. C Sofia Carvalho (Female)

Affiliation: University of KwaZulu-Natal

Abstract Title: Unlensing the CMB: a real space approach to extract the weak lensing potential

Abstract: We propose an estimator defined in real space for the reconstruction of the weak lensing potential due to the intervening large scale structure from high resolution maps of the cosmic microwave background. This estimator was motivated as an alternative to the quadratic estimator in harmonic space to surpass the difficulties of the analysis of maps containing galactic cuts and point source excisions. Using maps synthesised by pixel remapping, we implement the estimator for two experiments, namely one in the absence and one in the presence of detector noise, and compare the reconstruction of the convergence field with that obtained with the quadratic estimator defined in harmonic space. We find good agreement between the input and the reconstructed power spectra using the proposed real space estimator.

Name: Prof. Theodosios Christodoulakis (Male)
Affiliation: University of Athens

Abstract Title: Canonical Quantization of some miodi-superaspace models and the Classical Eqivalence problem

Abstract: The 3+1 (canonical) decomposition of all geometries admitting two-dimensional space-like surfaces is exhibited. A proposal consisting of a specific re-normalization Assumption and an accompanying Requirement is put forward, which enables the canonical quantization of these geometries. The resulting Wheeler-deWitt equation is based on a re-normalized manifold parameterized by three smooth scalar functionals. The entire space of solutions to this equation is analytically given, exploiting the freedom left by the imposition of the Requirement and contained in the third functional. The existence of only first spatial derivatives of the metric components in the basic functionals points to the fact that there must be a way to classify classical geometries using only first derivatives of the metric. The current state of knowledge for the subject is the Cartan-Karlhede equivalence classication scheme, which requires up to seven derivatives of the Riemann tensor. It is shown that an improvement of the scheme, using only up to first derivatives, exists.

Name: Dr. Adriano Contillo (Male)
Affiliation: SISSA

Abstract Title: Inflationary solutions in asymptotically safe higher-order gravity theories

Author List: A. Bonanno, A. Contillo, R. Percacci

Co-author Affiliation: OACT Catania (Bonanno), SISSA and Perimeter Institute (Percacci)

Abstract: Power-law inflationary solutions obtained from Renormalization Group improvement of a class of f(R) theories recently studied in the context of asymptotic safety scenario are discussed. The higher-order gravity dynamics encode the dimensional scaling around the non-gaussian fixed point coming from the beta functions of a polynomial Lagrangian up to order n=8 in the scalar curvature R. By means of a dynamical identification of the energy scale of the renormalization group equation, it is then found that power-law inflation is a rather general prediction of RG improved cosmologies in this truncation. DeSitter solutions are also obtained in the case of pure gravity and it is shown that they can be read as a limit case of the above mentioned power-law solutions.

Name: Konstantinos Dimopoulos (Male)
Affiliation: Lancaster University

Abstract Title: The quantum origin of cosmic structure: theory and observations.
Abstract: The current understanding in cosmology is that structures in the Universe, such as galaxies and galactic clusters, originated through gravitational instability from a primordial curvature perturbation. The latter is generated during inflation by the enhancement of quantum fluctuations of suitable fields, which are transformed into superhorizon classical perturbations when stretched by the inflationary expansion. I will briefly review this so-called particle production process and discuss several mechanisms (inflaton, curvaton, modulated reheating etc.) for transforming a superhorizon spectrum of scalar field perturbations into a suitable curvature perturbation spectrum, with some emphasis on observational aspects (e.g. non-Gaussianity). Afterwards, I will discuss mechanisms which allow a superhorizon spectrum of perturbations of suitable vector fields to affect or even generate the curvature perturbation. Finally, I will focus on distinct observational signatures (such as statistical anisotropy in the spectrum and bispectrum of the CMB temperature perturbations) of this possibility, which will be probed in the near future (e.g. by the Planck satellite).

Name: Prof. Joshua Erlich (Male)
Affiliation: College of William and Mary

Abstract Title: A Coherent State Principle for Gravity

Abstract: I will describe a principle by which Einstein gravity emerges as an effective interaction for field theoretic coherent states.

Name: Dr. Nikolaos Fanidakis (Male)
Affiliation: Durham University

Abstract Title: Modelling SMBHs in cosmological simulations

Author List: Nikolaos Fanidakis, Carlos Frenk
Co-author Affiliation: Durham University

Abstract: I will present a semi-analytic model that studies the evolution of SMBHs in a LCDM universe. The calculation is embedded in the GALFORM semi-analytical model which simulates the formation and evolution of galaxies in a cold dark matter universe. The model tracks the accretion onto the SMBHs and the evolution of SMBH mass and spin and reproduces the radio and optical signature of active galaxies reproduces the optical and radio signatures of AGN. In addition I will show the properties of SMBH binaries formed during galaxy mergers and make predictions for the gravitational waves emitted during the inspiral and final coalesce of the binary members.

Name: Prof. Jose A. Font (Male)
Affiliation: Dept. Astronomy and Astrophysics, University of Valencia

Abstract Title: Relativistic MHD simulations of stellar core collapse and magnetars

Abstract: In this talk we discuss MHD simulations of relativistic stars performed with a numerical code which solves the general relativistic magneto-hydrodynamics equations coupled to Einstein\'s field equations (in the conformally flat approximation) for the evolution of a dynamical spacetime. The code has recently been applied to the study of the dynamics of astrophysical scenarios in which both, high magnetic fields and strong gravitational fields appear, namely the magneto-rotational collapse of stellar cores and the evolution of highly magnetized neutron stars, or magnetars. The first half of the talk will be devoted to explore magneto-rotational core collapse simulations of a realistic iron core progenitor. In the second half we will discuss simulations of Alfven oscillations in magnetars, which we model as a relativistic star with a dipolar magnetic field. Mechanisms affecting the amplification of the magnetic field during the collapse and the presence of quasi-periodic oscillations in the resulting magnetars will be also briefly considered.

Name: Dr. Valeri Frolov (Male)
Affiliation: University of Alberta

Abstract Title: Applications of hidden symmetries to black hole physics

Abstract: The talk contains a brief summary of the applications of the hidden symmetries and complete integrability to the black hole theory in four and higher dimensions.

