COSMOSUR VI

Time / period	Monday	Tuesday	Wednesday	Thursday	Friday
8:00-9:00	Registration/Openin g				
9:00-10:00	CLAUDIA SCOCCOLA	ELIZABETH GONZALEZ	ELISA FERREIRA	OLIVER PIATTELLA	FARINALDO DA SILVA QUEIROS
10:00-10:45	COFFEE	COFFEE	COFFEE	COFFEE	COFFEE
10:45-11:45	FEDERICO CARRASCO	NELSON PADILLA	JOSÉ VILLANUEVA	NELSON VIDELA	TALK32/TALK33 (10:45-11:15/11:15-11:45)
11:45-12:15	TALK1	TALK10	TALK19	TALK23	TALK34
12:15:12:45	TALK2	TALK11	TALK20	TALK24	TALK35
12:45-14:30	LUNCH	LUNCH	TALK21/22 (12:45-13:05)/13:05-13:25)	LUNCH	LUNCH
14:30-15:00	TALK3	TALK12		TALK25	TALK36
15:00-15:30	TALK4	TALK13		TALK26	TALK37
15:30-16:00	COFFEE/POSTERS	COFFEE/POSTERS		COFFEE/POSTERS	COFFEE/POSTERS
16:00-16:20	TALK5	TALK14		TALK27	TALK38
16:20-16:40	TALK6	TALK15		TALK28	TALK39
16:40-17:00	TALK7	TALK16		TALK29	TALK40
17:00-17:20	TALK8	TALK17		TALK30	
17:20-17:40	TALK9	TALK18		TALK31	

PLENARY TALKS:

MONDAY

9:00-10:00. CLAUDIA SCOCCOLA. FCAG-UNLP/CONICET.

Searching the primordial CMB B-modes polarization with QUBIC.

The Q & U Bolometric Interferometer for Cosmology (QUBIC) is an experiment to measure the primordial B modes polarization of the CMB, that will be installed in Alto Chorrillos, in the Province of Salta, Argentina. The detection of the primordial B modes has not been achieved yet, not only because it is an extremely faint signal, but also because of contamination by foregrounds that emit at the same frequencies, most noticeably the galactic thermal dust. In this talk, I will review this novel instrument, its unique architecture, and its strategies to capture this faint signal, which would constitute a unique indirect probe of Inflation.

10:45-11:45. Federico Carrasco. IFEG-CONICET, FAMAF-UNC

Magnetospheres of neutron stars in compact binaries: precursor electromagnetic signals.

In this talk, I will show recent numerical results for a neutron star orbiting a black hole, aiming at clarifying the main magnetosphere properties of such binaries toward their innermost stable orbits. The plasma environment surrounding these compact binary systems is modeled by relying on the force-free approximation. Several configurations are explored, varying the orbital separation, the individual spins and misalignment angle among the magnetic and orbital axes. I will discuss how these systems are able to channel a fraction of their large kinetic energies (and how much) on each of the particular settings, and how this energy could be re-processed within the magnetosphere to potentially produce precursor electromagnetic signals on the different bands of the spectrum. Finally, I will comment on a dynamo effect arising from the misalignment of the individual spins.

TUESDAY

9:00-10:00. Elizabeth Gonzalez. IATE

Using gravitational lensing to measure cluster halo shapes

Shape measurements of dark matter halos constitute a test of the current cosmological ΛCDM paradigm, since they are sensitive to the initial density field and halo assembly. Moreover, determining halo shapes can also serve as a probe of the fundamental particle nature of dark matter. Nevertheless, deriving observational estimates of cluster dark matter halo shapes is challenging, being gravitational lensing one of the most promising observational techniques. In particular, weak-lensing stacking techniques can be applied in order to obtain the median projected ellipticity of a sample of halos. If the lensing signal is combined considering the orientation of the cluster projected mass distribution, the resulting stacked mass density can be modelled to derive the projected ellipticity of the total mass surface density. In this presentation, we review how the shape of the projected surface distribution of galaxy clusters can be obtained using this technique. We present the results of observational studies and also, using simulations, we evaluate the introduced bias in deriving the projected aligned ellipticity of cluster size halos.

10:45-11:45. Nelson David Padilla. IATE

Implications of primordial black holes as sizeable components of the dark matter

With primordial black holes (PBHs) back in the spotlight after the LIGO detections of binary black hole mergers with masses that often lie outside the most accepted range for stellar black holes, there has been a lot of attention to whether PBHs can conform a large fraction of the dark matter (DM). If this is the case there are several consequences that I will review during the talk for the abundance of low mass DM haloes, for the small scale clustering, and for additional interactions as PBHs can hold electrical charge, that further constrain this possibility.

WEDNESDAY

9:00-10:00. Elisa Ferreira. Kavli Institute for the Physics and Mathematics of the Universe

Ultra-light dark matter: the light and fuzzy side of dark matter

The nature of dark matter remains one of the biggest mysteries in cosmology. There are many different models to explain the nature of this elusive component. One of the most interesting class of models and that has become one the leading candidates is the ultra-light dark matter. This class represents the lightest possible dark matter candidates, and exhibits a wave-like behavior on galactic scales. This leads to a rich phenomenology on small scales that can potentially not only reconcile the CDM picture with the small scale behavior of dark matter, but offer us the unique possibility to probe their distinctive predictions, and imprints that can reveal clues about the internal properties of dark matter. In this talk, I will review this class of models, describing and classifying the different constructions and their phenomenology. Given their vast cosmological and astrophysical effects on observables, I will describe the ongoing advances in constraining these models using current gravitational tests, and highlight the strong constraining power of small scale astrophysical observations. Current and future observations of these systems present a powerful and, still not fully explored, gravitational laboratory that can reveal the fundamental physics of dark matter in the next few years.

