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Talk 1. Radiation Production and Stochastic Effects during Inflation

Rudnei O. Ramos

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Nonisentropic inflation models are characterized by radiation production due to the decay of fields coupled to the inflaton during inflation and that might sustain a thermal radiation bath as a result of the dissipative particle production. The presence of the radiation bath can impact on the dynamics of inflation and, consequently, on the observable quantities measured from the cosmic microwave background radiation. In particular, the amplitude of primordial curvature perturbations is enhanced and this is particularly significant when a non-trivial statistical ensemble of inflaton fluctuations is also maintained. Since gravitational modes are decoupled from the radiation bath for energies well below the Planck scale, the presence of the thermal radiation bath and/or a non vanishing statistical ensemble for the inflaton generically lowers the tensor-to-scalar ratio and yields a modified consistency relation for warm inflation, as well as changing the tilt of the scalar spectrum. This is able to alter the landscape of observationally allowed inflationary models, with for example the quartic chaotic potential being in very good agreement with the Planck results for nearly-thermal inflaton fluctuations, whilst essentially ruled out for an underlying vacuum state. Besides of dissipative effects, these are also accompanied by stochastic fluctuations. Both the origin and the impact of these effects on the inflationary dynamics is explained in this talk.

Talk 2. Validity conditions for linear cosmological perturbations

F. T. Falciano, N. Pinto-Neto, S. D. P. Vitenti

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One of the main issues concerning back-reaction in cosmology is to validate the use of linear order perturbation to evolve the large-scale metric despite the presence of structure formation. After the appearance of cosmic structures such as clusters and voids, the local dynamics becomes extremely non-linear and the local mass density can become 30 order of magnitude higher than the average mass density of the universe. Thus, it is certain that the matter evolution in small-scales is far from linear. Notwithstanding, at the same time the large scale metric perturbations are still perturbatively small. The LCDM model and the need for dark energy rest in the fact that the departure from FLRW metric is small and the linearized Einstein equations are the correct system to evolve them. However, it is still an open question whether or not the small-scale clumpiness can affect the evolution of the large-scales. We shall consider the validity conditions that could support the use of a homogeneous and isotropic metric to describe the universe in the large. We also stress that our treatment is covariant and gauge independent which allow us to immediately compare with different approaches found in the literature such as the 3 1 covariant approach first introduced by Hawking, Ehlers and Ellis.

Talk 3. The Geometric Scalar Gravity theory and a possible cosmological scenario

J. D. Toniato

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It will be presented a new possibility for describing the gravitational interaction in terms of a scalar field without having those popular problems that arise in others gravitational scalars theories. The main idea is to assume that the scalar field does not have a directly interaction with any other fields in the nature. Instead, it generates a metric for the spacetime, through which all kind of matter and energy will interact with. I intend explore too the cosmological aspects that can be derived from this theory.

Talk 4. Braneworld cosmology and scale factor dependent of the extra dimension

R. Texeira Cavalcanti, R. da Rocha

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In this work we solve the 5-dimensional Einstein's equations, providing a Friedmann equation on the brane. The scale factor governing the braneworld cosmology is shown to be dependent of the extra (transverse) coordinates, by using the junction conditions. The time-dependent scale factor on the brane is derived as a function of the FRW scale factor and of hyperbolic functions involving the extra dimension and the matter and energy content of the brane and the bulk. Cosmological scenarios are further analyzed in the particular case of a Randall-Sundrum braneworld setup.

Talk 5. Precision cosmology with voids

Santiago Patiri

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In recent years, significant progress has been made in the accuracy of measurements of cosmological parameters, thanks mainly to new CMB experiments and large scale galaxy surveys, resulting in a new era for Cosmology known as "Precision Cosmology". In order to keep improving results, it is essential to measure the parameters with different techniques and data. In this presentation I discuss a novel method to constrain cosmological parameters using the large underdensities found in the large scale structure of the Universe, the so-called voids. In particular, I show how to constrain the values of Sigma_8 and Omega_m h, and present results obtained using data from the Sloan Digital Sky Survey. I also discuss work in progress on constraining other parameters such as the equation of state for Dark Energy and non-Gaussianity.

Talk 6. Equivalence between statistical anisotropy and anisotropic expansion

Yeinzon Rodriguez, L. Gabriel Gomez, Carlos M. Nieto

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The first year PLANCK data has confirmed the presence of anomalies in the CMB, some of them strongly hinting to the existence of a preferred direction in the Universe. This direction may generate both anisotropic expansion and statistical anisotropy. However, although it is well known that anisotropic expansion automatically produces statistical anisotropy, it has prevailed the idea that statistical anisotropy may be generated even in the case that the expansion is isotropic. We present in this work the development of ideas that has led us to conclude that having statistical anisotropy is equivalent to having anisotropic expansion, at least regarding the power spectrum of the curvature perturbation.

Talk 7. Primordial magnetic helicity

Esteban Calzetta, Alejandra Kandus

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We study the possibility that primordial magnetic fields generated in the transition between inflation and reheating posses magnetic helicity. The fields are induced by stochastic currents of scalar charged particles created during the mentioned transition. We estimate the rms value of the induced magnetic helicity by computing different four point closed Feynman diagrams. The non-null result obtained indicates that primordial magnetic fields have non-trivial topology, a fact that can set up an inverse cascade and so lead to a slower decay of the large scale magnetic field along their evolution to the onset of galaxy formation.

Talk 8. The primordial bispectrum and the collapse of the wave function

Gabriel León

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The explanation of the origin of cosmic structure, provided by the inflationary paradigm, is not completely satisfactory as all of the scenarios, based on the conventional approach to the so-called "quantum-to-classical transition", lack the ability to point out the physical mechanism responsible for generating the inhomogeneity and anisotropy of our Universe starting from and exactly homogeneous and isotropic vacuum state associated with the early inflationary regime. The "collapse proposal"considers the spontaneous dynamical collapse of the wave function as a possible solution to that problem. In this talk, we will see that the expected characteristics of the bispectrum turn out to be quite different from those found in the traditional approach. In particular, the statistical features corresponding to the primordial perturbations, which are normally associated with the bispectrum, are treated here in a novel way leading to rather different conclusions.

Talk 9. Cosmology with matter diffusion

Simone Calogero, Hermano Velten

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We construct a viable cosmological model based on velocity diffusion of matter particles. In order to ensure the conservation of the total energy-momentum tensor in the presence of diffusion, we include a cosmological scalar field ϕ which we identify with the dark energy component of the universe. The model is characterized by only one new degree of freedom, the diffusion parameter σ. The standard ΛCDM model can be recovered by setting $\sigma = 0$. If diffusion takes place ($\sigma > 0$) the dynamics of the matter and of the dark energy fields are coupled. We argue that the existence of a diffusion mechanism in the universe may serve as a theoretical motivation for interacting models. We constrain the background dynamics of the diffusion model with Supernovae, H(z) and BAO data. We also perform a perturbative analysis of this model in order to understand structure formation in the universe. We calculate the impact of diffusion both on the CMB spectrum, with particular attention to the integrated Sachs-Wolfe signal, and on the matter power spectrum P(k). The latter analysis places strong constraints on the magnitude of the diffusion mechanism but does not rule out the model.

Talk 10. Constraining cosmology using cluster number counts

N. Chandrachani Devi, H. A. Borges, S. Carneiro, J. S. Alcaniz

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With the merger of a large number of cluster surveys which are either on going (SPT, SNAP, PLANCK, etc) or being planned (eROSITA , JPAS, WFXT) to set up in near future, the measurements of cluster abundance as a function of mass and redshift are coming up with the potential to improve the current constraint on cosmological parameters, including EoS of dark energy, the matter density of the Universe (Ω_{m0}) and the RMS density fluctuations on a scale of $\sigma_8 h^{?1}$Mpc , the total neutrino mass, etc. The cluster data can provide a new window for cosmological modeling, with an ability to distinguish the various dark energy models and also modified gravity models by their effects on structure formation. It has an advantage of probing both the expansion rate and the growth of perturbations. Therefore, the cluster data are complementary to other cosmological probes such as cosmic microwave background (CMB), supernovae Type Ia observations and measurement of baryon acoustic oscillations (BAO). With this motivation, we study the cluster number counts considering two different cosmological models. First, we consider a scalar field dark energy model and check how significantly they deviate from the ΛCDM model in terms of the density contrast at the time of collapse, the number density of galaxy clusters and the total cluster number counts. We find that the number density of galaxy clusters are affected by the presence of dark energies. We also find a significant deviation from the corresponding ΛCDM model at the redshift around z 0.5 and at more massive clusters. We do the similar analysis for another cosmological model where the vacuum energy density Ω_Λ decays continuously to the cold dark matter (CDM) over the cosmic evolution. We find that for such kind of model, the linear density contrast at the time of collapse differs significantly from the standard case, resulting in a larger number of bound structures.

Talk 11. Analysing the potential of OLIMPO's spectroscopic and photometric measurements in estimating cluster parameters

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Cosmic Microwave Background (CMB) Radiation encodes fundamental information about the early universe and is an important key to unlock a number of questions in modern cosmology. One of its most interesting features, and important secondary CMB anisotropy, is the inverse Compton scattering suffered by photons through interaction with hot electrons, the so-called Sunyaev-Zeldovich effect (SZ). The OLIMPO experiment, a mm-wave balloon-borne telescope, is aimed to measure this effect in a set of a carefully selected clusters. OLIMPO covers a wide range of frequencies, in four bands centred at 150, 220, 350 and 450 GHz, and with a high angular resolution, 4, 3, 2 and 2 arcmin FWHM, respectively. These features make it a promising instrument to measure CMB anisotropies at high multipoles and the SZ effect caused by galaxy clusters. We performed simulations of the OLIMPO spectroscopic and photometric measurements of the line-of-sight through one of the galaxy cluster chosen to be observed by the instrument. Using each kind of simulations individually and combined in order to fit a theoretical curve, we find out that, as expected, spectroscopic measurements have a superior performance, allowing the estimation of a larger set of cluster parameters, and being more accurate in constraining some of them. Moreover, a combination of spectroscopic and photometric simulation can even improve some parameter estimates and reduce the bias inherent to them.