Name: Dr. Michael Gabler (Male)
Affiliation: Max Planck Institute for Astrophysics

Abstract Title: Torsional shear oscillations of magnetized neutron stars

Author List: Michael Gabler

Co-author Affiliation: P. Cerda-Duran, N. Stergioulas, J.A. Font

Abstract: The discovery of giant flares of Soft Gamma Repeaters (SGRs) may open a first window to astroseismology for neutron stars. In the decaying tail of these bursts there were a couple of quasi periodic oscillations (QPOs) observed. If one follows the common assumption that SGR are strongly magnetized neutron stars and compares the observed QPOs with the torsional shear modes of the crust one finds a remarkable agreement for many of the QPOs. An alternative approach involves the magnetic field which provides a natural coupling to the magnetosphere where the emission is supposed to occur. Therefore one may interpret the QPOs as as Alfven oscillations of the core. Both approaches can hardly explain all of the observed frequencies satisfactory.

This work is concerned with coupled crust-core oscillations of magnetars. We extend a numerical method used to study the torsional Alfven modes of the core by adding an elastic crust. For low magnetic fields (< 10^14 G), it is possible to recover the purely crustal shear oscillation. For very large fields (> 10^15 G) the code reproduces the Alfven continuum of the core and the crustal modes are damped very efficiently. For realistic field strength of magnetars between 10^14 and 10^15 G, where the shear and magnetic field contributions are of the same order, there is no clear sign of crustal modes or quasi periodic oscillations of the core.

Name: Dr. Shan Gao (Male)
Affiliation: University of Sydney

Abstract Title: Explaining Holographic Dark Energy

Abstract: The physical origin of holographic dark energy (HDE) is re-examined. It is shown that the well-accepted explanation in terms of the UV/IR connection argument of Cohen et al is wrong. Moreover, Thomas's bulk holography argument, which is considered as another physical basis of the HDE model, is not consistent with observations either. A new conjecture is then proposed to explain the HDE model. It is suggested that the dark energy of the universe may originate from the quantum fluctuations of space-time limited in the event horizon of the universe. The energy density of such fluctuations is shown to assume the same form as that in the HDE model. Moreover, both theoretical considerations and latest observations suggest c~sqrt(pi)/2. The conjecture can also be tested in local parts of the universe, as it predicts that there will exist more dark energy between two black holes.

Name: Dr. Diego Rubiera-Garcia (Male)
Affiliation: Observatoire de Paris, France

Abstract Title: Black holes from generalized gauge field theories

Author List: Diaz-Alonso, Joaquin; Rubiera-Garcia, Diego
Co-author Affiliation: Observatoire de Paris, France

Abstract: We report on some main properties of the electrostatic spherically symmetric (ESS) solutions of a large class of generalized gauge field theories (abelian and non-abelian) in the context of Einstein gravity, which generalize the gravitating structures found for several models such as Maxwell and Born-Infeld. The models studied here are defined as arbitrary functions of the field invariants and classified into two sets according to the character of their associated flat-space energy for ESS fields. We qualitatively classify several features of the associated black hole solutions (metric, thermodynamics, etc). We also discuss briefly the extension of these results to higher-order gravity theories.

Name: Dr. Dimitrios Giannios (Male)
Affiliation: Princeton University

Abstract Title: Several aspects of MHD driven, relativistic jets

Abstract: Strong magnetic fields can extract rotational energy from compact objects launching relativistic jets in active galactic nuclei (AGNs) and gamma-ray bursts (GRBs). I argue that MHD processes can be responsible not only for the acceleration of jets but for the GRB and Blazar emission through magnetic dissipation. Interactions of the jets with the surrounding medium can probe the magnetization of the ejecta constraining the different models.

Name: Prof. Ruth Gregory (Female)
Affiliation: Durham University

Abstract Title: Gauss-Bonnet Holographic Superconductors

Abstract: We study 3+1-dimensional holographic superconductors in Einstein-Gauss-Bonnet gravity. The higher curvature corrections make condensation harder, and also influence the conductivity.

Name: Dr. Laur Jarv (Male)
Affiliation: University of Tartu

Abstract Title: Scalar-tensor cosmologies with a potential in the general relativity limit

Author List: Laur Jarv(1), Piret Kuusk(1), Margus Saal(2)
Co-author Affiliation: (1) University of Tartu, (2) Tartu Observatory

Abstract: We consider FLRW flat cosmological models in the framework of general Jordan frame scalar-tensor theories of gravity with arbitrary coupling functions, in the era when the energy density of the scalar potential dominates over the energy density of ordinary matter. To study the regime suggested by the local weak field tests (i.e. close to the so-called limit of general relativity) we propose a nonlinear approximation scheme, solve for the phase trajectories, and provide a complete classification of possible solutions. We argue that the topology of phase trajectories in the nonlinear approximation is representative of those of the full system, and thus can tell for which scalar-tensor models general relativity functions as an attractor. We conclude with some implications for cosmological expansion. [The talk is based on arXiv: 1003.1686 (to appear in PRD), PRD78 083530 (2008), and a forthcoming publication.]

Name: Dr. Naef Joachim (Male)
Affiliation: Institute for Theoretical Physics, University of Zuerich

Abstract Title: On the Spin Precession in f(R) Gravity

Author List: Joachim Naef, Philippe Jetzer
Co-author Affiliation: Institute for Theoretical Physics, University of Zuerich

Abstract: We consider f(R) gravity in the case where f is analytic at R=0. We use the 1/c expansion of the space time metric g_{\mu\nu} for a derivation of the leading order terms of the precession of a gyroscope in a gravitational field. For this purpose it suffices to assume f(R) = R + aR^2 with a positive dimensional parameter a. The result of the Gravity Probe B experiment yields the limit a $\lesssim$ 5 x 10^{11} m^2, whereas for the pulsar B in the PSR J0737-3039 system we get a bound which is about 10^4 times larger. Furthermore, it is a known result that f(R) gravity features a Yukawa correction to the Newtonian potential in the non-relativistic limit. The E\\\"ot-Wash experiment then provides a laboratory bound a $\lesssim$ 10^{-10} m^2. The different orders of the constraints on a may be interpreted in the sense of a chameleon effect.