10:45-11:45. José Ricardo Villanueva Lobos. Universidad de Valparaíso.

Adiabatic analysis of black holes

Using Carathéodory's approach to thermodynamics, the adiabatic-isoareal construction of the thermodynamic manifold for black holes is studied. The classical laws of thermodynamics are discussed with a couple of examples.

THURSDAY

9:00-10:00. Oliver Fabio Piattella. Università degli Studi dell'Insubria.

Does the cosmological constant stay hidden?

We elaborate on the proposal of [Phys. Rev. Lett. 123, 131302 (2019)], about the possibility of hiding the cosmological constant in the complicated topology that one expects to exist at the Planck scale. We build a differential equation ruling the time evolution of $\langle K\rangle$, the spatial average of the expansion scalar. Supposing that the solution $\langle K\rangle=0$ exists despite the presence of a large cosmological constant Λ, we show that such a solution seems to be unstable.

10:45-11:45. Nelson Videla Menares. Pontificia Universidad Católica de Valparaíso.

Inflation and Reheating in Generalized Scalar-Tensor Gravity.

The inflationary period ends when the equation-of-state parameter (EoS) becomes larger than $w=-1/3$, i.e. the slow-roll approximation breaks down, the expansion decelerates and the Universe enters into the radiation era of standard hot big-bang (HBB) cosmology. The transition era after the end of inflation, during which the inflaton is converted into the particles that populate the Universe later on is called reheating. Unfortunately, the underlying physics of reheating is highly uncertain, complicated, and it cannot be directly probed by observations, although some bounds from BBN, the gravitino problem, leptogenesis, and the energy scale at the end of inflation do exist. There is, however, a strategy that allows us to obtain indirect constraints on reheating. First we parameterize our ignorance assuming for the fluid a constant equation-of-state w_{re} during reheating. Next, we find certain relationships between the reheating temperature, T_{re}, and the duration of reheating, N_{re}, with w_{re} and the inflationary observables. In this talk, I will summary some results obtained along this direction by means stuying cosmic inflation and its dynamics in a generalized Scalar-Tensor Gravity theory in accordance with current observational data.

FRIDAY

9:00-10:00. Farinaldo da Silva Queiroz. UFRN

Fourfold Search for Dark Matter.

What could dark matter be? How could we detect it? We will review the basic ingredients of dark matter research, and show that in the era of dark matter complementary commonly referred as "collider, direct and indirect detection" a dark knight arises: NEUTRON STARS.

TALKS:

MONDAY

TALK1 (25'+5'): Martin Makler, International Center for Advanced Studies, ICIFI, USNAM & Brazilian Center for Physics Research.

Constraints on modified gravity using Einstein rings: prospects for the LSST era

Galaxy-scale strong lensing systems are key for testing modifications of general relativity at the few kpc scales. In particular, combining the kinematics of the central galaxy with the lens modeling allows one to set constraints on the so-called slip parameter eta, which is the ratio of the two scalar potentials for general metric theories. Most constraints derived so far on eta are based on a heterogeneous collection of lenses reaching of the order of a hundred systems. The upcoming Vera Rubin Telescope Legacy Survey of Space and Time (LSST) is expected to uncover about 10,000 strong lensing systems, tremendously increasing the sample of systems useful to determine eta. As LSST is a purely photometric survey, this science will require follow-up observations, both to spectroscopically confirm the redshifts of the lens and the source, as well as to measure the lens velocity dispersions. As a preparation for LSST, we have compiled a large sample of Strong Lensing systems (both confirmed and candidates) and generated a database of their images in the current wide-field surveys, such as DES, KiDS, HSC, Legcy Survey, CFHTLens, RCSLens and CS82, yielding thousands of systems. This database is useful to train algorithms to find, classify, and model these systems and to select a fraction for follow-up. We are performing a systematic program to gather spectroscopic information on selected systems with different instrument configurations on the CASLEO, SOAR and Gemini telescopes. The yield of this program and the implications for the determination of eta will guide future follow-ups of more homogeneous, numerous and higher redshift samples derived from LSST. Finally, we carry out simulations of a fully automated procedure to model the strong lensing systems using Machine Learning in LSST and find that it allows one to determine eta with no significant systematics. We conclude that a systematic program for finding and modeling galaxy-galaxy strong lensing systems in LSST combined with a selected spectroscopic follow-up will yield promising constraints on some modifications of general relativity.

TALK2 (25'+5'): Carlos Mauricio Correa. Instituto de Astronomía Teórica y Experimental.

Redshift-space effects in voids and their impact on cosmological tests

Cosmic voids are promising cosmological laboratories for testing the dark energy problem and alternative gravity theories. However, there is an obstacle that has prevented the use of voids as reliable probes. Our standard picture of distortions around them is incomplete. Traditionally, we have focused only on the spatial distribution of the surrounding galaxies. The truth is that intrinsic void properties are also affected, such as their number, their size and their spatial distribution. This generates additional anisotropic patterns on observations that lead to biased cosmological constraints if they are not taken into account properly. I will describe all the effects involved and how they affect two primary cosmological statistics: the void size function and the void-galaxy correlation function. My research can be found at: 10.1093/mnras/stz821; 10.1093/mnras/staa3252; 10.1093/mnras/stab3070

TALK3(25'+5'): Saulo Carneiro. Universidade Federal da Bahia

Neutrino primordial Planckian black holes

Extremal rotating black holes can be formed in the Planck energy scattering of Dirac spin parallel neutrinos in the mass state m2 (assuming m1 = 0), owing to the repulsive interaction between their magnetic dipoles, induced by vacuum fluctuations. Assuming that some recent results of loop-quantised Schwarzschild black holes would be also applicable for the Kerr case, we show that the resulting black hole has Planck mass and angular momentum ħ, and that its horizon area is in the spectrum of the Loop Quantum Gravity area operator. Moreover, we argue that such black holes could be produced at the reheating, with an abundance that allows their interpretation as forming the presently observed dark matter component, provided that the energy scale at inflation is ~ 10^(17) GeV. This scale can be lower if we attribute a high chemical potential to primordial neutrinos. As extremal black holes have zero surface gravity, there is no limits on their abundance from Hawking evaporation. [Phys. Lett. B 822 (2021) 136670]

TALK4 (25'+5'): Andrés Aceña ICB – CONICET.