Talk 12. The co-evolution of cosmic star formation rate and the active supermassive black holes

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Nowadays, we know that almost all galaxies have supermassive black holes in their center. However, an open question is related to modeling the co-evolution between the growth of the central black hole and the star formation in the hosting galaxy. In this work we present a simple and robust model of connection between the cosmic star formation rate (CSFR) and the evolution history of active supermassive black holes (SMBH). First, a new binning method to obtain the estimator of the mass function of the active SMBH's was developed, taking into account the flux limit of the catalog. Also, the mean Eddington ratio and the mean accretion rate of SMBH was computed. It was observed that black holes with mass in the range from $10^{8.6}$ up to $10^{9.6}\,M_{\odot}$ were the dominant active objects in the range of redshift $z = [1.0, 2.1]$. For the range $z = [0.3, 0.9]$, the objects with the lowest masses, $10^{7.5} - 10^{8.6}\mathrm{M}_{\odot}$

Talk 13. Galaxy evolution studies from space and ground based large IR/sub-mm surveys

Luigi Spinoglio

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Large spectroscopic surveys in the infrared and submillimeter spectral regions are crucial to study large scale processes such as the evolution of galaxies and the star formation process both in local and distant galaxies. The mid-to-far-IR is in fact the region where most energy is emitted by the obscured processes of star formation and black hole accretion, often hidden by large amounts of dust. To unravel such processes along the history of galaxies and establish their role along evolution, rest frame mid-to-far IR spectroscopy is needed, because at these frequencies dust extinction is at its minimum and a variety of atomic and molecular transitions, tracing most astrophysical domains, occur. Future IR space telescopes, such as SPICA, and ground-based large submillimeter telescopes, such as CCAT, will be able to perform such surveys in a synergic way.

Talk 14. Measuring sigma_8 with Weak Lensing of Supernovae

Miguel Quartin

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Soon the number of type Ia supernovae (SNe) measurements should surpass 10^5. Understanding weak lensing effects in these objects will then be more important than ever. Although SNe lensing is usually seen as a source of systematic noise in this talk I will show how this noise can be in fact turned into signal. To accomplish this I will first describe how we were able to accurately model the lensing effects and provide simple analytical fits to describe it. I will then show that the non-gaussianity introduced by lensing in the SNe Hubble diagram dispersion is basically modulated by Omega_m0 and sigma_8. Finally, I will argue that the modeling of such non-gaussianity allows for an independent measurement of sigma_8 with supernova data and present a first measurement with real data.

Talk 15. Impact and repercussions of the announced detection of primordial gravitational waves

Nelson Pinto-Neto

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Recently, the detection of primordial gravitational waves was announced by the BICEP2 experiment, performed in the South Pole. In this talk, I will discuss the reliability of this result, the assumptions made for the interpretation of the data, and the impact on Physics and Cosmology. Primordial gravitational waves may be generated by a highly-accelerated expansion phase in the Early Universe, the so-called inflation, as well as by a contraction phase of the Universe occurred before the present expansion phase. Their detection puts severe constraints on both kinds of models (in which the involved energies may attain trillions of times the characteristic energies of the Large Hadron Collider at CERN), discarding some of the most popular models. However, contrary to what it is divulged by the media, none of the quoted schemes is favoured, still remaining some tension between these results and those obtained last year by the Planck team regarding the inflationary paradigm. From the physics point of view, if this detection is confirmed, one of the main and most important predictions of General Relativity would have been proved: the existence of gravitational waves.

Talk 16. Multi-tracer surveys of large-scale structure and the J-PAS survey

L. Raul Abramo

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Astrophysical surveys are targeting an increasing number of different types of galaxies and other extragalactic objects. The potential of these surveys is significantly improved by this wide variety of tracers of the large-scale structure, and in fact our understanding about the formation of these objects, as well as their environments, is becoming increasingly intertwined with the cosmological applications of these datasets. Additional advantages of multi-tracer surveys of the cosmos are the enhanced constraints on cosmological parameters, which can even appear to violate the bounds imposed by cosmic variance. I will show how this is possible, which parameters can benefit from the multi-tracer analysis, and what are the constraints which can be achieved by the next generation of astrophysical surveys. In particular, I will discuss how these ideas can be employed in J-PAS (the Javalambre Physics of the Accelerating Universe Astrophysical Survey), which, starting in 2015, will use narrow-band filters to obtain a low-resolution spectrum of 1/5 of the whole sky.

Talk 17. Gamma-ray induced cascades in the extragalactic conditions

Mariana Orellana, Leonardo Pellizza, Clementina Medina, Susana Pedrosa, Matias Tueros

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The latest generations of telescopes have revealed a rich sky at high and very high energies. The most abundant identified sources are active galactic nuclei, usually blazars. It has been established that the Extra-galactic Background Light (optical to infrared wavelengths) attenuates high-energy photons through pair production. The development of pair-photon cascades along the line of sight modifies the originally emitted spectrum and have a measurable impact onto the source extent and arriving time of the photons. These effects should be included in our interpretation of the observations in order to progress in the understanding of the physical origin of the emission. We follow the three-dimensional trajectories of such cascades through numerical simulations. We report here the status of our investigations regarding the gamma-ray propagation through a $\sim$ 100 Mpc scale. This indirect study of the background photon fields and the extra-galactic magnetic field (EGMF) is an exciting aspect of what some authors already call gamma-ray cosmology.

Talk 18. Young PWNe detected at very high energy

Analía Cillis

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The current Imaging Atmospheric Cherenkov Telescopes (IACT) have detected more than 20 PWNe at very high energies (VHE). Such sources constitute the largest population of Galactic sources in this energy range. They are associated to very energetic, young pulsars and usually show an extended emission up to a few tens of parsecs. Many PWNe were observed by H.E.S.S. during his Galactic Plane survey conducted since 2004. It is interesting to note that the number of detections will increase significantly with the next generation of IACT. It is predicted that the future Cherenkov Telescope Array will detect approximately 300 to 500 sources of this type. This will provide a basis for unprecedented data for detailed studies. In this work we present a systematic study of all young PWNe detected at VHE using a time-dependent model, spanning over 20 decades in frequency. It is noteworthy that it is the first time that a study of all detected PWNe at VHE is performed within the same frame, allowing a useful comparison of the different parameters involved in the PWN model. The PWNe that have been studied are: Crab Nebula, G54.1 0.3, G0.9 0.1, G21.5-0.9, MSH 15-52, G292.2-0.5, Kes 75, HESS J1356-645, CTA 1, HESS J1813-178. Other young PWNe that have been detected at VHE have not been incorporated due to controversies in the association between the PWN and pulsar or lack of observations at low frequencies. In order to find general characteristics of these sources, after making a study of each one individually, we have searched for correlations between the luminosities in radio, X-ray and gamma and fundamental characteristics of the central pulsar. One of the most robust findings is that all detected PWNe in TeV are particle dominated. With respect to the spectrum of particle injection, our result suggests that the process of acceleration in the termination shock wave from the pulsar wind, cooling, advection and diffusion of the accelerated particles is common in young PWNe.

Talk 19. Neutrino emission from gamma-ray bursts

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Gamma-ray bursts (GRBs) are the most violent and energetic events in the universe. Short GRBs seem to be the result of the final merger of two compact objects, whereas long GRBs are probably associated with the gravitational collapse of very massive stars (collapsars).
The central engine of a GRB can collimate relativistic jets that propagate inside the stellar envelope. Although the location of the exact region where the gamma rays are created is still under debate, it is widely accepted that the prompt emission has a different origin from the afterglow emission. The latter is produced at much longer distances from the central engine, where the jet is decelerated by its interaction with the interstellar medium.
The prompt gamma-ray radiation and the afterglows are likely generated by relativistic electrons accelerated in shock fronts. The same shocks should also accelerate baryons leading to neutrino production, a distinctive signature of hadronic interactions.
In this talk I shall review different scenarios where neutrinos with energies from MeV to EeV can be produced in the collapse of massive stars and the subsequent processes. I shall also briefly discuss the case of short GRBs.

Talk 20. A two-zone model for the production of prompt neutrinos in gamma-ray bursts

M. M. Reynoso

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We study the production of high energy neutrinos in GRBs (gamma-ray bursts) associated with their prompt emission, taking into account the effects of particle acceleration and escape using a two-zone model. Primary electrons and protons are injected in an acceleration zone and the escaping particles are re-injected in a cooling zone which propagates downstream. The synchrotron photons from the accelerated electrons are taken as targets for $p\gamma$ interactions, which along with pp collisions with cold protons in the flow, lead to pion production. The distribution of these secondary pions and the decaying muons are also computed in both zones, from which the neutrino output is obtained. We find that for escape rates lower than the acceleration rate the synchrotron emission from electrons in the acceleration zone can account for the GRB emission, and the production of neutrinos via pγ interactions in this zone becomes dominant for $E_\nu > 10^5$ GeV. For illustration, we compute the corresponding diffuse neutrino flux under different assumptions and show that it can reach the level of the signal recently detected by IceCube.

Talk 21. Multiwavelength study of gamma-ray bursts emission

Ana Virginia Penacchioni

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I present the work I have done on Gamma-ray Bursts (GRBs) during my PhD at Sapienza University in Rome under the supervision of Prof. Ruffini. During my three years of PhD, many GRBs have been analyzed within the Fireshell model, but the truly unexpected new understanding has come from the relation of the Supernova (SN) event to the GRBs. Furthermore, we found some similarities between some long GRBs, with which we created a sub-class. To explain the physical processes that take place during the formation of this kind of GRBs, we worked out a new model called the Induced Gravitational Collapse (IGC). The model explains the emission of some long GRBs as originating in a binary system. It comes out naturally from the model that these GRBs are associated to a SN, which we can corroborate by the optical emission occurring days after the burst. The model enables us to make predictions about the SN occurrence as well, so as to alert the optical observations from a very early time. I present some of the most recent results regarding the IGC model.

Talk 22. Baryon loading of relativistic jets

Gabriela S. Vila, Florencia L. Vieyro, Gustavo E. Romero

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Relativistic neutrons are injected in the corona surrounding an accreting black hole through hadronic interactions of locally accelerated protons. If the source is a microquasar, a fraction of these neutrons may escape and penetrate the base of the jet. The neutrons will decay into protons inside the outflow, this being then a possible mechanism for loading Poynting-dominated jets with baryons. We study the characteristics of the proton distribution injected in this way and the consequences on the high-energy radiative spectrum of the jet. We also investigate the fate of those neutrons that escape the corona into the external medium.