Name: Dr. Kostas Kleidis (Male)
Affiliation: Department of Mechanical Engineering, Technological Education Institute of Serres

Abstract Title: A conventional form of Dark Energy

Author List: Kostas Kleidis and Nicholas K. Spyrou
Co-author Affiliation: Department of Astronomy, Aristoteleion University of Thessaloniki

Abstract: The basic unresolved issue of the current cosmological picture is that, the Universe must contain a considerably larger amount of energy, than the equivalent to

the total rest-mass of its matter content does. For this reason, an extra (dark) energy component has been introduced, to compromise for the observational results. On the other hand, much evidence has been accumulated in support of dark matter (DM), suggesting that, more than 85% (by mass) of the matter in the Universe consists of non-luminous and non-baryonic material. Although we do not know for certain how the DM came to be formed, a sizeable relic abundance of weakly interacting massive particles (WIMPs) is generally expected to have been produced as a by-product of the Universe\'s hot youth. Apart from their exact nature, the scientific community used to argue that, the WIMPs should be collision-less. However, many recent results from high-energy-particle tracers, such as the ATIC and PAMELA, combined with those of the Wilkinson microwave anisotropy probe (WMAP) survey, have revealed an unusually-high electron - positron production in the Universe, much more than what is anticipated by supernovae explosions or cosmic-ray collisions. These results have led many scientists to argue that, among the best candidate-sources of these high-energy events are the annihilations of WIMPs. If this is true, it could affect our perception on the nature of dark energy (DE). Indeed, assuming that the DM is slightly-collisional, i.e., it possesses also some sort of thermodynamical content; an extra energy-component does exist in the Universe: It is the energy of the internal motions of the collisional-DM fluid. On this basis, we have examined the evolution and the dynamical characteristics of a cosmological model (not necessarily reflecting our own Universe), in which (in principle) there is no DE at all. In other words, the matter-energy content of this model consists only of two components: The DM (dominant) and the luminous one (subdominant), both having the abundances attributed to them by the WMAP survey. Accordingly, we have considered that, these two constituents (basically the dark one) form a quasi-dust perfect fluid of total rest-mass density and a small (but positive) total pressure. In this case, together with all the other physical characteristics, the energy of this fluid\'s internal motions is (also) taken into account as a source of the Universal gravitational field. Although speculative, the idea that the (extra) DE - needed to flatten the Universe - could be attributed to the internal motions of a collisional-DM fluid, is (at least) intriguing.

Name: Georgios Kofinas
Affiliation: University of Crete

Title : Transplanckian bremsstrahlung and black hole production

Abstract: Classical gravitational bremsstrahlung in particle collisions at transplanckian energies is studied in spaces with extra compact dimensions. The radiated energy is computed and found to be larger than previous estimates by many powers of the Lorentz factor. The result is reliable for impact parameters larger than the Compton length of the scattered particles and at the same time in between the Schwarzschild radius and a scale marking the loss of the notion of classical trajectories. Since gravitational bremsstrahlung leads to extreme damping in transplanckian collisions, radiation reaction should be included in the analysis of black hole production.

Name: Dr. Roman Konoplya (Male)
Affiliation: Theoretical Astrophysics, Tubingen University

Abstract Title: Long life of Gauss-Bonnet corrected black holes

Author List: R. A. Konoplya, A. Zhidenko
Co-author Affiliation: Tubingen U, Sao Paulo U.

Abstract: Dictated by the string theory and various higher dimensional scenarios, black holes in D>4-dimensional space-times must have higher curvature corrections. The first and dominant term is quadratic in curvature, and called the Gauss-Bonnet (GB) term. We shall show that although the Gauss-Bonnet correction changes black hole`s geometry only softly, the emission of tensor type gravitons is suppressed by many orders even at quite small values of the GB coupling. The huge suppression of the tensorial graviton emission is due to the multiplication of the two effects: the quick cooling of the black hole when one turns on the GB coupling and the exponential decreasing of the grey-body factor of the tensor type of gravitons at small and moderate energies. At higher D the tensor gravitons emission is dominant, so that the overall lifetime of black holes with Gauss-Bonnet corrections is many orders larger than it was expected. This effect might be observable at the future experiments in the Large Hadron Collider (LHC).

Name: Dr. Chris Kouvaris (Male)
Affiliation: Free University of Brussels

Abstract Title: Can Neutron Stars constrain Dark Matter?

Abstract: Neutron stars can accrete significant numbers of dark matter particles even if the WIMP-nucleon cross section is below the current limits of dark matter search experiments. If WIMPs can annihilate, the produced heat can keep old neutron stars warm at late ages. This allows us to impose a lower bound on the surface temperature of neutron stars and therefore it might be possible to rule out WIMP candidates in the near future.

Name: Dr. Georgios Kraniotis (Male)
Affiliation: The University of Ioannina

Abstract Title: Precise analytic treatment of Kerr and Kerr-(anti) de Sitter black holes as gravitational lenses.

Abstract: The null geodesic equations that describe motion of photons in Kerr spacetime are solved exactly in the presence of the cosmological constant Λ. The exact solution for the deflection angle for generic light orbits, is calculated in terms of the generalized hypergeometric functions of Appell and Lauricella. We then consider the more involved issue in which the black hole acts as a gravitational `lens'. The constructed Kerr black hole gravitational lens geometry consists of an observer and a source located far away and placed at arbitrary inclination with respect to black hole's

equatorial plane. The resulting lens equations are solved elegantly in terms of Appell-Lauricella hypergeometric functions. In this framework, the magnification factors for generic orbits which include equatorial and polar orbits are calculated in closed analytic form for the first time. The exercise is repeated with the appropriate modifications for the case of non-zero cosmological constant.

Name: Prof. Ofer Lahav (Male)
Affiliation: University College London

Abstract Title: The Observational Status of LCDM

Abstract: The observational status of the \'standard\' Λ+Cold Dark Matter (ΛCDM) model will be reviewed. Future surveys will be discussed, e.g. the Dark Energy Survey and the ESA\'s Euclid space mission.

