Resúmenes

Miércoles 22 de Nov (Auditorio Hermann Gamm)

[1] **Norman Cruz Marin (USACH)**

Cosmologias disipativas: posibilidades y limitaciones

Fluidos disipativos, como uan extensión posible del modelo estandar, han sido investigados en cosmología con el fin de enfrentar varias de las tensiones actuales que este modelo presenta. En este trabajo discutimos en el contexto de la termodinámica causal y no causal usada para describir estos modelos, las posibilidades de aliviar algunas de las tensiones y las limitaciones asociadas a una descripción termodinámica consistente de este tipo de fluidos en cosmología.

[2] **Alexander Gallego Cadavid (UV)**

Reconstructing homospectral inflationary potentials

We develop a general algorithm to reconstruct the potential of minimally coupled single scalar fields from an arbitrary expansion history. We apply it to homospectral expansion histories to obtain the corresponding potentials, providing numerical and analytical examples. The infinite class of homospectral potentials depends on two free parameters, the initial energy scale and the initial value of the field, showing that, in general, it is impossible to reconstruct a unique potential from the curvature spectrum unless the initial energy scale and the field value are fixed, for instance, through observation of primordial gravitational waves.

[3] **Andrés Ignacio Burton Villalobos (UTA)**

Quantum cosmology of f(R) gravity's rainbow: with Schutz' perfect fluid

Es una presentación de Cosmologia cuantica de f(R) gravedad de arcoiris con el fluido perfecto de Schutz. En este se estudia la dinámica clásica de el fluido perfecto utilizando la acción gravitacional y de la materia para obtener el lagrangiano y las ecuaciones canónicas. Todo esto, considerando la descripcion del formalismo de Schutz. Ademas, se estudia de la misma manera la dinámica clasica del modelo cuantico, considerando la ecuacion de Wheeler-DeWitt, primeramente considerando el tiempo, y despues independiente del tiempo para estudiar la inflacion de Starobinsky.

[4] **José Antonio Belinchón (UDA)**

Brane cosmology with variable tension

We study brane-world models and demonstrate that such models do not admit self-similar solutions through the matter collineation approach. By introducing the hypothesis of variable brane tension, λ, we outline the new effective field equation (EFE) in the most simple case (symmetric embedding) under the assumption that the fundamental constants in 5D are constants. In this case, we find the exact form that each physical quantity may take in order that the EFE become invariant under scale transformations. By taking into account such assumptions, we find that in 4D, the gravitational constant $\kappa^2 \sim \lambda$ while the cosmological constant $\Lambda \sim \lambda^2$ are always decreasing. These results are quite general and valid for any homogeneous self-similar metric. Nevertheless, the study of the EFE under scale symmetries suggests that $\rho \sim \lambda$ (as a functional relationship). This allows to get a growing κ^2 but, in this case, the fundamental constants in 5D must vary as well. We outline a toy model allowing such a possibility.

[5] **Carlos M. Reyes (UBB)**

Modified gravity with nondynamical background fields

In this talk, we present a modified gravity model within the context of nondynamical background fields that break diffeomorphism symmetry. We explore the Hamiltonian formulation with particular emphasis on the analysis of boundary terms and the constraint structure. Furthermore, we apply the formalism to study accelerated expansion as an example of cosmological application.

[6] **Luis Cancino Arancibia (UTFSM)**

Análisis del flujo de la ecuación exacta del grupo de renormalización funcional para dos Pomerones usando teoría de campos de Reggeones