Dark matter halos with phenomenological equation of state

If we consider that dark matter halos are spherically symmetric and in hydrostatic equilibrium, then dark matter should have an effective pressure that compensates the gravitational force of the mass of the halo. An effective equation of state can be obtained for each rotational velocity profile of the stars in galaxies. In this talk we present recent results where one of such dark matter equations of state, obtained for the Universal Velocity Profile, is analyzed regarding the properties of the self-gravitating structures that emerges from it. Sadly, the resulting configurations are found to be unstable and we conclude that either the halo is not in hydrostatic equilibrium, or it is non spherically symmetric, or it is not static if the Universal Velocity profile should be valid to fit the rotational velocity curve of the galaxies.

TALK5 (15'+5'): Jordany Vieira de Melo. University of São Paulo.

Bispectrum in BINGO Radio Telescope.

Cosmology has experienced its best epoch in the last decades, whether, with tools increasingly better prepared for observation, software's capable of generating simulations as close to reality as possible, and larger and more accurate databases. However, produce more questions to be answered by the community, for example, the confirmation of the slow-roll inflationary scenario. Non-Gaussianity appears as a phenomenon that may be able to confirm or not this hypothesis, given the fact of its existence. As a tool to study this phenomenon, the bispectrum proved to be one of the best statistical estimators. In this work, we present a development of a module to detect the existence or not of non-Gaussianity in cosmological observations, from the calculation of the bispectrum. Where we use simulations generated for observations linked to the BINGO radio telescope project, with a non-Gaussianity added as a log-normal distribution to test it.

TALK6 (15'+5'): Cristóbal Zenteno Gatica. Universidad de Chile.

Multifield inflation with massive fields and its impacts on early universe cosmological observables.

In the context of inflation driven by multiples degrees of freedom, the effects of interactions between the adiabatic (or curvature) and the isocurvature modes of the perturbations have been studied in the last years. These interactions have a significant relevance because they can trigger enhancements in the curvature perturbation. An amplification in the primordial curvature perturbation could have an impact in various observables, for example, the generation of primordial black holes (PBH) or the stochastic gravitational-wave background (SGWB). Recently, the fields' interactions, which (in our work-frame) can be understood as non-trivial trajectories in the field space, have been studied for the non-canonical regime (where the parameter that describes the interaction is greater than one) for a massless and massive isocurvature field. In this talk, we review the theoretical methods to represent the fields solutions and discuss the generation of enhancements and signatures on the primordial power spectrum that could affect the PBH formation and the SGWB. In particular, we are focused on how these solutions can be generalized for various interaction models and how we can trace the features of a certain inflationary model into the observables.

TALK7 (15'+5'): Nicolás Parra Vera. Universidad de Chile

Primordial non-Gaussianities in rapid turn Multifield inflation

Cosmic Inflation offers a solid mechanism for producing the Gaussian, nearly scale invariant primordial perturbations we have observed so far in the cosmic microwave background anisotropies. However, this is quite unsatisfactory as the Gaussian statistic, parameterized by the primordial power spectrum, is determined by propagating free fields and gives no additional information about the underlying physics and particle content of the universe in the inflationary epoch. Taking into account nonlinear interactions, the power spectrum fails to encode all the information of primordial perturbations while higher order correlators develop a rich structure that reveals the nature of the interactions. Moreover, interactions between different degrees of freedom may break scale invariance, which opens the possibility of departure from Gaussianity outside the current measured wavelenghts. Recently, in the context of Multifield inflation, it has been shown that a strong but short lived interaction between adiabatic and isocurvature perturbations results in an amplification of the power spectrum outside the scales of the CMB. In this talk, we will review this model, discuss the analytical solutions for the fields and present a calculation of the three point correlation function or primordial Bispectrum. First, we will discuss how the field equations can be cast as first order equations for the Bogoliubov coefficients. Finally, we will consider nonlinear interactions in the theory and present a computation of the primordial Bispectrum based on the Schwinger-Keldysh path integral formalism.

TALK8 (15’+5’): Ignacio Jesús Araya Quezada. Universidad Arturo Prat (UNAP)

Magnetic field generation with Primordial Black Holes

We consider dark matter (DM) to be made of a population of primordial black holes (PBHs), characterized by a Schecter-like mass function. By endowing each PBH with a magnetic field, we show that a cosmic primordial magnetic field can be sourced, with a power spectrum directly related to the matter power spectrum of LCDM. We consider two possible mechanisms for generating the magnetic field of the PBHs: A Biermann battery process (a type of dynamo mechanism) and the accretion of magnetic monopoles at PBH formation (after inflation). We show that in the Biermann battery case, not enough magnetic field is generated by the PBHs, such that it does not suffice for constituting the seed magnetic fields required to reproduce the current field value. Conversely, we show that in the magnetic monopole scenario, we are able to produce enough magnetic field to constitute the required magnetic field seeds, without surpassing the maximum monopole density allowed by the current constraints due to the non-detection of magnetic monopoles.