Name: Dr. Paul Lasky (Male)
Affiliation: Tuebingen University

Abstract Title: Black holes and neutron stars in Tensor-Vector-Scalar theory

Abstract: Bekenstein's Tensor-Vector-Scalar (TeVeS) theory has had considerable success as a relativistic theory of Modified Newtonian Dynamics (MoND). In its strong-field regime it makes many predictions that differ from standard General Relativity, implying this regime provides an excellent testing ground for the theory using both current and future observations of neutron stars and black holes in both the electromagnetic and gravitational wave spectrum. In this talk I look at the current status of black hole and neutron star solutions in TeVeS, including some key observational properties that differ from General Relativity. I then discuss various perturbations of black holes and what can be learnt from both the stability of black holes in TeVeS as well as gravitational wave emission which will hopefully be detectable in the coming decade.

Name: Dr. Guo Chin Liu (Male)
Affiliation: TKU

Abstract Title: CMB Polarization and Dark Energy Induced Cosmological Birefringence

Abstract: The coupling between dark energy and the pseudoscalar of electromagnetism, if there is any, would induce a rotation of the polarization plane of the cosmic microwave background (CMB). This results in a non-vanishing B mode and parity-violating TB and EB correlations. Taking into account this effect, we calculate the full set of power spectra of cosmic microwave background (CMB) temperature and polarization anisotropies. We also give the constrains on the coupling strength from WMAP seven year data and other cosmological observations.

Name: Prof. Nikolaos Mavromatos (Male)
Affiliation: King's College London

Abstract Title: Stringy space time foam and gamma ray astronomy

Abstract: I will discuss constraints on models of stringy quantum gravity space-time foam from high and ultra-high energy gamma ray astronomy, as well as cosmological implications.

Name: Dr. Charalampos Markakis (Male)
Affiliation: University of Wisconsin - Milwaukee

Abstract Title: Quasi-equilibrium models of magnetized compact objects

Author List: Koji Uryu, Eric Gourgoulhon, Charalampos Markakis
Co-author Affiliation: KOJI URYU (University of the Ryukyus, Okinawa), ERIC GOURGOULHON (Observatoire de Paris - Meudon), CHARALAMPOS MARKAKIS (University of Wisconsin-Milwaukee)

Abstract: We report work towards a relativistic formulation for modeling strongly magnetized neutron stars, rotating or in a close circular orbit around another neutron-star or black hole, under the approximations of helical symmetry and ideal MHD.
The quasi-stationary evolution is governed by the first law of thermodynamics for helically symmetric systems, which is generalized to include magnetic fields. The formulation involves an iterative scheme for solving the Einstein-Maxwell and relativistic MHD-Euler equations numerically. The resulting configurations for binary systems could be used as self-consistent initial data for studying their inspiral and merger.

Name: Dr. Evangelos Melas (Male)
Affiliation: TEI of Lamia

Abstract Title: Review of the work on the representation theory of BMS group and its variants

The Bondi-Metzner-Sachs (BMS) group B emerged in General Relativity as the asymptotic symmetry group in future (past) null directions of space-times representing bounded gravitational sources emitting gravitational radiation. It has been suggested that B, via its representation theory, might play a role in the quantization of the gravitational field. With this motivation, the strongly continuous unitary irreducible representations (IRs) of B were found a long time ago. However, in studying quantum gravity, space-times signatures other than the usual Lorentzian one, and complex space-times, are frequently considered. Generalizations of B suitable for these other signatures have been defined earlier. The work which has been

done so far is reviewed with emphasis on some resent results on B(2,2), the BMS group appropriate for ultrahyperbolic signature.

Name: Dr. John Miritzis (Male)
Affiliation: University of the Aegean

Abstract Title: FRW models in the conformal frame of f(R) gravity
Abstract: We study the late time evolution of Friedmann-Robertson-Walker (FRW) models with a perfect fluid matter source and a scalar field arising in the conformal frame of f(R) theories nonminimally coupled to matter. We prove using the approach of dynamical systems, that equilibria corresponding to non-negative local minima for V are asymptotically stable. We show that if γ, the parameter of the equation of state is larger than one, then there is a transfer of energy from the fluid to the scalar field and the later eventually dominates. The results are valid for a large class of non-negative potentials without any particular assumptions about the behavior of the potential at infinity.

Name: Dr. Savvas Nesseris (Male)
Affiliation: Niels Bohr Institute / DISCOVERY

Abstract Title: A model independent null test on the cosmological constant.

Author List: Savvas Nesseris, Arman Shafieloo
Co-author Affiliation: NBI, Oxford

Abstract: We use the Om statistic and the Genetic Algorithms (GA) in order to derive a null test on the spatially flat cosmological constant model ΛCDM. This is done in two steps: first, we apply the GA to the Constitution SNIa data in order to acquire a model independent reconstruction of the expansion history of the Universe H(z) and second, we use the reconstructed H(z) in conjunction with the Om statistic, which is constant only for the ΛCDM model, to derive our constraints. We find that while ΛCDM is consistent with the data at the 2σ level, some deviations from ΛCDM model at low redshifts seems to be mildly preferred. (based on 1004.0960)

Name: Dr. Vasilis Oikonomou (Male)
Affiliation: Aristotle University of Thessaloniki

Abstract Title: Corrections to Gravity due to a Sol Manifold Extra Dimensional Space

Abstract: The corrections to the gravitational potential due to a Sol extra dimensional compact manifold, denoted as M_A^3, are studied. The total spacetime is of the form M^4 x M_A^3. The range of the Sol corrections is investigated and compared to the range of the T^3 corrections.