Bartels, Contreras y Vacca empezaron una investigación en la cual se preguntaban si la teoría de campos de Regge podría ser utilizada como una teoría efectiva para describir el comportamiento de la interacción fuerte en el límite de Regge, en específico se buscaba una conexión entre las regiones UV (perturbativa) e IR (no-perturbativa). En este trabajo, ampliamos las investigaciones antes mencionadas, agregando términos de mezcla de 'masas' entre los dos campos, además, se consideran todos los términos hasta tercer orden de los campos en el potencial. Específicamente, calculamos la evolución de las 'constantes' de nuestra teoría mientras avanzamos hacia el IR. Como el sector IR en la interacción fuerte es no-perturbativa, debemos ocupar técnicas que también lo sean. Es por esto que se ocupa la ecuación exacta del grupo de renormalización funcional introducida por Wetterich, las cuales nos dará las funciones β asociadas a la acción efectiva. Se ocupa el regulador de Litim, ya que este nos permite eliminar los modos UV de tal manera que la integral en el momentum sea más sencilla de calcular. Para obtener la descripción completa de las funciones β se calculan las dimensiones anómalas de la teoría utilizando técnicas funcionales. La búsqueda de un grupo de trayectorias del grupo de renormalización que comiencen en una zona UV, donde los campos no tienen un término de 'masa' mezclado, nos motivó al estudio de esa mezcla, a través de la diagonalización de la matriz de 'masa'. Dicha diagonalización nos permitió encontrar distintos flujos que conectaban dos estados diferentes, donde en el UV tenemos una configuración con los campos desacoplados (i.e., con m=0) y al avanzar hacia el IR, dichos campos se mezclan mientras evolucionan a el punto fijo IR calculado.

[7] **Enrique Muñoz (PUC)**

QED fermions in a noisy magnetic field background

We consider the effects of a noisy magnetic field background over the fermion propagator in QED as an approximation to the spatial inhomogeneities that would naturally arise in certain physical scenarios, such as heavy-ion collisions or the quark-gluon plasma. We considered a classical, finite, and uniform average magnetic field background $\langle B\rangle$, subject to white-noise spatial fluctuations with autocorrelation of magnitude ΔB. By means of the Schwinger representation of the propagator in the average magnetic field as a reference system, we used the replica formalism to study the effects of the magnetic noise in the form of renormalized quasiparticle parameters, leading to an effective charge and an effective refraction index that depend not only on the energy scale, as usual, but also on the magnitude of the noise ΔB and the average field $\langle B\rangle$.

[8] **Javier Alejandro Huenupi González (UCH)**

Non-Gaussian distribution of primordial curvature perturbation

Primordial curvature field is a metric perturbation that gives use statistical information about the matter distribution of the Universe. To calculate the probability density function of the contrast of this field, we use the Schwinger-Keldysh path integral formalism to get the n-point correlation function for a toy model with an arbitrary order of spatial derivatives.

[9] **Diego Sebastián Molina Peñafiel (UNAP)**

Más allá de la supergravity AdS en 2+1

Extensiones de la usual supergravity en 2+1

[10] **Pablo Ignacio Navarrete Noriega (U Helsinki FIN)**

The pressure of cold and dense quark matter in perturbation theory

The most pressing open question in the field of neutron star physics is whether deconfined quark matter is present or not in the inner cores of very massive neutron stars. In this context, the equation of state of QCD must be known with precision in the regime of large baryon densities. As the only first-principles method, lattice QCD, completely fails in this regime due to the infamous Sign Problem, perturbative QCD plays a major role in addressing this issue. In this talk, we review the state of the art of the perturbative computation of the pressure of cold and dense quark matter, and present the ongoing efforts on tackling the only missing contribution preventing us from knowing the full order $O(\alpha_s^3)$ pressure, consisting of a four-loop computation in full QCD.

[11] **Rod Aros (UNAB)**

Static Geometries with non-constant curvature transverse sections

In this talk, the analysis of some new static black hole solutions of Lovelock gravity with nonconstant curvature transverse section is presented. It will be shown that the finiteness of the charges and the action principle rely on the existence of constraints on the geometry of the transverse sections. Finally, in this context, some new sound solutions with nonconstant curvature transverse sections that deviate from the previously known geometries are discussed.

[12] **Fernando Izaurieta (USS)**

Charla de Divulgación

El destructor de mundos: Oppenheimer y el futuro de la humanidad.

Jueves 23 de Nov (Auditorio Paraninfo)

[13] **Alex Giacomini (UACH)**

Cosmological solutions in Einstein-Gauss-Bonnet gravity with static curved extra dimensions

In this talk we perform a systematic investigation of all possible solutions with static compact extra dimensions and expanding three-dimensional subspace. We will consider extra-dimensional subspace to be constant-curvature manifold with both signs of spatial curvature. We provide a scheme how to build solutions in all possible number of extra dimensions and perform stability analysis for the solutions found. Our study suggests that the solutions with negative spatial curvature of extra dimensions are always stable while those with positive curvature are stable for a narrow range of the parameters and the width of this range shrinks with growth of the number of extra dimensions. Another interesting feature which distinguish cases with positive and negative curvatures is that the latter do not coexist with maximally-symmetric solutions leading to "geometric frustration" while the former could.