TALK9 (15’+5’): Tiago Mourao Cerqueira e Silva. CBPF.

Gravitational Baryogenesis in Bouncing Cosmologies

We studied the applicability of Gravitational Baryogenesis for bouncing cosmologies generated by quantum effects represented by a Wheeler-DeWitt equation, interpreted according to the de Broglie-Bohm theory. In the context of minisuperspace models, we showed that it is possible to obtain the correct baryon asymmetry observed in the Universe, for large regions in the parameter space of this theory. Furthermore, we discuss how different types of bounces, both symmetric and asymmetric, affect these regions

TUESDAY

TALK10 (25’+5’)***:*** Thomas Maedler. Universidad Diego Portales

Well behaved coordinates at a regular black hole horizon and at null infinity

Spacetime representation is dependent on the choice of coordinates. This choice may be better or worse to illustrate its physical properties. For example, it is well known that the Schwarzschild metric in its “typical” representation has a coordinate singularity at the horizon but is bonafide at null infinity. We discuss two approaches for obtaining regular coordinates at the horizon and null infinity of isolated spherically symmetric black holes. In the first approach, those regular charts are constructed from a given explicit solution of the Einstein equations while in the second an affine null metric formulation of the Einstein equations is employed. We present solutions of the field equations in these coordinates and also show a nonlinear solution of slowly rotating black holes in null coordinates.

TALK11 (25’+5’): Osvaldo M. Moreschi. FaMAF – IFEG.

Interior of a Kerr black hole in terms of an explicit conformal diagram .

We will present an explicit conformal diagram for Kerr spacetime.
The necessary smooth null coordinates to cross the outer and inner horizons will be described.
The natural generalization of the tortoise coordinate is also presented.
This construction permits the discussion of several physical issues in the interior of the Kerr geometry.

TALK12 (25’+5’): Gustavo Dotti FaMAF, Universidad Nacional de Córdoba.

Parallel waves in Einstein-non linear sigma models.

The low energy QCD effective action for mesons is a nonlinear sigma model with target manifold SU(N), N the number of flavors. We have found exact solutions of this model coupled to Einstein gravity in the form of parallel propagated waves. There are also static solutions that asymptotically approach a cosmic string but are regular anywhere. For these, there is a relation between a topological charge and the mass per length.

TALK13 (25’+5’): Julio Fabris. Universidade Federal do Espírito Santo

On unimodular gravity and its cosmological consquences

Unimodular gravity is one of the oldest gravity theory alternative to General Relativity. Under some hypothesis unimodular gravity reduces to GR in presence of a cosmological constant. But, this is not the only possible scenario coming from unimodular gravity. If the restricted diffeomorphism is retained in all its generality, a quite different structure may emerge. We exploit this possibility and its consequence for cosmology. A viable cosmological scenario, very different from the standard one, may be obtained.

TALK14 (15’+5’): Thaís Lemos Porciúncula Alves. Observatório Nacional

Determination of Baryon Fraction in the Intergalactic Medium using Fast Radio Bursts and Supernovae

Fast Radio Bursts (FRBs) are millisecond-duration radio transients, with a dispersion measure observed (DM) greater than the expected Milk Way contribution, suggesting that FRBs are extragalactic events. Although some models have been proposed to explain the physics of the pulse, it is still unknown the origin of the FRB emission. From FRBs data with known host galaxies, the redshift is directly measured and can be combined with DM to measure the baryon number density of the universe, to constrain the cosmological parameters, Hubble constant. However, the degeneracy between the fraction of baryon mass of the intergalactic medium (f_{IGM}) with cosmological parameters and the poorly knowledge of f_{IGM} limits the cosmological application of FRBs. The purpose of this work is to determine the baryon fraction of the intergalactic medium independent of any cosmological model, combining FRBs data with localized host galaxy and supernovae data. We present a new approach to the DM of the IGM considering f_{IGM} constant and f_{IGM} in function of z.

TALK15 (15’+5’): Dinorah Barbosa da Fonseca Teixeira. Observatório Nacional do Rio de Janeiro

New dark energy parametrization based on generalized Chaplygin gas

The fact that Einstein’s equation are capable of constraining the total energy-momentum tensor, but not the contribution for each individual component implies in a degeneracy in the dark sector. This degeneracy makes it impossible to distinguish cases where the dark energy interacts with dark matter from an non-interactive scenario. Following (Marttens et al. 2020), we study the particular case for how a interaction Q in the form of a generalized Chaplygin gas (gCg) could mimic a non-interactive model. We find that this class of models never crosses w = -1, thus not allowing the existence of phantom dark energy. We investigate the capabilities of constrains with the use of Planck 2018, eBOSS DR16, Pantheon and KiDS 1000.

TALK16 (15’+5’): Augusto Tomás Chantada. Departamento de Física, FCEyN, Universidad de Buenos Aires (UBA).

Cosmological Informed Neural Networks to solve the background dynamics of the Universe

The field of machine learning has drawn increasing interest from various other fields due to the success of its methods at solving a plethora of different problems. An application of these has been to train artificial neural networks to solve differential equations without the need of a numerical solver. In this work, we employ this method to obtain artificial neural networks that represent a bundle of solutions of the differential equations that govern the background dynamics of the Universe for four different models. The cosmological models we have chosen are $\Lambda \mathrm{CDM}$, the Chevallier-Polarski-Linder parametric dark energy model, a quintessence model with an exponential potential, and the Hu-Sawicki $f\left(R\right)$ model. We used the solutions that the networks provide to perform statistical analyses to estimate the values of each model's parameters with observational data; namely, estimates of the Hubble parameter from Cosmic Chronometers, the Supernovae type Ia data from the Pantheon compilation, and measurements from Baryon Acoustic Oscillations. The results we obtain for all models match similar estimations done in the literature using numerical solvers.
In addition, we estimated the error of the solutions by comparing them to the analytical solution when there is one, or to a high-precision numerical solution when there is not."