Name: Dr. Demetrios Papadopoulos (Male)
Affiliation: Aristotle University of Thessaloniki, Department of Physics, Section of Astrophysics Astronomy and Mechanics

Abstract Title: Tensor perturbations in Starobinski\'s inflationary scenario

Author List: D.B.Papadopoulos
Co-author Affiliation: E.Verdaguer, Department of Physics, University of Barcelona,Spain
Abstract: In an almost de Sitter space-time, the stochastic semiclassical Einstein-Langevin equations with cosmological constant have been written in the TT-gauge in a perturbative way (e.g. as zero-order and first order equations). The zero order equation gave us an exact solution for the scale factor which is proportional to the cosmological constant Λ corresponding to an expanding universe. Knowing the scale factor we have applied order reduction to the inhomogeneous first order equations (e.g. to the stochastic semiclassical Einstein-Langevin equations) describing the evolution of the GWs modes and calculated a returted Green function. A two point correlation function of the tensor perturbations has been computed explicitly and the spectrum of the Gws as well.

Name: Dr. Taxiarchis Papakostas (Male)
Affiliation: TEI of CRETE

Abstract Title: The problem of the interior Kerr solution
Abstract: We present a review of the problem to find an interior solution statinary and axisymmetric that can be matched to Kerr solution and we give some new solutions to this problem.

Name: Dr. Nikolaos Pappas (Male)
Affiliation: University of Ioannina

Abstract Title: Graviton Emission in the Bulk by a Simply Rotating Black Hole

Author List: P. Kanti, H. Kodama, R. A. Konoplya, N. Pappas, A. Zhidenko

Abstract: In this work, we study the emission of tensor-type gravitational degrees of freedom from a higher-dimensional, simply rotating black hole in the bulk. The decoupled radial part of the corresponding field equation is first solved analytically in the limit of low-energy emitted particles and low-angular momentum of the black hole in order to derive the absorption probability. Both the angular and radial equations are then solved numerically, and the comparison of the analytical and numerical results show a very good agreement in the low and intermediate energy regimes. By using our exact, numerical results we compute the energy and angular momentum emission rates and their dependence on the spacetime parameters such as

the number of additional spacelike dimensions and the angular momentum of the black hole. Particular care is given to the convergence of our results in terms of the number of modes taken into account in the calculation, and the multiplicity of graviton tensor modes that correspond to the same angular-momentum numbers.

Name: Dr. Manolis Plionis (Male)
Affiliation: NOA

Abstract Title: Cosmological constraints using high-z X-ray AGNs

Author List: Plionis, Basilakos
Co-author Affiliation: Academy of Athens

Abstract: Using the clustering pattern of high-z X-ray selected AGN and a novel bias evolution model; we place tight constraints on the main cosmological parameters of spatially flat cosmological models. For the Omega_m, w parametrization we obtain very narrow contours in the relevant solution space, providing: Omega_{m}= 0.26+-0.05 and w=-0.93+-0.15. If we combine our AGN results with the latest SNIa Hubble relation results, we obtain: Omega_{m}= 0.27+-0.02 and w=-0.96+-0.07.

Name: Prof. David Polarski (Male)
Affiliation: Universite Montpellier

Abstract Title: Dark energy

Abstract: We will address some of the issues raised by Dark Energy models, models originally aimed to explain the late-time accelerated rate of expansion of our Universe.

Name: Prof. Dimitris Psaltis (Male)
Affiliation: University of Arizona

Abstract Title: Testing the No-Hair Theorem with Astrophysical Black Holes

Abstract: The Kerr spacetime of spinning black holes is one of the most intriguing predictions of Einstein's theory of General Relativity. The special role this spacetime plays in the theory of gravity is encapsulated in the no-hair theorem, which states that the Kerr metric is the only realistic axisymmetric solution to the vacuum field equations. Recent and anticipated advances in observations of black holes throughout the electromagnetic spectrum have both secured our understanding of their basic properties and opened new opportunities for devising tests of gravity theories. In this talk, I will show that observations of continuum and line spectra from accreting black-hole candidates with current and future instruments can provide the first direct test of the no-hair theorem. I will also discuss how the imaging observations of the inner

accretion flow around the black hole in the center of the Milky Way can help us map the spacetime in the vicinity of its horizon and lead to a detailed test of the Kerr solution.

Name: Dr. Nematollah Riazi (Male)
Affiliation: Physics Department, Shiraz University

Abstract Title: Can inflation, dark matter, and dark energy be unifed by a scalar field?

Author List: N. Riazi and E. Ebrahimi
Co-author Affiliation: Physics Department and Biruni Observatory, Shiraz University, Shiraz, Iran

Abstract: Dark matter and dark energy are the two big mysteris of current cosmology. The cause of inflation, currently believed to be an inevitable short period of rapid expansion in the early universe is also still unclear. In this presentation, we review the efforts which have been made so far for a unified picture of these three important ingredients in cosmology and propose a scalar field self-interaction potential tailored to exhibit some of the main features of inflation, dark matter, and dark energy.

Name: Dr. Shimon Rubin (Male)
Affiliation: Ben-Gurion University of the Negev

Abstract Title: Non-closed Universe and Zero Cosmological Constant from Normalized General Relativity

Author List: Shimon Rubin, Aharon Davidson
Co-author Affiliation: Ben-Gurion University of the Negev

Abstract: Constant shift in the Einstein-Hilbert Lagrangian is a symmetry of the Normalized General Relativity action. The theory offers a simple resolution to the first cosmological constant puzzle. Unfortunately, standard Friedmann-Robertson-Walker cosmology cannot be directly addressed within the framework of such a theory because a perfect fluid energy-momentum tensor is not derivable from a matter Lagrangian. However, this technical difficulty can be effectively bypassed at the minisuperspace level, where we prove that (i) If matter is attractive then the Universe cannot be closed, and reassure that (ii) The accompanying cosmological constant generically vanishes. Interestingly, the theory also allows for non-generic solutions with non vanishing cosmological constant, which are associated with Einstein static closed and Eddington-Lemaitre universes.

Name: Prof. Mairi Sakellariadou (Female)
Affiliation: King's College

Abstract Title: Cosmology within the NonCommutative Spectral Action

Abstract Title : The Spectral Triple approach to NonCommutative Geometry allows one to develop the entire Standard Model (and Supersymmetric extensions) of Particle Physics from a purely geometrical point of view. The Bosonic sector of the theory contains a modification to Einstein-Hilbert gravity, involving a nonconformal coupling of the Ricci curvature to the Higgs field and conformal Weyl term (in addition to a non-dynamical topological term). I will show that neglecting the nonminimal coupling of the Higgs field to the curvature, noncommutative corrections to Einstein's equations are present only for inhomogeneous and anisotropic space-times. Considering the nonminimal coupling however, one obtains corrections even for background cosmologies. I will then derive the weak field limit of this gravitational theory and show that the production and dynamics of gravitational waves are significantly altered. I will finally investigate whether two-loop corrections to the Higgs potential could lead to a slow-roll inflationary period in agreement with the CMB data.