[14] **Ellie Hughes (UCH & MIT)**

A cold dark sector, concordance, and a low σ_8

We investigate a cosmological model in which a fraction of the dark matter is atomic, i.e. there is a version of the electron and of the proton (and of photons) that interact with themselves as their light sector versions do but interact with everything else only gravitationally. The model parameters are the energy density in light relics, dark photon temperature, dark hydrogen binding energy, fraction of dark matter that is atomic, and the six parameters of the standard cosmological model. We find constraints in this model space given current cosmic microwave background (CMB) and baryon acoustic oscillation (BAO) data, with and without an Hubble constant prior, and with and without enforcing a big bang nucleosynthesis consistent helium abundance. We find that, at the low dark photon temperatures expected for a thermally-produced relic with a very early freeze-out epoch, one can have consistency with BAO and CMB data, with a fraction of atomic dark matter as large as ~ 0.1. Such a large fraction of atomic dark matter leads to a suppression of density fluctuations today on scales below about 60 Mpc that may be of relevance to the σ_8 tension. Our work motivates calculation of nonlinear corrections to matter power spectrum predictions in the atomic dark matter (ADM) model. We forecast parameter constraints to come from future ground-based CMB surveys, and find that if ADM is indeed the cause of the σ_8 tension, the influence of the ADM, primarily on CMB lensing, will likely be detectable at high significance.

[15] **José Ricardo Villanueva Lobos (UV)**

Análisis adiabático de Agujeros Negros

A partir del teorema de Carathéodory se construye la correcta variedad termodinámica asociada a cada agujero negro, a partir del análisis adiabático resultante de resolver la correspondiente ecuación de Pfaffian.

[16] **César Riquelme (UDEC)**

Violaciones de la simetría de Lorenz en el modelo Estándar

Alan Kostelecký y Stuart Samuel probaron que las interacciones en teoría de Cuerdas podría permitir la ruptura espontanea de la simetría de Lorentz. Posteriormente otros importantes candidatos a teorías de gravedad cuántica como las Teorías de campos no-conmutativos y Gravedad cuántica de lazos sugerirían el mismo marco de trabajo. Si bien la ruptura de la simetría de Lorentz en física involucra directamente a la noción de observador y experimento, en este trabajo buscamos introducir el sentido en que la simetría de Lorentz es rota y cómo la aparición de Backgrounds en el llamado Standard Model Extension (SME) amplía la fenomenología de las violaciones de Difeomorfismos, CPT y simetría de Lorentz a la escala de Planck.

[17] **Cristobal Corral (UNAP)**

Axial anomaly in nonlinear conformal electrodynamics

We study the axial anomaly of Dirac spinors on gravitational instanton backgrounds in the context of nonlinear electrodynamics. In order to do so, we consider Einstein gravity minimally coupled to a recently proposed conformal electrodynamics that enjoys duality transformation invariance. These symmetries allow us to generalize the Eguchi-Hanson configuration while preserving its geometry. We then compute the Dirac index of the nonlinearly charged Eguchi-Hanson and Taub-NUT configurations. We find that there is an excess of positive chiral Dirac fermions over the negative ones which triggers the anomaly.

[18] **Fabrizio Canfora (USS & CECs)**

Novel BPS bounds for magnetized solitons in the low energy limit of QCD

"Using the theory of Hamilton-Jacobi equation it is possible to derive novel BPS bounds in the low energy-limit of QCD in which the topological charge appearing in the bound is not the "obvious charge" (such as the Baryonic charge) which one would consider at a first glance but rather a non-linear function of it, Some explicit examples are presented in which one can compute exactly bot the Baryonic charge as function of the magnetic flux as well as the critical Baryonic chemical potential which makes these BPS configurations thermodynamically unstable.

[19] **Marcelo Loewe Lobo (USS)**

QED fermions in a noisy magnetic field background: The effective action approach.