TALK17 (15’+5’): Pedro Henrique Bessa Rodrigues Dutra. UFES.

Geodesic Deviation Equation and Jacobi Map in Horndeski Gravity .

Horndeski Gravity is the most general 2nd order scalar-tensor theory in 4 dimensions. This theory contains well known modified Gravity Theories such as Brans-Dicke, f(R) and Galileon Gravity.
In this work we aim to derive the Geodesic Deviation Equation and the Jacobi and optical tidal matrices in this theory of Gravity, working in the Einstein frame and writing the effective energy-momentum tensors in terms of the coupling functions of the Field Equations.
This generalizes previous results obtained in Modified Gravity Theories, providing a formalism for the study of Weak Gravitational Lensing in general scalar-tensor theories, and a probe to test Dark Energy and Modified Gravity theories using graviational lensing observables."

TALK18: Iván Gentile de Austria. FCEN-UNCUYO

Spherically symmetric linear perturbations of electrically counterpoised dust

We consider spherically symmetric linear perturbations of static spherically symmetric spacetimes where the matter content is electrically counterpoised dust. We show that the evolution equation for the fluid perturbation implies that the fluid elements move with constant velocities. Therefore there are neither oscillations nor exponential departure from the background solution. We present an explicit example that shows that the perturbation could lead to the formation of a black hole

WEDNESDAY

TALK19 (25'+5'): Susana Landau. Departamento de Física-UBA

Cosmological constraints on unimodular gravity models with diffussion

A discrete space-time structure occurring beyond the Planck scale (such asarisCes naturally from some proposals of quantum gravity), could manifest itself in the form of very small violations of the conservation of the matter energy-momentum tensor. To include such kind of violations, which are forbiden within the General Relativity framework , the theory of unimodular gravity might be invoked. In the cosmological context, a direct consequence of such violation of "energy conservation", might be heuristically viewed a "diffusion process of matter (both dark and ordinary)" into an effective dark energy term in Einstein's equations. Previous works have indicated that these kind of models might offer a natural scenario to alleviate the so called 'Hubble tension'. In this work, we assume a particular model for the cosmological history of such energy violation and analyze in that context the predictions for the anisotropy and polarization of the Cosmic Microwave Background (CMB). We present results of the comparison of the model's predictions with recent data from the CMB, Supernovae Type Ia, Cosmic Chronometers and Baryon Acoustic Oscillations.

TALK20 (25'+5'): Rodrigo von Marttens. Observatório Nacional.

Testing the consistency of the standard cosmological model with the current cosmological data

In this work, we assess how the standard cosmological model responds to the current cosmological data in light of the recent tensions. First, we discuss the legitimacy of carrying out joint analyses with the currently available data sets and explore their implications for a non-flat universe and extensions of the standard cosmological model. We use a robust tension estimator to perform a quantitative analysis of the physical consistency between the latest data of Cosmic Microwave Background, type Ia supernovae, Baryonic Acoustic Oscillations and Cosmic Chronometers. We consider the flat and non-flat cases of the ΛCDM cosmology and of two dark energy models with a constant and varying dark energy EoS parameter. Second, we perform a general test of the ΛCDM and wCDM cosmological models by comparing constraints on the geometry of the expansion history to those on the growth of structure. Specifically, we split the total matter energy density, Ω_M , and (for wCDM) dark energy equation of state, w, into two meta-parameters each: one that captures the geometry, and another that captures the growth. We constrain our split models using current cosmological data, including type Ia supernovae, baryon acoustic oscillations, redshift space distortions, gravitational lensing, and cosmic microwave background (CMB) anisotropies. Lastly, we relax the conventional assumption of a minimal coupling between the DM and DE, to reconstruct a possible interaction in the dark sector in a model-independent way, using data from type Ia supernovae, cosmic chronometers and baryonic acoustic oscillations. According to our analysis, the ΛCDM model is consistent with our model-independent approach at least at 3σ CL over the entire range of redshift studied. On the other hand, our analysis shows that the current background data do not allow us to rule out the existence of an interaction in the dark sector.
"

TALK21 (15'+5'): Juan Sebastian Cabello Fuentes. Universidad de Chile.

Clustering of Primordial Black Holes From Non-Perturbative Tails

In recent years the research around primordial black holes (PBHs) has taken an interesting turn, deviations from Gaussian statistics may significantly alter the abundance of these objects. Since PBHs should be rare objects formed from large fluctuations beyond a certain threshold, their formation probability is extremely affected by changes in the tail of the probability distribution, such as those produced by non-Gaussianities. There are several works showing that an exponential decay, instead of a Gaussian one as a perturbative treatment suggests, may significantly enhance this probability.
In this presentation, I'll talk about perturbation theory breakdown for unlikely events in the tail of distributions and how a non-perturbative approach using path integrals can be used to calculate the exact PBH abundance. Also, I'll clarify that the smoothed density contrast is the correct quantity to use when calculating PBH's observables instead of a perturbation of the metric such as the comoving curvature perturbation. Then, I'll briefly review some observables that will be affected, like PBH clustering, and how this impacts current observational constraints. These corrections may revindicate pbhs as Dark Matter candidates.

TALK22 (15’+5’) ***CANCELLED***

THURSDAY

TALK23 (25’+5’): Heliana E. Luparello Iate-CONICET-Argentina

Cosmic shalows: Absorption and polarisation of CMB photons in extended galaxy halos.