Talk 23. Interactions of relativistic particles in stellar winds

Santiago del Palacio, Valentí Bosch-Ramon, Gustavo Romero

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Some galactic gamma-ray sources are binary systems in which one of the components is a massive star and the companion is either a similar star or a compact object (i.e. a neutron star or a black hole). This type of massive binaries presents non-thermal emission from radio to X and gamma-rays.
Radiation coming from the inner region of the binaries is likely to undergo absorption and radiative reprocessing. Its detailed modeling yields an inverse problem that, if properly solved, might provide information on the emitter and the properties of the surrounding medium.
The main goal of this work is to characterize the high energy physics of gamma-ray binaries by implementing a general modeling their high energy processes. Specifically, we produce emissivity maps for different cuts of the relevant state parameters that can be used to quickly identify the general characteristics of the source.

Talk 24. First order Fermi acceleration in turbulent magnetic reconnection sites

M. V. del Valle, E. M. de Gouvia Dal Pino, G. Kowal

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Fast magnetic reconnection occurs in many astrophysical sources and currently it is being studied as an important process to produce particle acceleration via first-order Fermi process. Also, it has been demonstrated that fast magnetic reconnection occurs in the presence of weak turbulence. Turbulence also increases the acceleration efficiency by a combination of two effects: the presence of a large number of converging small scale current sheets and the broadening of the acceleration region. In this work we analyze the dependence of the acceleration rate and of the energy distribution of test particles injected in three dimensional MHD turbulent reconnection sites with the reconnection velocity (which is of the order of the Alfvén speed) and with the turbulence injection parameters.

Talk 25. High-energy sources at the dawn of the Universe

I. F. Mirabel

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The re-ionization of the universe that took place during the first billon years after the Big Bang is one of the major frontiers in cosmology. Until recently, most models of the re-ionization had considered the ultraviolet radiation from the first generations of massive stars as the only important factor in the process of re-ionization of the intergalactic medium. I will show that besides the UV radiation of massive stars, feedback from the fossils of those massive stars (X-rays and relativistic jets from i.e. accreting stellar black holes), played an important role determining the early thermal history of the universe and partially ionizing the intergalactic medium over large volumes of space. Feedback from accreting black holes had a direct impact on the properties of the faintest galaxies at high redshifts, the smallest dwarf galaxies in the local universe, and on the cold dark matter model of the universe.

Talk 26. Gamma-ray polarization of accreting black holes

G. E. Romero, F. L. Vieyro, S. Chaty

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Recent observations have shown the existence of a high degree of polarization in the high-energy radiation of the black hole binary system Cygnus X-1. This radiation has been attributed to a jet, but in this work we show that the coronal plasma might be responsible for it.

Talk 27. Constraints on cosmological parameters from Planck and BICEP2 data

Luis Anchordoqui

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We first show that inflationary models based on S-dual potentials are in agreement with both Planck and BICEP2 data. After that we demonstrate that the tension introduced by the detection of large amplitude gravitational wave power by the BICEP2 experiment with temperature anisotropy measurements by the Planck mission is alleviated in models where extra light species contribute to the effective number of relativistic degrees of freedom. We particularize this discussion to the well motivated and consistently anomaly-free constructions which are embedded in a grand unified exceptional E6 group.

Talk 28. Concepts and science drivers of the Cherenkov Telescope Array

Adrián C. Rovero, for the CTA Consortium

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The Cherenkov Telescope Array (CTA) is the next generation ground-based instrument for the observation of very-high-energy gamma rays. It will provide an order of magnitude more sensitivity in an extended energy range (20 GeV to 100 TeV) than currently operating instruments (VERITAS, MAGIC, HESS). The CTA will cover the full sky by constructing two observatories, one in each hemisphere, composed of more than a hundred Cherenkov telescopes of three different sizes. With improved sensitivity and angular resolution CTA will help to address a number of important open questions in astrophysics and fundamental physics. This talk will present the basic concepts of CTA and highlight some of its science drivers.

Talk 29. LLAMA: the Argentinian-Brazilian project

I. F. Mirabel

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I will describe the science drivers of the bi-national project LLAMA (Long Latin American Millimeter Array).

Talk 30. Recent results from the Pierre Auger Observatory

M. A. Leigui de Oliveira for the Pierre Auger Collaboration

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The mechanisms for the production and acceleration of Ultra-High Energy Cosmic Rays (UHECRs) are among the main open problems in the field of Astroparticle Physics. This field has been greatly revitalized in the last decades, partially due to advances in the experimental techniques and partially due to the discoveries of new structures in the cosmic rays spectrum and new astrophysical sources of ultra-high energy particles and gamma-rays. In this talk, we present some results from the last years of operation of the Pierre Auger Observatory. The main topics are related to energy spectrum, mass composition, neutrino flux and hadronic cross section.

Talk 31. The current status of the MIRAX Mission

Joao Braga

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I will present the current status of the Brazilian space Mission MIRAX (Monitor e Imageador de Raios X) under development at the National Institute for Space Research (INPE), Brazil. MIRAX will be the first Brazilian astronomical experiment to operate in space. MIRAX consists essentially in a set of (probably) 4 wide-field coded-aperture hard X-ray (5-200 keV) imaging telescopes equipped with state-of-the-art cadmium-zinc-telluride (CZT) solid-state room-temperature semiconductor detectors. The main scientific objective of the mission is to produce an unprecedented discovery space coverage of most transient X-ray sources, especially X-ray binaries at the central Galactic Plane, by scanning the sky at a near-equatorial low-Earth orbit. The imaging CZT detectors for MIRAX are being developed in a close collaboration with the Harvard Smithsonian Center for Astrophysics (CfA), the details of which are still uncertain due to funding insecurity. The detector plane for each telescope will have a 0.6 mm spatial resolution and an area of 256 cm^2. A 0.3 mm-thick tungsten mask with a random pattern, located at 70 cm from the detector plane, will provide images with 6 arcmin angular resolution and 30x30 degrees field-of-view (FWHM).

Talk 32. Quantum Gravity with Higher Derivatives and the Problem of Massive Ghosts

Ilya Shapiro

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The main problem of Quantum Gravity is the conflict between renormalizability and unitarity. The quantum version of GR is non-renormalizable, and when we provide renormalizability by introducing higher derivatives, the particle spectrum of the theory includes massive unphysical ghosts. Removing the ghosts from the spectrum leads to violated unitarity. In order to check whether the ghosts really pose a danger, one can explore the dynamics of metric perturbations (gravitational waves) at the tree-level in the theory with higher derivatives. In the recent papers we have shown that, in case of the cosmological background, there are no traces of ghosts beyond the Planck scale. Now we try to formulate the problem in a more general setting and explore more general backgrounds and more general higher derivative theories, corresponding to a superrenormalizable versions of quantum gravity.

Talk 33. Scalar Self-force in Schwarzschild Space-time

M. Casals, S. Dolan, A. Ottewill, B. Wardell

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The centers of most galaxies host supermassive black holes which are eagerly devouring smaller astrophysical objects in their vicinity and emitting gravitational waves in the process. The detection of these waves would open up a unique window into our Universe. In the extreme mass-ratio limit, the inspiral can be viewed as the smaller object deviating from a geodesic of the background spacetime of the supermassive black hole due to the action of its own field, the self-force. In this talk we will introduce novel methods for the calculation of the self-force which are based on the Green function of the wave equation obeyed by field perturbations of the background spacetime. We will focus on the case of a scalar charge in Schwarzschild spacetime, which serves as a useful toy-model for the gravitational case. We will present a spectroscopy analysis of the Green function, which includes characteristic resonances ('quasinormal modes') and a branch cut in the complex-frequency plane. We will apply this analysis to reveal geometrical properties of wave propagation on a black hole spacetime and to calculate the scalar self-force.

Talk 34. Nonlinear Electrodynamics as a symmetric hyperbolic system

F. Abalos, F. Carrasco, E. Gourlat, O. Reula

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Recent years have witnessed a great activity in nonlinear generalizations of Maxwell's equations, relevant in different areas of physics. In quantum field theories, the vacuum polarization naturally lead to nonlinear corrections of electromagnetism. Resulting in complicated dispersive media which exhibit almost every phenomenon which is well known from ordinary condensed matter systems. Other contexts where nonlinear electrodynamics (NLE) has been studied are cosmological models, black holes and in the description of the dark sector of the universe. In summary the NLE attracts our attention because it offers deep insights into the important role played by light in experimental and theoretical studies of relativity. Using the geometric formalism of R. Geroch for differential treatment of partial differential equations PDE's, we show that the equations governing the non-linear electrodynamics, considering arbitrary Lagrangian, are part of the so-called symmetric-hyperbolic systems. Such systems guarantee existence and uniqueness of solutions, as well as the continuity of the initial data; desirable features of any system of equations that point to describe a physical problem. We found that the conditions under which a particular version of the theory is a symmetric hyperbolic system are directly linked to physic propagation cones of that theory. That is, we find that the hyperbolizations found, constitute cones that match the propagation cones of the associated effective metric of these theories.

Talk 35. Charge - size inequality in General Relativity

Marcelo E. Rubio

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Geometric inequalities have been of interest in General Relativity in recent years. From them, it is possible to relate physical quantities that have a precise geometric meaning–like mass, area, charge and angular momentum–, and thus be able to predict significant consequences on the evolution and stability of some physical systems.
In this talk, I present a conjecture relating the electrical charge to the size of a real object, inspired on the hoop conjecture valid for black holes. First I discuss briefly some relevant aspects of the hoop conjecture and then I state the analogous conjecture for real objects in general. Physical motivation of the inequality is discussed, as well as define with precision what we understand about the ”size” of a three dimensional object.
As first approaches, I study some problems: the spherical one with ECD, wherein this conjecture is precisely formulated and a spherical model of constant electric field with a given charge density. In both cases, I show that the conjecture is true outside and in the bound of the sphere.
Finally, I work about a possible counterexample of the conjecture, also in spherical symmetry, and show some numerical computations.