We consider the effects of a noisy magnetic field background over the fermion propagator in QED. The idea is to get an approximation to the spatial and time-fluctuations that might naturally arise in some physical scenarios as relativistic heavy ion collisions and the quark gluon plasma in early stages of the evolution of the universe. We consider a classical uniform magnetic field background on top of which white-noise fluctuations are included. By means of the Schwinger representations of the propagator in the average magnetic field as a reference system, we use the replica formalism to study the effects of the magnetic noise in the mean field level in terms of a certain vector order parameter whose magnitude represents the ensemble average over magnetic noise of the fermion current. We identify the region where this order parameter acquires a finite value, thus breaking the U(1)-symmetry of the model due to the presence of the magnetic noise.

[20] **Oscar Castillo-Felisola (UTFSM)**

Does the metric play a fundamental role in the building of gravitational models?

The idea that General Relativity could be an effective model, of a yet unknown theory of gravity, has gained momentum among theoretical physicists. The polynomial affine model of gravity is an alternative model of affine gravity that possesses many desirable features to pursue a quantum theory of gravitation. In this paper we argue that such features are a consequence of the lack of a metric structure in the building of the model, even though a emergent metric could be defined. The model introduces additional degrees of freedom associated to the geometric properties of the space, which might shed light to understand the nature of the dark sector of the Universe. When the model is coupled to a scalar field, it is possible to define inflationary scenarios.

[21] **Andrey Bradley Alcalá Leyton (USACH)**

Weak-strong duality in non-commutative Landau problem induced by vortex permutation

A correspondence is established between the dynamics of the two-vortex system and the non-commutative Landau problem (NCLP) in its sub-, super-, and critical phases. As a result, a trivial permutation symmetry of the point vortices induces a weak-strong coupling duality in the NCLP.

[22] **Nelson Videla Menares (PUCV)**

Reconstructing k-inflation from $n_s(N)$ and reheating constraints

Inspired by the reconstruction scheme of the inflaton field potential $V(\phi)$ from the attractors $n_s(N)$, we investigate the viability of reconstruct the inflationary potential within the framework of k-inflation for a non-linear kinetic term $K(X) = k_{n+1}X^n$ through three expressions for the scalar spectral index $n_s(N)$, namely: (i) $n_s - 1 = -\frac{2}{N}$, (ii) $n_s - 1 = -\frac{p}{N}$, and (iii) $n_s - 1 = -\frac{\beta}{N^q}$. For each reconstructed potential, we determine the values of the parameter space which characterize it by requiring that it must reproduce the observable parameters from PLANCK 2018 and BICEP/Keck results. Furthermore, we analyze the reheating era by assuming a constant equation of state, in which we derive the relations between the reheating duration, the temperature at the end of reheating together with the reheating epoch, and the number of e-folds during inflation. In this sense, we unify the inflationary observables in order to narrow the parameter space of each model within the framework of the reconstruction in k-inflation.

[23] **Igor Kondrashuk (UBB)**

Correlators of the dressed mean gravitons in N=8 supergravity

The method to calculate the Green functions of the dressed gravitons in N=8 supergravity is proposed.

[24] **Simón Riquelme (USS & CECs)**

Ultralight Spin 2 Fields During Inflation

The inflaton background generates a preferred foliation of the FRWL spacetime endowing it with a "condensed matter" structure, where quasiparticles may emerge, leaving non-trivial signatures on the statistics of both quantum scalar curvature perturbations and graviton perturbations. We quickly review the systematics of the construction of effective field theories for the early universe, and report some work in progress as we consider the highly relevant case of a spin 2 field as matter content.

[25] **Gabriel Gómez (USACH)**

Generalized Coupled Vector Dark Energy Models

I will present a comprehensive approach for building models of interacting dark energy that incorporate vector fields conformally and disformally coupled to dark matter, independent of the underlying gravity theory. This discussion will include a focus on establishing general conditions to prevent the presence of ghost instabilities within the theory. For concreteness, we will consider the standard Proca theory with a vector exponential potential to describe the vector-tensor sector. Additionally, specific coupling functions will be assumed to investigate the dynamics of the cosmological background using dynamical system techniques. To gain a more quantitative understanding of the effects of the coupling parameters on the cosmological background evolution, we will also perform numerical computations. These results shed light on how these couplings alter the cosmological dynamics across different stages of the Universe's evolution compared to the standard LCDM cosmological model.