We report and analyse the presence of foregrounds in the cosmic microwave background (CMB) radiation associated to extended galactic halos. Using the cross correlation of Planck and WMAP maps and the 2MRS galaxy catalogue, we find that the mean temperature radial profiles around nearby galaxies at cz ≤ 4500km/s show a statistically significant systematic decrease of ~15 uK extending up to several galaxy radii. This effect strongly depends on the galaxy morphological type at scales within several tens of times the galaxy size, becoming nearly independent of galaxy morphology at larger scales.
The effect is significantly stronger for the more extended galaxies, with galaxy clustering having a large impact on the results.
Our findings indicate the presence of statistically relevant foregrounds in the CMB maps that should be considered in detailed cosmological studies. Besides, we argue that these can be used to explore the intergalactic medium surrounding bright late–type galaxies and allow for diverse astrophysical analysis.

TALK24 (25’+5’): Gonzalo Damián Quiroga. IFEG-CONICET-Argentina

Spin stability of a binary black hole coalescence

We analyze the spin stability of a binary black hole coalescence when the binary system is described by the Post-Newtonian (PN) equations in the adiabatic regime. The main idea in this work is to make a massive exploration of the solution space in search of chaos. For that, we evolve the PN equations using a CUDA implementation of the RKF78 scheme and study the dynamical behavior of the system. Each initial spin configuration run in the GPU is composed by more than 80000 simulations. The chaos indicator used to characterize the degree of separation of two infinitesimally close trajectories is the Lyapunov exponent. We find zones in the solution space where the separation between nearby trajectories reaches several orders of magnitude bigger than the initial separation. Also, we note that the chaotic behavior can be observed in forward as well as in backward evolution.

TALK25 (25’+5’): Gabriel Leon. FCAG-UNLP

Inflation and the cosmological (not-so) constant in unimodular gravity

In this talk we will present a mechanism for generating an inflationary phase without resorting to any type of scalar field(s). Instead, this early accelerated expansion is driven by a dynamical ``cosmological constant'' in the framework of unimodular gravity. The time dependent cosmological constant can be related to an energy diffusion term that arises naturally in unimodular gravity due to its restrictive diffeomorphism invariance. We will show the generic conditions required for any type of diffusion to generate a realistic inflationary epoch. In addition, we will analyze the feasibility of identifying the variable cosmological constant, responsible for the inflationary expansion, with the current observed value.

TALK26 (25’+5’): Joaquín Pelle. FaMAF / Conicet.

Strong non-dipolar magnetic fields in millisecond pulsars?

It has been recently suggested that the millisecond pulsar PSR J0030+0451 has a significant off-centered non-dipolar magnetic field component. This has been deduced via statistical inference methods on the shape and location of the hot spots over the surface of the neutron star by modelling the latest NICER observational data. In this talk we revise these conclusions under the light of a similar emission model based on relativistic force-free pulsar magnetosphere simulations which yield complex hot spot configurations using only dipolar magnetic fields.

TALK27(15’+5’): Gaston Briozzo. UNC FaMAF

Plasmatic Lensing Surrounding Compact Object

Deflection of light by gravitational potentials is a classic phenomenon of General Relativity. Compact objects are known to generate convergent gravitational lensing effects.
On this presentation we will study how the presence of a refractive plasma surrounding compact objects, produces (most of the times) a divergent lens effect that competes with the gravitational lensing, altering the trajectories of photons and generating a range of chromatic effects.
So, we will consider space-times static and asymptotically flat, filled with a plasma not magnetized and pressureless.

First, we will focus on the study of slow rotation pulsars, emphasizing in the numerical calculation of the photons trajectories and the pulse profiles generated by emission caps. Then, we will propose analytical approaches for a simpler analysis of these problems.
Secondly, we will study the shadows of rotating black holes, showing some methods for obtaining axisymmetric metrics, and focusing on the numerical calculation of the shadows, also, we will be considering relativistic aberration effects.
Finally, we will discuss some of the numerical methods that were used.

TALK28 (15'+5'): Juan Manuel Armaleo. IFIBA - FCEyN, UBA

Searching for spin-2 ULDM with gravitational waves interferometers

The detection of gravitational waves from merging binaries has ushered in the era of gravitational wave interferometer astronomy. Besides these strong, transient, calamitous events, much weaker signals can be detected if the oscillations are nearly monochromatic and "continuous", that is, coherent over a long time. In this work we show that ultra-light dark matter of spin two, owing to its universal coupling α to Standard Model fields, generates a signal that is akin to but distinct from a continuous gravitational wave. We show that this signal could be detected with current and planned gravitational wave interferometers. In the event of a null detection, current facilities could constrain the coupling to be below $\alpha \sim 10^{-7}$ for frequencies of tens of Hz, corresponding to dark matter masses around the 10^{-13} eV mark. Future facilities could further lower these upper limits and extend them to smaller masses down to 10^{-18} eV. These limits would be the most stringent bounds on the spin-2 Yukawa fifth force strength, parametrised by α, in the frequency ranges accessible by gravitational wave interferometers. The implementation of this type of searches for gravitational wave interferometers would therefore further our grasp of both dark matter and gravity.

TALK29 (15'+5'): Javier Badía. IAFE (CONICET-UBA)

Effects of plasma on the shadow of black holes obtained through the Newman-Janis algorithm.

Since the announcement of the first image of a supermassive black hole obtained by the Event Horizon Telescope, the study of shadows has received an increasing interest. Recently, much attention has been paid to the shadows of various classes of rotating black hole geometries obtainable from their static counterparts through the Newman-Janis algorithm. We extend these calculations to the case where the black hole is surrounded by a plasma environment. We find that the Hamilton-Jacobi equation for the motion of light rays is separable if the plasma frequency obeys a certain mathematical condition, and we present the shadow contours and the related observables for example spacetimes.