Talk 36. On numerical evolution of Ricci Flow

Santiago Gomez, Florencia Parisi, Mirta Iriondo, Oscar Reula

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In this talk I will discuss some attempts to evolve a Ricci Flows in S^3. I will focus in different types of problems that arise in this activity: Some analytical ones, among them, which are the convenient gauge choices, which are the questions one would like to answer (hopping on getting some feedback from the audience), and the way to extract relevant global information from the numerical solution. Evolving numerically partial differential equations on manifolds with non-trivial topology implies the use of multiple grids, each one representing a coordinate patch, and the union of them, a chart for the underlying manifold. Numerical techniques to deal with these situations have to be properly implemented so that information from one of the grids can be carried to the others, and how to prevent spurious solutions to appear and dominate the evolution. Finally we will discuss some practical implementation issues, like the use of GPU's to accelerate the computation.

Talk 37. Collisionless self-gravitating systems in f(R)-gravity within Palatini approach and relativistic Boltzmann equation in the Post-Newtonian approach

Raíla André, Gilberto M. Kremer

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In this work we analysed the dynamics of collisionless self-gravitating system described by the f(R)-gravity and Boltzmann equation in the weak field approximation focusing on the Jeans instability.This instability causes the collapse of interstellar gas clouds and subsequent star formation.It occurs when the internal gas pressure is not strong enough to prevent gravitational collapse of a region filled with matter.The f(R)-gravity is a type of modified gravity theory which generalizes General Relativity.Actually, it is a family of theories, each one defined by a different function of the Ricci scalar.The post-Newtonian approximations are expansions in a small parameter, which is the ratio of the velocity of matter, source of the gravitational field, to the speed of light. In its turn, the Boltzmann equation describes the statistical behaviour of a thermodynamic system. Searching this description we employed the version of GR of this equation when the fluid is in the presence of a gravitational field.The field equations for this approximation were obtained in the Palatini approach which has as most fundamental concept the independence between the affine connection and the metric tensor.The field equations obtained by this approach in the weak field approximation are modified Poisson equations for two potentials $\phi_0(x)$ and $\psi_0(x)$.To study the dynamic of collisionless systems we employed the relativistic collisionless Boltzmann equation coupled to the modified Poisson equations. In the equilibrium, a time-independent distribution function is assumed as a Maxwellian distribution function for stellar systems.Through the solution of coupled equations we achieved the collapse criterion for infinite homogeneous fluid and stellar systems, given by a dispersion relation.This result is compared with the results of the standard case and the case of f(R)-gravity in metric formalism.The limit of instability varies according to which theory of gravity is adopted.

Talk 38. Hořava-Lifshitz quantum cosmology

Carlos A. D. Zarro, Orfeu Bertolami

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In this work, a minisuperspace model for the projectable Hořava-Lifshitz gravity without the detailed-balance condition is investigated. The Wheeler-DeWitt equation is derived and its solutions are studied and discussed for some particular cases where, due to Hořava-Lifshitz gravity, there is a "potential barrier" nearby $a = 0$. For a vanishing cosmological constant, a normalizable wave function of the Universe is found. When the cosmological constant is nonvanishing, the WKB method is used to obtain solutions for the wave function of the Universe. Using the Hamilton-Jacobi equation, one discusses how the transition from quantum to classical regime occurs and, for the case of a positive cosmological constant, the scale factor is shown to grow exponentially, hence recovering the general relativity behavior for the late Universe. Reference: Phys. Rev. D 84, 044042 (2011).

Talk 39. New results for the Reduced Relativistic Gas model

Júlio.C. Fabris, Ilya L. Shapiro, Alan M. Velasquez-Toribio, Winfried Zimdahl

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We consider the interacting RRG model, which is capable to describe, analytically, the emission of radiation by baryonic matter and the corresponding evolution of the Universe with additional WDM and cosmological constant. The Reduced Relativistic Gas (RRG) model was introduced by A. Sakharov in 1965 for deriving the cosmic microwave background (CMB) spectrum. It was recently reinvented by our group to achieve an interpolation between the radiation and dust epochs in the evolution of the Universe.

Talk 40. The Rastall formulation of Brans-Dicke theory

Júlio Fabris

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The Rastall theory is an alternative to General Relativity theory, touching one important cornestone of usual physical theories: the conservation laws. The concepts of Rastall theory can be applied to the Brans-Dicke theory. The resulting theoretical construction gives interesting new results concerning local and cosmological physics.

Talk 41. To turbulence in black holes and back again

L. Lehner

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Motivated by the fluid-gravity correspondence I discuss how turbulence arise in gravity and its relation to black hole perturbations. In particular, rapidly-spinning black holes can display turbulent gravitational behavior which is mediated by a new type of parametric instability. This instability transfers energy from higher temporal and azimuthal spatial frequencies to lower frequencies - a phenomenon reminiscent of the inverse energy cascade displayed by 2 1-dimensional turbulent fluids. This finding reveals a path towards gravitational turbulence for perturbations of rapidly-spinning black holes, and provides the first evidence for gravitational turbulence in an asymptotically flat spacetime. Interestingly, this finding predicts observable gravitational wave signatures from such phenomena in black hole binaries with high spins and gives a gravitational description of turbulence relevant to the fluid-gravity duality.

Talk 42. New geometries for the characterization of dark matter phenomen

Osvaldo M. Moreschi, Ezequiel Boero, Emanuel Gallo, Federico Geser

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The standard characterization of dark matter phenomena is through models that assume the generally accepted cold dark matter model. However, when studying dark matter phenomena with different techniques one often finds non-trivial disagreement among the measurements. Notably, when estimating the matter content in a region using gravitational weak lensing effects and dynamical studies, the different techniques do not coincide in the estimated value.
These problems might be related to the way one normally deals with inhomogeneities in cosmology. We will comment briefly on the inherent problems involved in the notion of averaging of tensors; that contribute to unexpected terms in the energy momentum tensor.
In a previous study of weak lensing we have noticed that a spacelike contribution of the energy-momentum tensor has been neglected in previous works.
We will present some new geometries that involve new kind of energy momentum tensors which are suitable for the description of dark matter phenomena.

Talk 43. Averages associated to the energy momentum tensor of new geometries describing dark matter

E.F. Boero, O.M. Moreschi, E. Gallo

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New geometries for describing dark matter phenomena suggest that space-like components of the energy-momentum tensor have a very important role to account for observational aspects of the dark matter problem. However they present some peculiar features which do not permit an easy interpretation in terms of the standard source of energy, this of course is not surprising due to the strange and still unknown nature of the dark matter, but the lack of intuition about this solutions motivate us to investigate if contributions to the space-like components of the energy-momentum tensor could arise from averages in the geometry of astrophysical system in which the dark matter is manifest.
The rotation curves requires the use of the geodesic equation in which the connection of the geometry is involved. For other hand the use of weak lensing gives us information about the optical scalar and the deflection angle; the optical scalar are obtained via the geodesic deviation equation and are given in terms of curvature scalar related associated with the Weyl tensor (Ψ_0) and the Ricci tensor (Φ_{00}), while the deflection angle only makes use of the geodesic equation in which the connection again is present. This suggest that different aspects of the geometry are tested by the different measurement.
In this work we want to discuss some aspect of averages in the context of general relativity and how they are related to the different aspect of the geometry.

Talk 44. Shape of black holes

María Eugenia Gabach Clement, Martín Reiris

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It is well known that celestial bodies tend to be spherical due to gravity and that rotation produces deviations from this sphericity. We explore these issues on axisymmetric black holes, both in stationary and dynamical regimes. We find that black hole rotation indeed manifests in the widening of their central regions, limits their global shapes and enforces their whole geometry to be close to the extreme-Kerr horizon geometry at almost maximal rotational speed. The results, which are based on the stability inequality, depend only on the horizon area and angular momentum. In particular they are entirely independent of the surrounding geometry of the space-time and of the presence of matter satisfying the strong energy condition. We also discuss the relations and applications of this result to the Hoop conjecture.

Talk 45. Regular phantom black holes as gravitational lenses

Ernesto F. Eiroa, Carlos Maximiliano Sendra

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The distortion of the spacetime structure in the surroundings of black holes affects the trajectories of light rays. As a consequence, black holes can act as gravitational lenses. Observations of type Ia supernovas, show that our Universe is in accelerated expansion. The usual explanation is that the Universe is filled with a negative pressure fluid called dark energy, which accounts for 70% of its total density, which can be modeled by a self-interacting scalar field with a potential. We consider a class of spherically symmetric regular phantom black holes as gravitational lenses. First, for small deflection angles, we perform the weak deflection limit to obtain the positions and the magnifications of the primary and secondary images of a point source. For large deflection angles we use the strong deflection limit, corresponding to an asymptotic logarithmic approximation. In this case, photons pass close to the photon sphere of the black hole and experiment several loops around it before they emerge to the observer, giving place to two infinite sets of relativistic images. Within this limit, we find analytical expressions for the positions and the magnifications of these images, and the time delays between them. Finally, we discuss the results obtained and make a comparison with the Schwarzschild and Brans-Dicke solutions for the case of the galactic center supermassive black hole.

Talk 46. Gravitational entropy of a Kerr black hole

Daniela Pérez, Gustavo E. Romero

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The gravitational entropy density of a Kerr black hole is calculated using a classical estimator based on the Bel-Robinson tensor, which has been recently proposed by Clifton, Ellis, and Tavakol. The results are compared with previous estimates obtained by the authors using a different approach. A brief analysis is provided of both methods in order to determine which represents the better expected behaviour of the gravitational entropy density.

Talk 47. On the linear stability of the extreme Kerr black hole under axially symmetric perturbations

Sergio Dain, Iván Gentile de Austria

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We prove that for axially symmetric linear gravitational perturba- tions of the extreme Kerr black hole there exists a positive definite and conserved energy. This provides a basic criteria for linear stabil- ity in axial symmetry. In the particular case of Minkowski, using this energy we also prove pointwise boundedness of the perturbation in a remarkable simple way.

Talk 48. Penrose inequality with angular momentum

Natacha Altamirano, Sergio Dain

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In this work we try to investigate a possible proof of Penrose inequality with angular momenum $m \geq \sqrt{\frac{A}{16\pi}\frac{J^2 4\pi}{A}}$, where m is the mass, A the area and J the angular momentum of the blak hole. A weaker version of this inequality, $m \geq \sqrt{\frac{A}{16\pi}}$ has ben proven uising the *Inversean Mean Curvature Flow* first propossed by Geroch. This flow has the property that the Hawking Mass is non decreasing on it. The idea is to try to demonstrate the inequality for small angular momentum using the Hawking mass.