[26] **Francisco Colipí Marchant (UCH)**

Unitarity Cutting Rules for n-point correlation functions in Schwinger-Keldysh formalism

To deduce the statistical distribution of quantum metric perturbations in inflation, we are required to evaluate n-point correlation functions at time equal to the end of inflation with initial conditions at early times. One of the strategies to do it, is to use Schwinger-Keldysh formalism, based on lagrangian formalism. This method allows one to compute n-point correlation functions as a Feynman diagram expansion, similar to flat QFT observables. Additionally, Unitarity of the QFT holds even if it involves primordial curvature perturbations, and contains powerful results and constraints on the theory and its interactions. This information must appear in SK formalism computations and, again, similar to QFT in flat space, involves an Optical Theorem (developed recently) and Unitarity based cutting rules for SK diagrams and n-point correlation functions. In this work, we developed a set of cutting rules related with Unitarity which allows one to obtain information about the structure of n-point correlation functions and simplify nested time integrals in diagrammatic computation.

Viernes 24 de Nov (Auditorio Paraninfo)

[27] Daniel Andres Flores Alfonso (UNAP)

De la topología geométrica a las ondas gravitacionales

Recientemente, se ha mostrado que las estructuras geométricas fundamentales de los espacios tridimensionales son vacíos de gravedad cuadrática. En esta plática, analizamos sus análogas con signatura Lorentziana pero enmarcados en la relatividad general. Físicamente, los sistemas que presentamos incluyen ondas gravitacionales, radiación electromagnética gravitante y campos indetectables gravitacionalmente.

[28] Erick Contreras Pasten (UV)

Tilted Cosmology and the cosmological principle

Presentaré un resumen de mi trabajo de doctorado (3 publicaciones realizadas y 3 en preparacion) acerca del cuestionamiento que existe hoy en la comunidad hacia el principio cosmologico, fundamentado en la isotropia de nuestro universo y el principio copernicano. Es posible que la estructura local a gran escala de nuestro universo, como el estar localizados en un void o estar en medio de un bulk flow, tenga mayores influencias en la cosmologia de lo que antes pensabamos y resumiré las evidencias encontradas en la literatura y por mi propio trabajo. La parte final de mi charla se enfocara en la teoria de "Tilted Cosmology", la cual es una profundizacion de las teorías de relatividad general para observadores que se mueven en un bulk flow. Esta teoria tiene la importante conclusion de que un parametro de deceleracion negativo puede ser explicado por un mero efecto aparente en relatividad general debido a no ser observadores copernicanos, pudiendo explicar la energia oscura sin nuevas fisicas. Actualmente trabajo en metodos para contrastar esta teoria con los datos.

[29] Israel Ignacio Obreque Maureira (USACH)

Bayesian comparison of a new class of modified holographic Ricci dark energy interaction models

En este trabajo se presenta un amplio conjunto de modelos de interacción con energía oscura holográfica tipo Ricci como una alternativa al modelo estándar de la cosmología. En particular se presenta un análisis a través de sistemas dinámicos, se describen las soluciones analíticas, el parámetro de la coincidencia y se realiza un contraste observacional para estudiar la dinámica del universo tardío asociada a estos modelos. Se utilizan datos de BAO, SNIA, CMB y Cronómetros cósmicos. Empleamos técnicas de inferencia bayesiana para realizar una comparación entre los modelos holográficos y el modelo estándar. Realizamos un análisis de nuestros resultados destacando dos escenarios que se distinguen por prior asignado al parámetro adimensional de Hubble. Presentamos los gráficos de contorno para los modelos estudiados, donde resaltamos el comportamiento frente al cambio de prior y discutimos las correlaciones entre los parámetros holográficos. En los resultados se muestra una evidencia a favor del modelo estándar de la cosmología en la mayoría de los casos estudiados, donde se presentan modelos compatibles con interacción nula, sin embargo, la evidencia en el caso del modelo de energía oscura holográfica de Ricci sin interacción resulta inconclusiva. El mecanismo presentado en este trabajo nos motiva a explorar otros modelos de energía oscura holográfica en cosmología.

[30] Pedro Alvarez (UA)

Supersymmetry in the adjoint representation

We study a general recipe to implement models for gravity, gauge theories and matter using the adjoint representation of the superconformal algebra. A striking feature of the model is that fermion/boson matching of d.o.f. is not mandatory. We will discuss general properties of the theory and interesting gravitational solutions that are found on it.