Name: Dr. Juan Carlos Bueno Sanchez (Male)
Affiliation: University of Ioannina, UCM

Abstract Title: Growth of matter and dark energy perturbations in scalar-tensor cosmologies

Author List: Juan C. Bueno Sanchez, L. Perivolaropoulos, J. Dent, S. Dutta

Abstract: We study analytically and numerically the growth of dark energy and matter linear perturbations in scalar tensor cosmologies. On subhorizon scales the amplitude of the dark energy perturbations becomes scale independent, hence larger than those corresponding to general relativity. We find that the dark energy perturbations are anti-correlated with matter and show that, owing to this, the matter density contrast is up to 10% larger than the corresponding matter contrast for ΛCDM. We also carry out an analytical study of the growth of the matter perturbations beyond the subhorizon approximation. We find that our approximate equation for the matter contrast is in excellent agreement with the numerical solution on scales up to horizon. We then go on to present a new scale-dependent parametrization for the growth of the matter perturbations in scalar-tensor cosmologies. Implications of our findings are briefly discussed.

Name: Prof. Subir Sarkar (Male)
Affiliation: University of Oxford

Abstract Title: "Cosmology beyond the standard model"

Abstract: Precision observations of the cosmic microwave backround and of the large-scale clustering of galaxies have supposedly confirmed the indication from the Hubble diagram of Type Ia supernovae that the universe is dominated by some form

of dark energy which is causing the expansion rate to accelerate. Although hailed as having established a standard model for cosmology, this raises a profound problem for fundamental physics. I will highlight several observed problems with the standard model and discuss whether dark energy may just be an artifact of interpreting observations assuming an exactly homogeneous metric.

Name: Dr. Rodrigo Ferreira Sobreiro
Affiliation: Universidade Federal Fluminense

Abstract Title: Affine gauge theory of gravity and its reduction to the Riemann-Cartan geometry.

Abstract: We discuss a formal construction of a gauge theories of gravity for the affine group that seems to be suitable for a quantum theory of gravity. The formal framework, based on the fibre bundle theory, allows us to show that the resulting gravity theory can be reduced from the metric-affine scenario to the Riemann-Cartan one with the presence of matter fields associated with the nonmetric degrees of freedom of the original setup. Moreover, the geometrical reduction shows itself to be independent of the dynamical equations, being then a general result independent of the starting action. Finally, the conditions to be fulfilled by a quantum consistent action is also discussed.

Name: Prof. Joan Sola (Male)
Affiliation: Dept. ECM, Univ. de Barcelona

Abstract Title: Cosmologies with a time dependent vacuum

Abstract: Cosmologies with running cosmological term may naturally be expected if the evolution of the universe can ultimately be derived from the first principles of Quantum Field Theory or String Theory. I discuss several examples and consider their possible phenomenological implications. In some cases the time evolution of the vacuum energy is accompanied by a logarithmic running of the gravitational coupling. It turns out that these cosmologies produce a matter power spectrum with the same shape as that of the ΛCDM model, thus predicting the same basic features on structure formation. In addition, I discuss how these models can provide useful clues for solving the old cosmological constant problem.

Name: Dr. Thomas Sotiriou (Male)
Affiliation: DAMTP, University of Cambridge

Abstract Title: Horava-Lifshitz gravity: infrared dynamics and viability

Abstract: Horava-Lifshitz gravity has been proposed with the hope of being a UV complete gravity theory. After giving a comprehensive overview of the characteristics

of the theory and distinguishing between the various versions, will focus on its dynamics. I will extensively discuss the dynamics of the extra scalar degree of freedom with respect to general relativity. The consistency and viability of each version depends crucially on the behaviour of this scalar mode.

Name: Prof. Nikolaos Spyrou (Male)
Affiliation: Astronomy Department

Abstract Title: CONFORMAL DYNAMICAL EQUIVALENCE AND APPLICATIONS

Author List: Study Group

Abstract: CONFORMAL DYNAMICAL EQUIVALENCE AND APPLICATIONS

Research Work since about 2000

Study Group

M. Plionis, IAA/NOA Athens, Greece
C.G. Tsagas, University of Thessaloniki, Greece
K. Kleidis, Technological Education Institute of Serres, Greece
S. Basilakos, RCAAM, Academy of Athens, Greece
K. Zagkouris, University of Thessaloniki, Greece
N.K.Spyrou, University of Thessaloniki, Greece

CONFORMAL DYNAMICAL EQUIVALENCE AND APPLICATIONS

(Spyrou)

The Conformal Dynamical Equivalence between the hydrodynamic (or magnetohydronamic) flows on the one hand, and the goedesic motions on the other hand, is known since about a decade. In the Newtonian theory of gravity the Dynamical Equivalence implies that the hydrodynamic (Euler) or/and the magnetohydrodynamic equations of flow motion can be written in the form of Newton's Law with the usual gravitational potential replaced by a generalized gravitational potential depending, in an explicitly known way, on the usual gravitational potential and the internal physical characteristics (and the magnetic field) of the fluid source. In the general relativistic case, the Dynamical Equivalence Approach implies that the vanishing of the covariant derivative of the energy-momentum of a perfect-fluid gravitating source (for the flow motions) can be put in the form of the vanishing of the covariant derivative of the four-velocity (for the test particle) in another explicitly known energy-momentum tensor.

In a series of four presentations, we intend to use the Conformal Dynamical Equivalence Approach in facing a few interesting contemporary problems at the planteray, stellar, galactic, and cosmological levels, as they are described in the

corresponding abstracts below. It is our belief that this kind of treatment of the astronomical systems, namely, as continuous (in contrast to the point-masses) gravitating systems, is in accordance with many observational data, is very promising, and, in some cases, necessary.