Talk 49. Shadow cast by a Kaluza--Klein spinning dilaton black hole

L. Amarilla, E. Eiroa

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We study the shadow of a rotating Kaluza-Klein black hole in Einstein gravity coupled to a Maxwell field and a dilaton. The size and the shape of the shadow depend on the mass, the charge, and the angular momentum. The size increases with the rotation parameter and decreases with the electric charge. The minimum size is reached for the critical value of the charge and is lower than the one predicted for a Kerr-Newman black hole, while the maximum charge that can be storaged is higher. The distortion with respect to the non rotating case grows with the charge and the rotation parameter. We find that, for fixed values of these parameters, the shadow is slightly larger and less deformed than for its Kerr-Newman counterpart.

Talk 50. Weyl geometry and scalar-tensor theories

T. S. Almeida, M. L. Pucheu, J. B. Formiga, I. Lobo, C. Romero

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We apply the Palatini method to Brans-Dicke's gravitational action and derive a geometrical scalar-tensor theory, in which the space-time has the structure of a Weyl integrable geometry. In order to satisfy the weak equivalence principle, matter must couple with the scalar field in a certain specific form, which leads to free particles moving along Weyl affine geodesics. In this way, the resulting theory represents a departure from metric Brans-Dicke theory. By making use of the Weyl transformations we are able to go to a frame (which we call the Riemann frame), in which the theory becomes formally equivalent to Einstein's general relativity plus a minimally coupled massless scalar field. In this frame, we study exterior static spherically symmetric solutions and show that depending of the values of the parameter w we can have wormholes, $2M < \omega < 0$, or naked singularities, $\omega > 0$. This leads to speculating whether we have a violation of the Cosmic Censor Conjecture, in a different context of its original formulation. Here the scalar field that originates the naked singularity has a purely geometrical nature. We also discuss Weyl geometry as a possible framework to scalar-tensor theories and give as a example the relations between Brans-Dicke metric theory and the so-called WIST theories . We reinterpret what in the literature is called Einstein-frame in scalar-tensor . As an application of the new approach we investigate cosmological and static solutions.

Reference: Almeida,T.S.; Pucheu, M.L.; Romero, C.; Formiga, J.B.,"From Brans-Dicke gravity to a geometrical scalar-tensor theory arxiv.org/gr-qc/1311.5459.

Talk 51. Hamiltonian formulation of modified teleparallel theories of gravity

María J. Guzmán

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In this talk we will review the Hamiltonian formulation of $f(T)$ theories of gravity. The teleparallel equivalent of general relativity (TEGR) is a theory for the tetrad field which has no curvature, but torsion. It is used the Weitzenböck connection and the Lagrangian is built from the torsion scalar T. The theory is equivalent to General Relativity up to a border term. $f(T)$ gravity has the same spirit than $f(R)$ theories, it is a generalization of the Lagrangian for TEGR with an arbitrary function f. We will give particular emphasis to the degrees of freedom of the theory.

Talk 52. Holographic aspects of higher curvature gravity

Jose Edelstein

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I will discuss some features of higher curvature gravity in the context of the AdS/CFT correspondence. I will mostly focus on the case of Lovelock theory as a toy model for ghost-free higher curvature gravity. It admits a family of AdS vacua, most (but not all) of them supporting black holes, that display interesting features such as a generalized variant of the Hawking-Page phase transition. I will comment on various consistency constraints coming from AdS/CFT that seem to play an important role in this framework.

Poster 1. Distance-redshift relations in an anisotropic cosmological model

Roberto Menezes Jr., Cássio Pigozzo, Saulo Carneiro

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In this paper we study an anisotropic model generated from a particular Bianchi type-III metric, which is a generalization of Gödel's metric and an exact solution of Einstein's field equations. We analyse type Ia supernova data, namely the SDSS sample calibrated with the MLCS2k2 fitter, and we verify in which ranges of distances and redshifts the model anisotropy could be observed. We also consider, in a joint analysis, the position of the first peak in the CMB anisotropy spectrum, as well as current observational constraints on the Hubble constant. We conclude that a small anisotropy is permitted by the data, and that more accurate measurements of supernova distances above z = 2 might indicate the existence of such anisotropy in the universe.

Poster 2. Spectropolarimetry of Li-rich giants: probing the role of magnetic fields, rotation and evolutionary status on the lithium abundance

Bruno Lustosa, Dayvid Miranda, Joleen Carlberg, Gustavo F. Porto de Mello, Pascal Petit, Eduardo Janot Pacheco, José-Dias do Nascimento Jr.

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Lithium is easily destroyed in the stellar interior. The existence of lithium-rich giants still represents a challenge for stellar evolution. Observations from our team revealed a serendipitous discovery of some unusually high lithium content star. A possible source of the non-standard episodes required to produce Li-rich stars were identified in magneto-thermohaline mixing accounted by models of extra-mixing induced by magnetic buoyancy. On this context, the first and unique detection of a variable magnetic field in a Li-rich giant has been made by Lèbre, do Nascimento et al., (2009). Given the complexity of the problem, it is mandatory to revisited the rotation distribution of Li-rich giants and reanalyze the evolutionary status. In this study, we also present first results from the high-resolution SPaDOnS spectropolarimetry mode to resolve without ambiguity the magnetic intensity some Li rich giants.

Poster 3. Estimating the mean inclination of rotational axes of the Pleiades

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The true rotational velocity of star, V, can be measured from the radius and period of the star. However, determination of the angle of inclination of the rotational axis with the sight line i, is possible only in special cases (eg, star or measured rotation period in binary systems with rotation and translation synchronized). Often, the average equatorial speed, $\langle V \rangle$, for a sample of stars is usually estimated by the ratio between the projected average speed, $\langle V \sin i \rangle$, and the sine of the angle of inclination, $\langle \sin i \rangle$. The latter is assumed to always equal to $\pi/4 = 0,79$ chance of random distribution of rotational axes irrespective of the particular stellar population or sample. While this procedure has rarely led to discrepancies between theoretical models and the data observations. This work uses the radius star and the period of rotation to determine the equatorial velocity actual best fit with the curve of distribution of velocities equatorial actual procedure by which to determine the index q Tsallis entropy which allows to estimate the average $\langle \sin i \rangle$ based on a sample of radius, rotation periods and projected. This method is used to estimate the average $\langle \sin i \rangle$ of a database containing 217 stars in the Pleiades open cluster, whose rotation periods are available. The result shows an excellent agreement with the observational data.

Poster 4. Theoretical foundations of primordial gravitational waves printed in the CMB and its observational status

A. Bonilla

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The anisotropy study cosmic microwave background (CMB) is one of the main observational tools for modern cosmology. However, alongside the study of the thermal fluctuations of the CMB are other equally important information, which is known as the polarization of the CMB. The inflationary model predicts that the CMB is linearly polar- ized and the physical mechanism of this polarization is studied from the Thompson scattering, the dominant process on the surface of last scatter- ing. There are basically two types of polarization called E and B modes, the first produced by scalar perturbations and the latter by tensor per- turbations, such as those due to gravitational waves in the primordial universe. So if we are able to measure these types of polarization will have an entry to the study of the inflationary epoch. This paper presents the main physical mechanisms that support theoretically the polarization of the CMB due to primordial gravitational waves (PGW) and the constraints obtained from the tensor-scalar ratio (r), that shows to be in excellent agreement with the Concordance model.

Poster 5. Inflación en espacio-tiempos inhomogéneos

Florencia A. Teppa Pannia, Santiago E. Perez Bergliaffa

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¿Puede una región del espacio-tiempo inflacionar cuando está contenida en un fondo inhomogéneo? Esta pregunta, aún no posee una respuesta concluyente. En este trabajo se desarrolla un modelo simple para estudiar este problema: la evolución de una burbuja de vacío dentro de una región inhomogénea, descrita por la métrica de Lemâitre (que tiene simetría esférica y materia con presión no nula como fuente). Usando las condiciones de pegado de Israel, será estudiada numéricamente la evolución del radio de la burbuja para diferentes valores de los parámetros del problema, y para diferentes perfiles de inhomogeneidad. El objetivo del trabajo es analizar bajo qué condiciones la burbuja colapsa o se expande sin estabilizarse, y de esta forma determinar la viabilidad de la inflación en espacio-tiempos inhomogéneos.

Poster 6. Cenários inflacionários via um gás bosônico não-comutativo

Elisama Eraldene Marques Lima, Francisco de Assis Brito

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Neste trabalho, estudaremos os cenários inflacionários de um Universo preenchido por um gás de bósons não-comutativo à altas temperaturas. Um gás de bósons não-comutativo é um gás composto por um campo escalar bosônico em um espaço-tempo não comutativo. Tais teorias quânticas de campos não comutativas foram introduzidas como uma generalização da mecânica quântica não comutativa formulada por Snyder em 1947, nesta proposta as coordenadas espaciais tornam-se discretas a energias suficientemente altas, logo, não comutam entre si. O objetivo dessa teoria seria de descartar divergências ultravioletas na teoria quântica de campos, mas essa proposta foi esquecida devido o sucesso do processo de renormalização. Recentemente estas ideias foram retomadas devido a teoria de cordas e a gravitação quântica. As principais características apresentadas por essa teoria são a violação da invariância de Lorentz e a violação da simetria CPT. No presente trabalho usamos uma teoria de campos não comutativa que introduz um parâmetro θ, além do parâmetro σ que controla o alcance da não comutatividade e atua como um regulador para a teoria. Ambos os parâmetros desempenham um papel fundamental na modificação das relações de dispersão de um campo bosônico não comutativo, levando a possíveis consequências fenomenológicas. Desta forma, obtemos a equação de estado $p = \omega(\sigma, \theta; \beta)\rho$ relacionando pressão p e densidade de energia ρ para um gás bosônico não-comutativo no limite de altas temperaturas. Além disso, analisamos os possíveis comportamentos para os parâmetros σ, θ e β, de modo que $-1 \leq \omega < -1/3$, que é uma região onde o Universo entra em uma fase acelerada.