TALK30 (15'+5'): Matías Leizerovich. Buenos Aires University.

Testing f(R) gravity models using AGNs fluxes .

In the last few years, the observed non-linear relation between the X-ray and optical-ultraviolet (UV) luminosities in Active Galactic Nuclei (AGNs) has suggested that these objects might be ""standarizable"" candles.
In this work, we use these observables for the first time to test the predictions of two f(R) gravity models. This type of alternative gravity theories are known for being able to explain the late time accelerated expansion of the universe without including a dark energy component. Furthermore, we included additional data sets to make our analyses more robust such as estimates of the Hubble parameter H(z) from Cosmic Chronometers (CC), the Pantheon Type Ia supernovae compilation (SN), and Baryon Acoustic Oscillations (BAO) measurements. Our results show that the allowed space parameter is restricted when both AGN and BAO data are added to CC and SnIa data, being the BAO data set the most restrictive one. We also conclude that even though our results are consistent with the ones from the ΛCDM model, small deviations from General Relativity, that can be successfully described by the $f(R)$ models studied in this work, are also allowed by the considered data sets.

TALK31 (15'+5'): TO BE CONFIRMED

FRIDAY

TALK32 (25'+5'): Ernesto F. Eiroa. IAFE (CONICET-UBA).

F(R) gravity with a conformally invariant Maxwell field in N dimensions: spherically symmetric solutions and thin shells

We generalize the spherically symmetric black hole solution previously found in N-dimensional F(R) gravity coupled to a conformally invariant Maxwell field, with constant scalar curvature R. A particular case of our solution is a generalization of the one already known in General Relativity. We also present a class of spherically symmetric thin shells within this theory and we use our generalized solution to construct examples of charged thin shells. We analyze the stability of these constructions under radial perturbations, showing that stable configurations are possible when suitable values of the parameters are adopted. We compare the higher dimensional case with the four dimensional one.

TALK33 (25'+5'): Uendert dos Santos Andrade. Observatório Nacional

A test of the standard cosmological model with geometry and growth

We perform a general test of the ΛCDM and wCDM cosmological models by comparing constraints on the geometry of the expansion history to those on the growth of structure. Specifically, we split the total matter energy density, Ω_M, and (for wCDM) dark energy equation of state, w, into two parameters each: one that captures the geometry, and another that captures the growth. We constrain our split models using current cosmological data, including type Ia supernovae, baryon acoustic oscillations, redshift space distortions, gravitational lensing, and cosmic microwave background (CMB) anisotropies. We focus on two tasks: (i) constraining deviations from the standard model, captured by the parameters $\Delta\Omega_M \equiv \Omega_M^{grow} - \Omega_M^{geom}$ and $\Delta w \equiv w^{grow} - w^{geom}$, and (ii) investigating whether the S_8 tension between the CMB and weak lensing can be translated into a tension between geometry and growth, i.e. $\Delta\Omega_M \neq 0$, $\Delta w \neq 0$. In both the split ΛCDM and wCDM cases, our results from combining all data are consistent with $\Delta\Omega_M = 0$ and $\Delta w = 0$. If we omit BAO/RSD data and constrain the split wCDM cosmology, we find the data prefers $\Delta w < 0$ at 3.6σ significance and $\Delta\Omega_M > 0$ at 4.2σ evidence. We also find that for both CMB and weak lensing, $\Delta\Omega_M$ and S_8 are correlated, with CMB showing a slightly stronger correlation. The general broadening of the contours in our extended model does alleviate the S_8 tension, but the allowed nonzero values of $\Delta\Omega_M$ do not encompass the S_8 values that would point toward a mismatch between geometry and growth as the origin of the tension.

TALK34 (25'+5'): Cristian Erices. Universidad Central de Chile

Phase transitions of black strings in dynamical Chern-Simons modified gravity

We study conserved charges and thermodynamics of analytic rotating anti–de Sitter black holes with extended horizon topology—also known as black strings—in dynamical Chern-Simons modified gravity. The solution is supported by a scalar field with an axionic profile that depends linearly on the coordinate that spans the string. We compute conserved charges by making use of the renormalized boundary stressenergy tensor. Then, by adopting the Noether-Wald formalism, we compute the black string entropy and obtain its area law. Indeed, the reduced Euclidean Hamiltonian approach shows that these methods yield a consistent first law of thermodynamics. Additionally, we derive a Smarr formula using a radial conservation law associated to the scale invariance of the reduced action and obtain a Cardy formula for the black string. A first-order phase transition takes place at a critical temperature between the ground state and the black string, above which the black string is the thermodynamically favored configuration.

TALK35 (25'+5'): Juan Diego Racker. IATE (CONICET/UNC) y OAC (UNC)

Baryogenesis and neutrinos

The origin of the cosmic asymmetry between the amount of matter and antimatter is one of the big mysteries of cosmology and according to general consensus it involves physics beyond the Standard Model of particle physics. After a brief introduction we will comment on models with two exotic neutrinos almost degenerate in mass, which are theoretically and experimentally appealing.

TALK36 (25'+5'): Nahuel Mirón-Granese. Facultad de Ciencias Geofísicas y Astronómicas, Universidad Nacional de La Plata.