[31] Giorgos Anastasiou (UNAP)

Conformal Renormalization in Einstein-AdS gravity and scalar-tensor theories

In this talk, there will be presented aspects of the conformal renormalization prescription for metric fields and its extension to scalar-tensor theories. In particular, it will be shown that bulk conformal invariance dictates the counterterms of Einstein-AdS gravity in 4D and 6D. Explicit examples of the 6D case will be provided. It will be also discussed the recent generalization of this prescription in the presence of scalar fields.

[32] Nikolaos Dimakis (UFRO)

Ruptura de simetría y movimiento geodésico

En este trabajo estudiamos el movimiento geodésico y cómo una ruptura explícita de simetría puede resultar en la generación de nuevas simetrías y cargas conservadas. Se presentan ejemplos en el contexto del movimiento en un fondo de pp-wave y al considerar un espacio-tiempo de tipo Finsler introduciendo una ruptura de la simetría de Lorentz.

[33] **Nicolás Alberto Cáceres de la Fuente (PUC)**

Renormalizacion holografica de teorías tenso escalares

Estudiamos la renormalización holográfica de teorías tenso escalares en cuatro dimensiones. En particular estudiamos la renormalización holografica de la teoría de Horndeski y a partir de el, recuperamos los casos de Dilaton Gauss Bonnet gravity y gravedad Klein Gordon.

[34] **Marco Stefano Bianchi (UACH)**

Transcendentality in Quantum Field Theory

I will gently introduce the concept of transcendental numbers and functions in the perturbative series of Quantum Field Theory predictions, pointing out its relevance and applications. I will conclude with some conjectures on the transcendentality of certain correlation functions in maximally supersymmetric Yang-Mills theory.

[35] **Fernando Izaurieta (USS)**

Gravitational Waves Faraday Rotation and the Hubble Parameter Tension

If dark matter is fermionic, its torsion could explain the Hubble parameter tension. It also would cause the gravitational analogue of Faraday Rotation for gravitational waves, providing two new independent channels to explore dark matter behavior.

[36] **Genly Leon (UCN)**

Dark Universe Phenomenology from Yukawa Potential?

We argue that the effect of cold dark matter in the cosmological setup can be explained by the coupling between the baryonic matter particles in terms of the long-range force having a graviton mass m_g via the Yukawa gravitational potential. Such a quantum-corrected Yukawa-like gravitational potential is characterized by the coupling parameter α, the wavelength parameter λ, which is related to the graviton mass via $m_g = \hbar/(\lambda c)$, that determines the range of the force and, finally, a Planck length quantity I_0 that makes the potential regular at the centre. The corrected Friedmann equations are obtained using Verlinde's entropic force interpretation of gravity based on the holographic scenario and the equipartition law of energy. The parameter α modifies Newton's constant as $G_{\text{eff}} \to G(1+\alpha)$. We argue that dark matter is an apparent effect as no dark matter particle exists in this picture. Furthermore, the dark energy is also related to graviton mass and α. in particular, we point out that the cosmological constant can be viewed as a self-interaction effect between gravitons. We further show that there exists a precise correspondence with Verlinde's emergent gravity theory, and due to the long-range force, the theory can be viewed as a non-local gravity theory. We show that the agreement with observations is very efficient, and within 1σ confidence level, we find the best-fit parameters $\lambda = (2693 + 1191 - 1262)$ Mpc, $\alpha = 0.416 + 1.137 - 0.326$, and a graviton mass of $m_g = (2.374 + 2.095 - 0.728) \times 10^{-42}$ GeV. Additionally, we establish a connection between the effective dark matter and dark energy density parameters and the angular radius of the black hole shadow of the SgrA and M87 black holes in the low-redshift limit, consistent with the Event Horizon Telescope findings.

[37] **Cristian Villavicencio (UBB)**

Axial coupling constant in dense nuclear matter under external magnetic field

Using appropriate QCD finite energy sum rules, we discuss the influence of an external magnetic field and baryonic density on the axial-vector coupling constant g_A. This scenario corresponds to a magnetar environment. We found that g_A decreases both as function of the magnetic field strength and the baryonic density. It turns out that at the nuclear density ρ_0 the axial-vector coupling takes the value $g_A^* \approx 0.92$. Although g_A decreases in general with the magnetic field intensity, g_A^* does not change in a relevant way with the magnetic field.