Poster 7. Testing the duality relation with galaxy clusters and type Ia supernovae: a comparative study

Simony Santos da Costa, Rodrigo Fernandes Lira de Holanda

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This work proposes to compare two tests, model-independent cosmological, for the distance-duality (DD) relation, $\eta(z) = D_L(z)(1z)^{-2}/D_A(z)$, where $D_L(z)$ and $D_A(z)$ are, respectively, the luminosity and angular diameter distances. The first test to be considered proposed by Holanda *et al.* (2010) uses to angular diameter distance two samples of galaxy clusters , compiled by De Filippis *et al.* (2005) and Bonamente *et al.* (2006), by combining Sunyaev-Zel'dovich effect and X-ray surface brightness whereas D_L distances are provided by two sub-samples of type Ia supernovae (SNe Ia) taken from Constitution data, so that their redshifts coincide with the ones of the associated galaxy cluster sample. The second test to be considered proposed by Gonçalves *et al.* (2010) uses the general expression for X-ray gas mass fraction, f_{gas}, of galaxy clusters jointly with type Ia supernovae data furnish a validity test for the DD relation. In this case, were considered 38 f_{gas} measurements, studied by two groups considering different assumptions to describe the clusters (La Roque *et al.* 2006 e Ettori *et al.* 2009) and two sub-samples of type Ia supernovae for luminosity distances extracted from the Union2 compilation. In the two tests, the DD relation was tested assuming the η parameter is a function of the redshift parametrized by two different ways: $\eta(z) = 1\eta_0 z$ and $\eta = 1\eta_0 z/(1z)$. The results found to η_0 depend of the observable used on test (gas mass fraction or angular diameter distance).

Poster 8. Are hyperons present in neutron star cores?

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Despite recent progress toward the understand of nuclear physics beyond the nuclear saturation density, the physics of neutron star core is still far from being fully understood. It is well known in the literature that strangeness containing particles may be create in neutron star core once the chemical potential of the nucleons reaches the rest mass of these particles due to the Pauli principle. The effect o the hyperon onset in neutron star matter is well known to soften the equation of state (EoS) and reduces the maximum possible mass. The recent discovery of two super massive pulsars, the PSR J1614 - 2230 and the PSR J0348 0432, indicates that the EoS has to be very stiff to reconciliate nuclear theory with the astrophysical observations. In this work, we revisited several parametrizations of quantum hadrodynamics and showed which of them can predict a massive hyperonic neutron stars. Our work indicate that the presence of strangeness containing particles in neutron star core is still an open puzzle.

Poster 9. Discrete values of planetary energies and orbital distances.

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A rigorous analytical derivation of discrete energies and planetary distances from a central star or massive body is presented. Given the position of two orbiting objects as boundary values, the derived formula gives the positions of all the other objects orbiting a particular central massive body. The formula is applied successfully to the solar system, the satellites and moons of the solar planets, to the rings of planets, periodic comets and to all applicable exoplanet systems, pulsars, circumbinary and circumternary systems, and to star clusters orbiting the centre of the Milky Way galaxy. The calculated distances agree with observation within a total average relative deviation of 0.021, or 2.1%.

Poster 10. Cosmological dynamics with non-linear interactions

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We present a dynamical system analysis for a certain class of non-linear couplings between dusty Dark Matter and a w-type Dark Energy. We show that for certain types of interactions, even though the EoS of Dark Energy is phantom-like, there is no Big Rip and we can even address the coincidence problem. For a specific model, SNIa shows an interesting estimation of parameters that is in accordance to a matter dominated era.

Poster 11. Inverse See-Saw Type II

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The extension of the standard model by a scalar triplet is a very promising scenario in the sense that it may explain the masses of neutrinos through See-Saw mechanisms. In this paper we use this scalar triplet to develop the inverse type-II seesaw mechanism. The signatures of this mechanism are new scalars with masses around few hundreds of GeV's. We check if the contributions of these scalars to rare leptonic decays are in agreement with recent bounds. These scalars decouple from the standard quarks and Higgs, thus it can not be probed by the LHC. We investigate possible detection of these new scalars in the future ILC experiment.

Poster 12. The Type Ia supernova pipeline for the Javalambre Physics of the Accelerating Universe Astrophysical Survey

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The Javalambre Physics of the Accelerating Universe Astrophysical Survey (J-PAS) is an astronomical facility being built in Sierra de Javalambre, Spain. The main goal is to study the expansion of the Universe through different cosmological observables such as baryonic acoustic oscillations, type Ia supernovae and galaxy clusters. The main instrument will be a 2.5 m telescope equipped with a system of 56 narrow band filters in the optical. Here we present a sketch of the pipeline we are developing to detect type Ia supernovae with J-PAS. First we describe each individual step of the pipeline, such as image subtraction and source selection. Then we show some results we obtained when applying our pipeline to images from the Sloan Digital Sky Survey and the Alhambra survey, which had a set of narrow band filters similar to the ones that will be used by J-PAS.

Poster 13. Vacuum decay and particle production leading to cosmic acceleration

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The correspondence between cosmological models powered by a decaying vacuum energy density and gravitationally induced particle production is investigated. Although being physically different in the physics behind them we show that both classes of cosmologies under certain conditions can exhibit the same dynamic and thermodynamic behavior. New observational results are going to constraint some classes of these models and a rank of the models will be presented.

Poster 14. Measuring galaxy morphologies in the CFHT/MegaCam Stripe-82 Survey

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We present the determination of galaxy structural parameters in the CFHT/MegaCam Stripe-82 Survey (CS82) stacked images. The CS82 survey covered an area of 170 square degrees with the CFHT 3.6 m telescope in a field determined by $-40 <$RA< 45 and $-1 <$DEC< 1 (within the SDSS stripe-82 region) in i-band to a depth of $\mathrm{mag}_{AB} \sim 24$. Its excellent image quality (mean seeing of 0.6) and uniformity makes CS82 specially suitable for applications involving gravitational lensing and galaxy morphology. In this work we present the determination of galaxy structural parameters, which has applications to galaxy evolution studies, weak lensing through the effect of magnification, and the improvement of the photometry in other surveys (e.g. SDSS), through the ``forced photometry'' method. In this work the morphological analysis of galaxies is performed through a profile fitting method implemented with SExtractor PSFEx. First, we use SExtractor to perform the detection and obtain basic measurements of objects, then we use PSFEx to model the PSF across the field, and, finally, we run SExtractor again to perfom the model-fitting of objects. In this work we use 4 models implemented in SExtractor: Sércic, de Vaucouleurs, exponential and 2-component de Vaucouleurs exponential. We discuss some applications of these results, such as the evolution of galaxy sizes and the measurement of the lensing magnification signal combining precise photometry, counts and sizes.

Poster 15. Testing the phenomenological dipole hypothesis for the variation of alpha with Supernova data

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Since the large-number hypothesis proposed by Dirac in 1937, the space-time variation of fundamental constants has been an important subject of research. Many observational and experimental efforts have been made to establish constraints on these variations. The astronomical methods are based mainly on the analysis of high-redshift quasar absorption systems. Most of the reported data are, as expected, consistent with null variation of the fine structure constant. But, there is a certain amount of data obtained with the Keck and VLT telescopes, that led Webb and collaborators to propose a phenomenological model in which alpha might vary spatially. On the other hand, there has been recent some observational evidence which could be interpreded as a hint for deviations from large scale statistical isotropy like the alignment of low multipoles in the CMB angular power spectrum and large scale alignment in the QSO optical polarization data. In this work we consider the Union2 data of the angular distribution of luminosity distances of Type Ia supernovae (SnIa) to test the phenomenological "dipole-model" proposed by Webb et al.

Poster 16. Decay of dyonic black holes

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We study general two-body decays of arbitrary torsion 1/4-BPS dyons black holes in four-dimensional type IIB string compactifications. We find a "master equation" for marginal stability that generalizes the curve found by Sen for 1/2-BPS black hole decay, and analyze this equation in a variety of cases including decays to 1/4-BPS black hole products.

Poster 17. γ gravity: steepness control

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We investigate a simple generalization of the metric exponential $f(R)$ gravity theory that is cosmologically viable and compatible with solar system tests of gravity. We show that, as compared to other viable $f(R)$ theories, its steep dependence on the Ricci scalar R facilitates agreement with structure constraints, opening the possibility of $f(R)$ models with equation-of-state parameter that could be differentiated from a cosmological constant ($w_{de} = -1$) with future surveys at both background and perturbative levels.

Poster 18. The observed frame k-band and r-band luminosity function inside clusters of galaxies in XMM- Newton Cluster Survey Catalogue

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We are constructing the observed frame k-band and r-band Luminosity Function inside the clusters of galaxies, and the datasets we use the XMM-Newton Cluster Survey catalogue (XCS), Sloan Digital Sky Survey (SDSS) DR10, United Kingdom Infrared Digital Sky Survey (UKIDSS) Large Area Survey (LAS) DR9. First, we select the clusters of galaxies data sets from XCS, because we are interested in what the difference between the dynamical stable and dynamical unstable clusters. For the k-band Luminosity Function inside the clusters of galaxies, the dust obscuration won't be affected, and it is a good tracer to trace back to the mass. After that, we can compare to the r-band Luminosity Function inside the clusters with SDSS to know what's different in each cluster. Our goal is to know the cluster environments for galaxies between the $0 < z < 1$.

Poster 19. Gravitational waves in decaying vacuum cosmologies

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We discuss the problem of cosmological production of massless gravitons in the framework of an expanding, spatially homogeneous and isotropic FRW type Universe with decaying vacuum energy density. The main motivation to study a decaying vacuum energy density is because it can alleviate the cosmological constant and coincidence problem. The gravitational wave equation is established and its time-dependent part has been exactly solved in the case of a flat geometry. Unlike the standard ΛCDM cosmology (no interacting vacuum), we show that massless gravitons can be produced during the radiation era. Introducing the decaying vacuum term, $\lambda(t)$ in the Friedmann equations we calculate the scale factor for a three phase (inflation, radiation and matter) cosmological model. In this context we calculate the linear quantum tensor perturbations in the metric obtaining a solution for the gravitational waves in each cosmological era. The power spectrum and energy density were calculated in a general form, so as the delineated formalism of Bogoliubov transformations to subsequently calculate the number of gravitons created.