Relativistic viscous effects on the primordial gravitational waves spectrum

We study the impact of the viscous effects of the primordial plasma on the evolution of the primordial gravitational waves (pGW) spectrum from Inflation until today, considering a self-consistent interaction that incorporates the back-reaction of the GW into the plasma. We use a relativistic causal hydrodynamic framework with a positive entropy production based on a Second-Order Theory (SOT) in which the viscous properties of the fluid are effectively described by a new set of independent variables. We study how the spin-2 modes typical of SOTs capture the simplest GW-fluid viscous interaction to first order. We consider that all non-ideal properties of the primordial plasma are due to an extra effectively massless self-interacting scalar field whose state becomes a many-particles one after Reheating and for which an effective fluid description is suitable. We numerically solve the evolution equations and explicitly compute the current GW spectrum obtaining two contributions. On the one hand we have the viscous evolution of the pGW: for the collision-dominated regime the GW source becomes negligible while in the collisionless limit there exists an absorption of the pGW energy due to the damping effect produced by the free-streaming spin-2 modes of the fluid and driven by the expansion of the Universe. The latter effect is characterized by a relative amplitude decrease of about 1 to 10 % with respect to the GW free evolution spectrum. On the other hand we get the GW production due to the decay of the initial spin-2 fluctuations of the fluid that is negligible compared with the above-mentioned contribution. This SOT framework captures the same qualitative effects on the evolution of GW coupled to matter reported in previous works in which a kinetic theory approach has been used.

TALK37 (25'+5'): Carlos Bengaly. Observatório Nacional

Model-independent tests of the standard cosmological model

The standard cosmological model - namely, the flat LCDM paradigm - provides the best explanation for observational data for over two decades. Still, it is necessary to probe its validity in the most agnostic way possible. Hence, I will present in this talk a variety of fundamental hypotheses underlying the standard model using model-independent methods based on machine learning algorithms. I will discuss recent results on a null test of the Cosmological Principle using BAO measurements, as well as a test of the speed of light variability using Supernovae and cosmic chronometers.

TALK38 (15'+5'): Claudio Bórquez. Universidad de Antofagasta

Lagrangiano cuántico de la teoría de gravedad de Horava

En este trabajo se presenta la cuantización consistente de la teoría de gravedad de Horava para los casos proyectable y no proyectable, mediante el formalismo BFV. Las no localidades se hacen presente como consecuencia de la fijación gauge. Los resultados obtenidos en el caso proyectable ya se encuentran en la literatura desde otro enfoque. Para el caso no proyectable los vínculos de segunda clase de la teoría juegan un rol importante al momento de obtener los propagadores. Se muestra algunos diagramas cruciales a 1-loop para el caso no proyectable que establecen distinciones notorias con el caso proyectable.

TALK39: Simón Riquelme. Universidad de Chile

EFT Approach to Black Hole Scalarization and its Compatibility with Cosmic Evolution

We address the issue of black hole scalarization and its compatibility with cosmic inflation and big bang cosmology from an effective field theory (EFT) point of view. In practice, using a well-defined and healthy toy model which (in part) has been broadly considered in the literature, we consider how higher-order theories of gravity, up to cubic operators in Riemann curvature, fit within this context. Interestingly enough, we find that already at this minimal level, there is a non-trivial interplay between the Wilson coefficients which are otherwise completely independent, constraining the parameter space where scalarization may actually occur. Conclusively, we claim that the EFT does exhibit black hole scalarization, remaining compatible with the inflationary paradigm, and admitting General Relativity as a cosmological attractor.

TALK40: TO BE CONFIRMED

Posters

1) Facundo Rodriguez. Instituto de Astronomía Teórica y Experimental (IATE)

The galaxy size-halo mass scaling relations of central and satellite galaxies.

This work explores the scaling relations for a sample of central and satellite galaxies from the Sloan Digital Sky Survey (SDSS). We show that while these galaxies have similar stellar mass-to-size ratios, their halo mass-to-size ratios differ significantly. More massive haloes tend to host larger central galaxies. However, the size of satellite galaxies shows almost no dependence on halo mass. We show that these results are compatible with a remarkably simple model in which the size of central and satellite galaxies scales as the cube root of the mass of their host halo, with the normalisation of satellites being ~30% smaller than that of central galaxies, which can be attributed, for example, to removal by tidal forces. Furthermore, we find that our measurements are in excellent agreement with the predictions of the IllustrisTNG 300 hydrodynamical simulation.

2) Gabriel R. Bengochea IAFE (CONICET-UBA)

Quantum features of the emergent universe.

In this presentation, some quantum aspects of structure generation in the context of the Emergent Universe are analyzed, as they are explored within the framework of a CSL model of objective collapses as a triggering mechanism of initial perturbations. Special emphasis is placed on its impact on the angular spectrum of the CMB.

3) Francisco Ignacio Colipí Marchant. Universidad de Chile

Topological renormalization of non-asymptotically locally AdS gravitational instantons

En este póster se estudiará desde el punto de vista termodinámico la métrica de Eguchi Hanson con constante cosmológica. Principalmente enfocado en la renormalización on shell de la acción euclídea asociada a esta métrica utilizando diversas estrategias y métodos, cómo Emparan-Johnson-Myers o renormalización con términos topológicos. Además del estudio de la entropía asociada a esta métrica.

4) Javier Alejandro Huenupi González. Universidad de Chile

Excitation of quantum states during the primordial universe

We know that the structure of the universe on the large scale owes its existence to small space-time primordial fluctuations that were present during the Big Bang. These fluctuations could have been produced by quantum processes, during inflation, that generated the excitation of the quantum states potentially observables.
In this work, we study the generation of these excited states with differential equations, and solving them with numerical methods, of the curvature and isocurvature fluctuations with Bogoliubov coefficients, also using the turning rate parameter in the field-space to analyze its contribution to the behavior and magnitude of the different modes of the coefficients.