THE SOLAR SYSTEM: A NEW LOOK

(Zagkouris and Spyrou)

In accordance with many observational data, we treat the Solar System as a continuous gravitating perfect fluid source (with the spherically-symmetric Sun at its center). In the interior of such a system, and in accordance with the conformal dynamical equivalence approach, the hydrodynamic flows are dynamically equivalent to geodesic motions. We apply this approach in order to i) evaluate the acceleration at a point in the interior of this source and, so, give a purely classical explanation of the celebrated Pioneer (10) Anomaly Effect, and of similar effects for other space probes (Pioneer 11, New Horizons), ii) determine analytivally the true linear dimensions of the above Solar- System model (approximately half the distance to a-proxima Centauri, depending on the values of some physical partameters of the system), and iii) determine the thermodynamical parameters (mass density, temperature, internal thermodynamic energy) in the near and far regions of the Solar System. We believe that this kind of treatment of the Solar System is very promising.

A CONVENTIONAL FORM OF DARK ENERGY

(Kleidis and Spyrou)

The basic unresolved issue of the current cosmological picture is that, the Universe must contain a considerably larger amount of energy, than the equivalent to the total rest-mass of its matter content does. For this reason, an extra (dark) energy component has been introduced, to compromise for the observational results. On the other hand, much evidence has been accumulated in support of dark matter (DM), suggesting that, more than 85 % (by mass) of the matter in the Universe consists of non-luminous and non-baryonic material. Although we do not know for certain how the DM came to be formed, a sizeable relic abundance of weakly interacting massive particles (WIMPs) is generally expected to have been produced as a by-product of the Universe\'s hot youth. Apart from their exact nature, the scientific community used to argue that, the WIMPs should be collision-less. However, many recent results from high-energy-particle tracers, such as the ATIC and PAMELA, combined with those of the Wilkinson microwave anisotropy probe (WMAP) survey, have revealed an unusually-high electron - positron production in the Universe, much more than what is anticipated by supernovae explosions or cosmic-ray collisions. These results have led many scientists to argue that, among the best candidate-sources of these high-energy events are the annihilations of WIMPs. If this is true, it could affect our perception on the nature of dark energy (DE). Indeed, assuming that the DM is slightly-collisional, i.e., it possesses also some sort of thermodynamical content; an extra energy-component does exist in the Universe: It is the energy of the internal motions of the collisional-DM fluid. On this basis, we have examined the evolution and the dynamical characteristics of a cosmological model (not necessarily reflecting our own Universe), in which (in principle) there is no DE at all. In other words, the

matter-energy content of this model consists only of two components: The DM (dominant) and the luminous one (subdominant), both having the abundances attributed to them by the WMAP survey. Accordingly, we have considered that, these two constituents (basically the dark one) form a quasi-dust perfect fluid of total rest-mass density and a small (but positive) total pressure. In this case, together with all the other physical characteristics, the energy of this fluid\'s internal motions is (also) taken into account as a source of the Universal gravitational field. Although speculative, the idea that the (extra) DE - needed to flatten the Universe - could be attributed to the internal motions of a collisional-DM fluid, is (at least) intriguing.

NEWTONIAN HYDRODYNAMICS AND MAGNETOHYDRODYNAMICS AND CONFORMAL DYNAMICAL EQUIVALENCE

(Tsagas and Spyrou)

The main characteristic and useful result of the Conformal Dynamical Equivalence Approach in Newtonian gravity is that the Euler Equations of classical hydrodynamics and the corresponding equations of magnetohydrodynamics can be put in the form of Newton's Law. We examine whether and under what conditions magnetohydrodynamic flows can be represented as hydrodynamic ones and, then, as Newtonian-type gravitational motions. In the latter case we define a generalised effective density and an effective Poisson-type potential, which include the magnetic input and determine the dynamics of the magnetised system. We use the above to test mass measurements based on purely gravitational motions. We also provide the generalised Raychaudhuri equation corresponding to the aforementioned effective potential and discuss its implications for the kinematics of the fluid.

CONFORMAL DYNAMICAL EQUIVALENCE, THERMODYNAMICS AND THE MASSES OF CLUSTERS OF GALAXIES

(Plionis, Basilakos, Spyrou)

As it is known, the Conformal Dynamical Equivalence Approach in Newtonian gravity implies that the Euler Equations of classical hydrodynamics can be put in the form of Newton's Law. These geodesic motions occur in a generalized gravitational potential depending on the usual gravitational potential and the internal physical characteristics of the fluid source, and, therefore, indicate a different mass obtained with the aid of geodesic motions. In this work, mostly in progress, we intend to use the above results in an effort to explain some differences in the determined values of the X-ray masses and the virialized masses of clusters of galaxies.

Name: Prof. Nikolaos Stergioulas (Male)
Affiliation: Aristotle University of Thessaloniki

Abstract Title: Black hole spacetimes with self-gravitating, massive accretion tori.

Abstract: Stationary, axisymmetric black hole spacetimes are constructed in the presence of massive accretion tori, using a self-consistent numerical method. These

models serve as initial data for nonlinear simulations that investigate the nonaxisymmetric stability of massive accretion tori.

Name: Prof. Angelo Tartaglia (Male)
Affiliation: DIFIS, Politecnico di Torino and INFN

Abstract Title: Lensing in an elastically strained space-time

Abstract: Describing curved space-time as a four-dimensional manifold strained by the presence of matter or texture defects an additional term in the Lagrangian of space-time has to be introduced besides the Ricci scalar, accounting for the strain. The additional term produces dark matter-like effects around any given body. These effects show up both in the angular speed of freely orbiting objects and in the gravitational lensing of light. These effects are evaluated and exposed.

Name: Prof. Nikolaos Tetradis (Male)
Affiliation: University of Athens, Greece

Abstract Title: Black holes, Holography and Thermodynamics of Gauge Theories

Abstract: We express the AdS-Schwarzschild black-hole configuration in five dimensions in coordinates such that the boundary metric is of the FLRW type. We review how this construction can be used in order to calculate the stress-energy tensor of the dual CFT on the FLRW background. We deduce the temperature and entropy of the CFT, which are related to the temperature and entropy of the black hole. We find that the entropy is proportional to the area of an apparent horizon, different from the black-hole event horizon. For a dS boundary we reproduce correctly the intrinsic temperature of dS space.