Poster 20. Confrontando o modelo de Szekeres quase-esférico com cosmologia observacional

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O modelo padrão atual da cosmologia considera que o universo seja homogêneo e isotrópico em larga escala. As observações atuais, norteiam que o modelo de concordância ΛCDM, deve ser dominado por duas componentes exóticas, a matéria escura e a energia escura, as quais se ajustam bem. Contudo, ele não escapa de grandes problemas teóricos, relacionados com a constante cosmológica Λ, que nos dá uma dinâmica acelerada na expansão do universo.
Porém existem modelos cosmológicos alternativos, o modelo de Szekeres por exemplo, que descreve uma geometria heterogênea e sem simetria alguma (vetores de Killing nulos). Neste trabalho, apresentarei o caso quase-esférico do modelo de Szekeres, descrevendo um vazío local, no qual a densidade de matéria depende unicamente da componente radial r, para confrontarlo com o catálogo de supernovas do tipo Ia Union2. Com uma simples análises bayesiana, mostramos que não pode ser excluida a hipótese que vivemos dentro de um grande vazío local rodeado do modelo de Einstein-de Sitter.

Poster 21. Gravitação na linguagem das Formas Exteriores

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In this work we use the formalism of exterior calculus to derive the basic equations of the geometric structure of space-time, in theories like standard general relativity and its extension Einstein-Cartan Theory. These equations are obtained from the variational principle and symmetries of the Poincaré group, besides tetrads (Vierbien) fields and spin connection. Finally we show that there is an equivalence between the two formalisms, the tensor calculus and exterior calculus. This work was developed to be presented as a final work of a Bachelor degree in Physics at Universidade Federal do ABC.

Poster 22. Estructura de estrellas compactas en Palatini f(R)

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El estudio de la estructura de objetos compactos, en el marco de las teorías alternativas a la gravedad, puede resultar útil para establecer cotas a teorías $f(R)$ en el régimen de campo gravitacional fuerte. En particular, los efectos que sufre la estructura de estrellas de neutrones bajo la generalización de la densidad lagrangiana de la forma $f(R) = R\alpha R^2$, o gravedad cuadrática, han sido explorados recientemente en el formalismo métrico.
En este trabajo estudiamos configuraciones de estrellas de neutrones en gravedad cuadrática basados en el formalismo de Palatini, es decir, considerando que la conexión es también una variable independiente al momento de variar la acción. En este formalismo las ecuaciones de campo resultan de segundo orden, como en Relatividad General, y las ecuaciones de Tolman-Oppenheimer-Volkoff modificadas pueden ser deducidas en forma exacta. Realizamos una integración numérica de las ecuaciones de estructura que describen estrellas de neutrones en gravedad $f(R)$, recuperando sus relaciones masa-radio, y haciendo foco en el comportamiento de sus perfiles internos. Finalmente comparamos nuestros resultados con sus correspondientes en Relatividad General.

Poster 23. Study of the chemical composition of high energy cosmic rays using the muon LDF of EAS between $10^{17.25}$ and $10^{17.75}$ eV

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We explore the feasibility of estimating primary cosmic ray composition at high energies from the study of different parameters of Extensive Air Showers (EAS) at ground and underground level with Monte Carlo simulations. Using a lateral distribution function, we fit the muon density of EAS simulated to find the slope of this function. We also study the number of muons at a certain distance of the shower core. The primary mass discrimination with the merit factor for each parameter distribution is discussed in this work. The analysis considers three different primary particles (proton, iron and gamma), four different zenith angles (0°, 15°, 30° and 45°) and primary energies of $10^{17.25}$ eV, $10^{17.50}$ eV and $10^{17.75}$ eV.

Poster 24. Discos de acreción en espaciotiempos de Kerr magnetizados

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A partir de observaciones de sistemas binarios de rayos X existen fuertes evidencias de la existencia de objetos demasiado masivos y compactos como para poder ser explicados por los modelos actuales de estrellas de neutrones. Cuando dichos sistemas se encuentran en el estado térmico (*high/soft*), los espectros de emisión observados en el rango $0.1 - 5$ keV pueden ser explicados satisfactoriamente por medio de la emisión térmica de discos de acreción formados alrededor de objetos súper compactos.
En este trabajo presentamos resultados obtenidos mediante un código capaz de calcular espectros térmicos observados, que se originan en discos de acreción delgados formados en espaciotiempos de Kerr para todo valor del parámetro de rotación a. El mismo incorpora el seguimiento de rayos de luz desde la fuente hasta el observador teniendo en cuenta efectos relativistas como la deflexión de la luz, el efecto Doppler relativista y el enrojecimiento gravitacional. Además, analizamos el efecto que producen campos magnéticos externos sobre estos espectros, para ello consideramos dos configuraciones diferentes de campo magnético en el disco: a) uniforme y b) dipolar.
Mostramos que los datos obtenidos a partir de observaciones de binarias de rayos X descartan modelos de discos de acreción formados alrededor de singularidades desnudas (descriptas por la métrica de Kerr cuando $a > 1$). Estos resultados fortalecen el paradigma de la formación de agujeros negros como resultado final de la evolución de estrellas de gran masa y pueden además ser utilizados como argumento a favor de la validez de la conjetura fuerte de censura cósmica en ámbitos astronómicos.

Poster 25. Nonlinear electrodynamics and cosmology

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Nonlinear electrodynamics can clarify some questions that remains from linear one and implies different results in cosmology; in particular concerning the singularity issue. Besides; the non-minimal coupling between gravitational and electromagnetic fields can bring some new results in order to help us to understand our universe and its proprieties on its primordial phases.

Poster 26. Gravitational waves in boucing models

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We aim to explore the possibility of direct detection of gravitational waves in bouncing models (Cosmological models which there is no primordial singularity). In a recent article (Stochastic background of relic gravitons in bouncing the quantum cosmological model, arxiv 1207.5863) has shown that, within a specific bouncing model, the primordial gravitational waves produced have very low amplitude for be detected directly. We intend to attest that this result is model independent and characteristic of models with bouncing In particular, we study the tensor modes amplified by a bouncing phase dominated by stiff matter. We will attest in which conditions this amplification could be enough to make these primordial gravitational waves observable.

Poster 27. Comparación de las predicciones de cosmologías alternativas al modelo estándar con datos del Fondo Cósmico de Radiación

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A través de análisis estadísticos buscamos comparar las predicciones de modelos alternativos al modelo cosmológico estándar con datos recientes del Fondo Cósmico de Radiación. En particular consideramos modelos donde la emergencia de un universo anisotrópico e inhomogéneo a partir de un estado inicial isótropo y homogéneo se puede explicar como consecuencia del colapso dinámico de la función de onda. Utilizamos los datos observacionales del FCR y censos de galaxias para poner poner límites sobre los parámetros libres de estas teorías alternativas.

Poster 28. Solução para o espaço-tempo de dois corpos massivos - Métricas de Schwarzschild e de Reissner-Nordstrom

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Com a intenção de entender como configurações localmente estáticas ao redor de corpos massivos podem ser imersas em um universo em expanção, são usados os critérios de junção de Israel para analizar a colagem de dois espaço-tempos estáticos e esferamente simétricos, isto é, as métricas de Schwarzschild e Ressiner-Nordstrom. Se mostra que o procedimento somente é possível nos horizontes através de hipersuperficies nulas dando como resultado uma configuração estática. Por outro lado, ao considerar o espaço-tempo de Kottler surge uma solução não estática consistindo de duas regiões estáticas acopladas nos horizontes cosmologicos a uma região em expansão caracterizada por uma constante cosmológica. O mesmo resultado é obtido com a solução de Reissner-Nordstrom-de-Sitter.

Poster 29. Estudio de microvariabilidad foto-polarimétrica en los blazares 1ES 1959 650 y HB89 2201 044

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Se presenta el estudio realizado para determinar variaciones en escalas temporales que van de horas a días, tanto en el flujo total como en la polarización lineal óptica de dos blazares: 1ES 1959 650 y HB89 2201 044. Estos blazares son núcleos galácticos activos (AGN) relativamente cercanos, cuyas galaxias anfitrionas están bien resueltas espacialmente, y tienen parámetros fotométricos determinados con precisión. Esto nos ha permitido aplicar modelos que tienen en cuenta el efecto depolarizador introducido por la luz (no polarizada) de la galaxia, evaluando al mismo tiempo cualquier variación espuria en las curvas temporales de polarización debidas a condiciones variables de seeing, que afectan en forma diferente al núcleo (puntual) y a la galaxia anfitriona (extendida). Sumado a esto se llevó a cabo un estudio de las PSF de cada objeto con la intención de modelar la galaxia anfitriona y poder obtener un ajuste óptimo que permita determinar los parámetros estructurales con mejor precisión como así también la magnitud del núcleo de la fuente. Estos resultados además de proveer información sobre el comportamiento óptico de los blazares detectados a altas energías, nos han permitido utilizar técnicas poco exploradas pero con buen desarrollo es nuestro país, como es el caso de la polarimetría óptica.

Poster 30. Study of pulse structure of long GRBs: radiative mechanisms associations and geometry of the emission

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The GRBs are the most enigmatic events as well as one of the oldest known in the Universe. In this work, we have studied six different GRBs detected by Swift mission: 080411 (z = 1, 03), 071010B (z = 0, 94), 081008 (z = 1, 96), 090715B (z = 3), 110503A (z = 1, 61), 110715A (z = 0, 82). We have used the pulse model for each GRB in four different energy bands to fit only regular pulses. The analysis suggests that there are two types of pulses associated to two specific radiative mechanisms which remain invariant to different ages of the Universe. This fact suggest that the GRBs are candidates to Standard Candles. We have analyzed the light curves for different pulses of each GRB; we have researched the spectral lag of each GRB, correlation between spectral lag, luminosity and others spectral parameters. We have tried to verify if the GRB's analysis are consistent with the two types of pulses defined before, and the relation of these with the geometry in its emission moment.

Poster 31. Thin-shell wormholes with a generalized Chaplygin gas in Einstein-Born-Infeld theory: construction and stability

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In the present work we constructed a spherically symmetric wormholes using thin-shell formalism in Born-Infeld electrodynamics coupled to Einstein gravity. Using a black hole metric and cutting the manifold beyond horizon, we pasted both identical regions in order to construct the wormhole. In this form, the new manifold obtained has not horizon and the surface where both regions were pasted is the throat which violates energy conditions. For this reason it is needed the presence of exotic matter supported in this work by a generalized Chaplygin gas. We analysed the stability of wormhole under radial perturbations for different values of the Born-Infeld parameter and the charge, and we compared the results with those obtained in a previous work for Maxwell electrodynamics. The stability region in the parameter space reduces and then disappears as the value of the Born-Infeld parameter is modified in the sense of a larger departure from Maxwell theory.

Poster 32. Nonsingular brane cosmology

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One of the motivations for brane world models arises in the second string revolution, based upon the Horava and Witten model, in which the gauge fields are confined in two (1 9)-branes located at the orbifold fixed points. Within this context, the brane world paradigm may be understood as a Horava-Witten effective theory in five dimensions, where the (3 1)-branes are embedded into a 5-dimensional spacetime (the bulk). In its simplest versions, these models can be performed by Randall-Sundrum singular branes living in a warped spacetime. Our research addresses nonsingular branes generated by bulk scalar fields coupled to gravity. Our main aim is to study the cosmological implications of specific scalar field setups leading to branes with time-dependent warp factors. The field equations have been solved for a spatially flat FRWL brane.

Poster 33. Magnetic and thermodynamics properties of curved grafen sheet by Monte Carlo method

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We consider magnetic and thermodynamic properties of curved grafen sheet using combination of analytic and numerical approaches. It is well-known that the dynamics of 2d gravity is equivalent to the one of the scalar field. The main supposition of the present work is that the effect of such a scalar can be responsible for the observed effects of geometry on the properties of grafen with curved surface. The final results are achieved by means of the Monte Carlo method.

Poster 34. Spherical collapse for unified dark matter models

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We study the non-linear spherical "top hat"collapse for Chaplygin and viscous unified cosmologies. The term unified refers to models where dark energy and dark matter are replaced by one single component. For the generalized Chaplygin gas (GCG) we extend previous results of [R. A. A. Fernandes et al. Physical Review D 85, 083501 (2012)]. We discuss the differences that appear at non-linear level between the GCG with $\alpha = 0$ and the ΛCDM model. The bulk viscous model, which differs from the GCG due to the existence of non-adiabatic perturbations, is also studied. In this case, the clustering patterns are in general suppressed and the viable parameter space of the viscous model is constrained.

Poster 35. Comparison of UHECRs deflection in the intracluster medium under CGL and MHD frameworks

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The origin, propagation, and mechanisms of acceleration of the ultra-high energy cosmic rays (UHECRs) are not yet well understood. In particular, the presence of turbulent magnetic fields strongly affects the transport of energetic charged particles in the intracluster medium (ICM). In order to obtain a better understanding of particle transport in the ICM, we perform kinetic magnetohydrodynamical simulations including pressure anisotropy, and study the deflection of charged particles in the turbulent plasma. We compare our results with those obtained in standard magnetohydrodynamics.

Poster 36. Generation of primordial magnetic fields during contracting cosmological phases

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It is known from inflation that gauge invariant $f(\phi)^2F^2$ theories where the electromagnetic fields couples to the background dynamics are plagued by the strong coupling/backreaction problem. We found that, indeed, such problem arises in cosmological backgrounds where $w < -1/3$. However, in contracting cosmologies this is not the case. We found that any contracting phase with $w > -1/3$ can evade both, the strong coupling and the backreaction of electric fields, in the simplest models. Without this problems we obtained safe magnetogenesis during the ekpyrotic contracting phase of a non-singular bouncing cosmology. We also found that $f(\phi)^2F^2$-instabilities might arise during the final kinetic driven expanding phase if the ekpyrotic potential is very steep.

Poster 37. Emissivity of neutrinos by the direct Urca process and cooling of neutron stars in the presence of a strong magnetic field

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Direct Urca process is an extremely efficient mechanism for cooling a proton neutron star after its formation. It is believed to be the process responsible for the cooling of proto-neutron stars after the first 100 years of life. In this work we study the influence of strong magnetic fields on the cooling of neutron stars due to the neutrino emissivity coming from the direct Urca process. The matter is described using a relativistic mean-field model at zero temperature with the baryon octet, electrons and muons. We calculate numerically the emissivity of neutrinos and the cooling for different magnetic fields, and compare the results for the case without magnetic field. We found that the magnetic field increases the cooling due to the increasing of the proton fraction

Poster 38. The Relativistic Poisson Particle

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In Einstein's Brownian particle motion theory the occurrence of a huge number collisions at all times is a necessary condition for the application of the central limit theorem which analytically lead us to Gaussian noises and Wiener-like stochastic processes. Yet what if such conditions are not verified (e.g. very sparse media) so that the particle under study collides with medium particles at random intervals of time typifying a Poisson (or shot-noise) process? Furthermore, what if such case has got a characteristic speed comparable with the speed of light? In this poster, relativistic stochastic processes with poisson noise are investigated. Relativistic stochastic processes for the Brownian particle have been already discussed paving the way to a solvable covariant version of the Fokker-Planck Equation equation (FPE). However, non-Gaussian cases - Poisson included - one cannot rely on FPE methods since Poisson noise has cumulants of all orders which invalidates obtaining the FPE. Hence, one has to generalise the Langevin equation within a relativistic context. This step was partially put forward by Hanggi and Dunkel. The first aim of this poster is to obtain an extended non-Gaussian relativistic Langevin equation. The next step concerns generalising the Poisson noise to relativistic frames. It is very important to know how is the behaviour of the noise for different frames of reference. Some implications of this formalism are discussed and investigated.

Poster 39. Compact Charged Stars

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We study the equilibrium and stability of charged compact stars. In order to do so, we choose to solve numerically a system of differential equations describing the structure of charged compact objects, including the generalization of the Tolman-Oppenheimer-Volkoff equation for this class of objects. We assume a polytropic equation of state for the fluid. For the relation between charge density and the fluid's energy density, we have assumed more realistic relations than the linear relation usually assumed in the literature. We obtained upper limits for the charge such objects can acquire, study the stability of these equilibrium configurations, and verified the existence of a phenomenon called charge regeneration.

Poster 40. Kerr black holes in modified teleparallel theories of gravity

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In this work we analyze rotating black hole solutions in f(T) gravity. f(T)'s are theories of modified gravity coming from a deformation of the teleparallel equivalent of General Relativity (TEGR). They use torsion rather than curvature to describe gravity. This is because TEGR starts from the Weitzenbock connection, whose Riemann tensor is identically null. In teleparallelism, the dynamical variable is the tetrad or vierbein field, and the scalar Lagrangian T is quadratic in the torsion of the Weitzenbock connection. Differing from TEGR, f(T) theories lack the local invariance under Lorentz transformation of the tetrad. This feature is an obstacle to find solutions, even for highly symmetric geometries. In particular, the question about a suitable tetrad for the Kerr geometry is still open.

Poster 41. Espinores en espacio curvo: fenomenología y representación espacio-momento

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Algunas teorías fundamentales, como la teoría de Cuerdas, la gravedad cuántica de lazos o la relatividad especial doble, predicen relaciones de dispersión modificadas (MDR) a altas energías. Las MDR pueden usarse como enfoque fenomenológico para investigar la escala de Planck. Estas relaciones modificadas afectarían la estructura de la teoría cuántica de campos, en particular su renormalizabilidad. En el caso de backgrounds no homogeneos, la renormalización del tensor de tensiones, resulta compleja, pues el operador de Klein-Gordon contiene derivadas espaciales. De hecho, la representación de DeWitt-Schwinger para las funciones de Green, que es el punto de partida de la técnica de ramificación de puntos no funciona en este caso. En los programas de renormalización resulta necesario tener en cuenta las derivadas de la métrica, es decir para calcular órdenes adiabáticos superiores en la renormalización es útil contar con una representación adecuada de las funciones de Green. La estructura de singularidades de estas funciones podría revelarse en una representación de espacio-momento generalizada. Motivados en la física trans-Planckiana y sus eventuales efectos observables; profundizamos en el cálculo de funciones de dos puntos en presencia de gravedad, utilizando el enfoque de espacio-momento. Calculamos el propagador para un espinor masivo en presencia de campos clásicos. Se analiza el caso de una métrica con dependencia espacio-temporal arbitraria en los límites de campos débiles y campos fuertes. Se observa que la consistencia de la solución está restringida por la longitud de variación característica de la métrica. Los efectos gravitacionales sobre el spin se analizan con vistas a sus posibles correlaciones con la fenomenología de neutrino bursts.

Poster 42. GPU computing applied to high-energy astrophysics

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We present some applications of general-purpose computing on graphic processing units (GPGPU) to the calculation of non-thermal radiation from relativistic astrophysical plasmas. We discuss the implementation and assess the efficiency of the GPU-accelerated codes when compared to traditional parallel CPU computing.

Poster 43. Exploring cosmic ray ionization power

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Primordial cosmic rays could be responsible of the reionization of the universe at z=20-15?. In this contribution we will show how the ionization power of cosmic rays can be calculated, as an intermediate step on the way of answering this question.

Poster 44. Constraints on dark energy cosmological models from galaxy clusters

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Different cosmological tests favored to the concordance model LCDM, which is the most accepted today. However, there are strong theoretical arguments to look for alternative models. To distinguish which one is the best model, we need to increase the number of independent cosmological tests. In this work we use the gas mass fraction (fgas) and the angular diameter distance (dA), derived of Sunyaev-Zel'dovich/X-Ray effect, to constrain several dark energy cosmological models. In adding, we consider strong lensing systems, BAO, CMB, H(z) and SNIa data. Furthermore, we use the Bayesian and Akaike information criterion to discriminate between different alternative models.

Poster 45. Does Chaplygin Gas have salvation?

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We investigate the unification scenario by the generalized Chaplygin gas (GCG) model (a perfect fluid characterized by an equation of state $p = -A/\rho^{\alpha}$). Our concerns lies with a possible tension existing between background kinematic tests and those related to the evolution of small perturbations. We analyze data from the observation of the differential age of the universe, type Ia supernovae, baryon acoustic oscillations and the position of the first peak of the angular spectrum of the cosmic background radiation. We show that these tests favour negative values of the parameter α. These would correspond to negative values of the squared speed of sound which are unacceptable from the point of view of structure formation. Finally, we address the case where $\alpha = 0$, usually considered to be undistinguishable from the standard ΛCDM model, but we show that the evolution of small perturbations, governed by the Meszaros equation, is indeed different and the formation os sub-horizon GCG matter halos may be importantly affected in comparison with the ΛCDM scenario.

Poster 46. Stability of thin disks with a dipolar magnetic field

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We use the "Displace, Cut and Reflect"method to generate thin disks from Gutsunaev-Manko solution of Einstein Equations. This solution represents a massive object endowed with magnetic dipole moment and our purpose is to study the stability of the disklike configurations obtained.

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