Name: Dr. E. Tigrak (Female)
Affiliation: The Kapteyn Astronomical Institute
Abstract Title: Schrodinger Solutions and the Cosmic Web

Abstract: The Large scale structure of the Universe is marked by prominent lamentary and sheetlike features embedded within a weblike network, the Cosmic Web. Extensive N-body simulations are used to model and understand its complex and intricate dynamical structure, guided by insights provided by a variety of theoretical formalisms that model its linear, quasi-linear and nonlinear evolution. In this study we demonstrate that the lamentary type structures of the Cosmic Web can be modeled as solitonic waves which are the solutions a Reaction diffusion systems. These are the hydrodynamical analog of the non-linear SchrÄodinger type equation. We present the analytical solution of this system, which follows from the application of a special method to yield the dissipative soliton solutions. These solutions form the basis of a

framework describing the dynamical nonlinear development of the weblike arrangement of laments.

Name: Dr. Alexey Toporensky (Male)
Affiliation: Sternberg Astronomical Institute

Abstract Title: Cosmological dynamics in generalized modified gravity

Author List: A. Toporensky and M.Skugoreva
Co-author Affiliation: Sternberg Astronomical Institute

Abstract: We consider cosmological dynamics in generalized modified gravity theory with the R□R term added to the action of the form R+R^N. Influence of R□R term to the known solutions of modified gravity is described. We show that in particular case of N=3 these two non-Einstein terms are equally important on power-law solutions. These solutions and their stability have been studied using dynamical system approach. Some results for the case of $N \neq 3$ (including instability of deSitter solution in the theory under investigation) have been found using other methods.

Name: Dr. Christos Tsagas (Male)
Affiliation: University of Thessaloniki

Abstract Title: Large-scale peculiar motions and cosmic acceleration

Abstract: Recent surveys seem to support bulk peculiar velocities well in excess of those anticipated by the standard cosmological model. In view of these results, we consider here some of the theoretical implications of large-scale drift motions. We find that observers with small, but finite, peculiar velocities have generally different expansion rates than the smooth Hubble flow. In particular, it is possible for observers with larger than the average volume expansion at their location, to experience apparently accelerated expansion when the universe is actually decelerating. Analogous results have been reported in studies of inhomogeneous (nonlinear) cosmologies and within the context of the Lemaitre-Tolman-Bondi models. Here, they are obtained within the linear regime of a perturbed, dust-dominated Friedmann-Robertson-Walker cosmology.

Name: Dr. Minas Tsoukalas (Male)
Affiliation: N.T.U.A.

Abstract Title: Gauss-Bonnet Perturbations in Codimension-2 brane worlds

Author List: Bertha Cuadros-Melgar, Eleftherios Papantonopoulos, Minas Tsoukalas, Vassilios Zamarias

Co-author Affiliation: Eleftherios Papantonopoulos, Vassilios Zamarias (N.T.U.A.)-
Bertha Cuadros-Melgar (Univeridad Andres Belo (Santiago de Chile))

Abstract: I will present the framework, within codimension-2 braneworlds, which can consistently reproduce Einstein Equations on the Brane. In this context, Gauss-Bonnet curvature terms have to be included in the bulk action. We will study several solutions in 5 and 6 dimensions and examine the stability of one class of them. We will see that this solution is dominated by a strong coupling regime. Still, at least for the scalar part of the perturbation, the equations decouple giving us the chance to examine stability issues.

Name: Dr. Elias Vagenas (Male)
Affiliation: RCAAM, Academy of Athens

Abstract Title: Quantum Gravity Corrections and Entropy at the Planck time

Author List: S. Basilakos, S. Das, E.C. Vagenas
Co-author Affiliation: RCAAM, Academy of Athens (Greece) and University of Lethbridge (Canada)

Abstract: I will describe the effects of Quantum Gravity on the Planck era of the universe. In particular, using different versions of the Generalized Uncertainty Principle and under specific conditions it is shown that the main Planck quantities such as the Planck time, length, mass and energy become larger by a factor of order 10-10^{4} compared to those quantities which result from the Heisenberg Uncertainty Principle. However, it is proven that the dimensionless entropy enclosed in the cosmological horizon at the Planck time remains unchanged. These results, though preliminary, indicate that we should anticipate modifications in the set-up of cosmology since changes in the Planck era will be inherited even to the late universe through the framework of Quantum Gravity (or Quantum Field Theory) which utilizes the Planck scale as a fundamental one. More importantly, these corrections will not affect the entropic content of the universe at the Planck time which is a crucial element for one of the basic principles of Quantum Gravity named Holographic Principle.

Name: Dr. Petros Wallden (Male)
Affiliation: University of Athens

Abstract Title: The problem of time in quantum cosmology, a decoherent hisotires view

Author List: Theodosios Christodoulakis and Petros Wallden
Co-author Affiliation: University of Athens

Abstract: The problem of time in qunatum gravity arises due to the diffeomorphisms invariance of the theory and appears via the Hamiltonian constraint, in the canonical

quantizations. There is a need for a discreption where one can ask some timeless questions that still encode some sense of temporality. The decoherent histories approach to quantum theory, already at the kinematic level admits an internal time. Several alternative proposals for resolving the problem of time via the decoherent histories, exist, and in this contribution we focus on one of them and examine the consequences it has for some simple cosmologial models.

Name: Prof. Richard Woodard (Male)
Affiliation: University of Florida

Abstract Title: Nonlocal Models of Cosmology
Author List: N. C. Tsamis and R. P. Woodard

Abstract: I describe a class of nonlocal gravitational field equations which might represent the cosmologically most important part of the effective field equations of quantum gravity. All models in this class give a long phase of inflation which ends in a universal manner. They can also be adjusted to give a realistic late time expansion history, including a late phase of acceleration after the onset of matter domination. My talk is based on arXiv:0904.2368 and arXiv:1001.4929.