Centro de Astronomia e Astrofísica

Departamento de Física

Faculdade de Ciências . Universidade de Lisboa

SEMINÁRIO

21 Novembro 2011

"ΛCDM Cosmology faces oncoming wide-field radio surveys"

Stefano Camera
CENTRA

The oncoming generation of wide-field, continuum radio surveys will provide with unprecedented accuracy a vast amount of data, covering almost the entire sky and reaching sources at very high redshifts. Here, I present promising results regarding the issue of testing the concordance LCDM model with these surveys. Specifically, I show that alternative cosmological models could be well constrained, and also how we will be able to obtain significantly better results if we can add some amount of redshift information to the data.

2ª Feira , 21 Novembro 2011
15:30 H , Observatório Astronómico de Lisboa
(Tapada da Ajuda, Edifício Leste, 2º andar)

Centro de Astronomia e Astrofísica
Departamento de Física
Faculdade de Ciências . Universidade de Lisboa

SEMINÁRIO

5 Dezembro 2011

"Modified Gravity Tomography"

Philippe Brax
Institut de Physique Theorique, CEA, França

I will describe a new parametrisation of modified gravity models mediated by a scalar degree of freedom and how local constraints in the solar system and the laboratory together with astrophysical tests can be implemented within this framework.

2ª Feira , 5 Dezembro 2011
15:30 H , FCUL C8, Sala 8.2.10

Centro de Astronomia e Astrofísica

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SEMINÁRIO

9 Dezembro 2011

"Quintessential Covariant Holography"

Pedro Gonzalez Diaz
IMAFF, CSIC, Espanha

6ª Feira , 9 Dezembro 2011
14:30 H , Observatório Astronómico de Lisboa
(Tapada da Ajuda, Edifício Leste, 2º andar)

Centro de Astronomia e Astrofísica
Departamento de Física
Faculdade de Ciências . Universidade de Lisboa

SEMINÁRIO

16 Janeiro 2012

"Interesting Anisotropic and Inhomogeneous Cosmologies"

Miguel Quartin
Instituto de Física, UFRJ, Brasil

Although thoroughly studied by relativists, non-standard Friedman Lemaître Robertson Walker (FLRW) metrics have remained largely ignored by cosmologists until recently. The possibility that the best large scale metric could be something different than FLRW must nevertheless be ruled out by observations instead as by purely theoretical biases. Inhomogeneous void models have been proposed which could match all (or almost so) observations without need for a dark energy component. A simple anisotropic model which is both shearless and irrotational but still distorts cosmological distances has also been recently proposed. In this talk, we discuss the motivation and observational implications of both ideas in current and near future data.

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2ª Feira , 16 Janeiro 2012
15:00 H , Observatório Astronómico de Lisboa
(Tapada da Ajuda, Edifício Leste, 2º andar)

Centro de Astronomia e Astrofísica
Departamento de Física
Faculdade de Ciências . Universidade de Lisboa

SEMINÁRIO

30 Janeiro 2012

"Dark energy related singularities and their possible resolution"

Mariam Bouhmadi-Lopez
CENTRA

I will review some kinds of cosmological singularities that have appeared over the last few years, motivated initially from the possible presence of an exotic dark energy component. Then I will show how these singularities could be removed or appeased either on a semi-classical setup or using a quantum approach within the framework of quantum geometrodynamics.
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2ª Feira , 30 Janeiro 2012
15:00 H , FCUL C8, Sala 8.2.10

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SEMINÁRIO

13 Fevereiro 2012

"From the Dark Ages to Dark Energy: opening a new observational window with the Next Generation of Radio Telescopes"

Mário Santos
CENTRA

The new generation of radio-telescopes (such as ASKAP, APERTIF, LOFAR and the future SKA) will provide exquisite cosmological measurements due to their large field of view. I will describe how they can be used to probe the Epoch of Reionization, a crucial stage in the history of galaxy and structure formation and even the preceding dark ages before the first luminous objects formed, as well as probe the nature of dark energy at lower redshifts using very large continuum sky surveys.

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2ª Feira , 13 Fevereiro 2012
15:30 H , Observatório Astronómico de Lisboa
(Tapada da Ajuda, Edifício Leste, 2º andar)

Centro de Astronomia e Astrofísica
e
Laboratorio de Sistemas Instrumentação e Modelação
Faculdade de Ciências . Universidade de Lisboa

SEMINÁRIO

27 Fevereiro 2012

"The physics of galactic spiral arms: taking into account the depth of their gravitational potential"

Jacques Lépine
IAG, Universidade de São Paulo, Brasil

The nature of the spiral arms is better understood in terms of organized stellar orbits, following the ideas of Kalnajs (1972). We investigated the stable closed orbits that can exist in the potential of our Galaxy, in a rotating frame of reference which is that of the spiral arms. The corotation radius, at which the material of the disk rotates at the same angular speed of the spiral arms, is found to be very close to the radius of the solar orbit. Corotation is an important resonance, which produces visible effects in the gas distribution, stellar distribution, and even in the gradient of metallicity. Once you know the position of one resonance in our Galaxy, you automatically know where are all the others. We were able to recognise other resonances as well, for instance the 4:1 resonance (4 epicycle oscillations in one turn of the star around the Galaxy). Simulations show that the stars tend to keep of from corotation but to be attracted by other resonances. The interaction of the gas of the disk with the arms seen as channels in the gravitational potential will also be discussed.

2ª Feira , 27 Fevereiro 2012
15:30 H , Observatório Astronómico de Lisboa
(Tapada da Ajuda, Edifício Leste, 2º andar)

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Departamento de Física
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SEMINÁRIO

12 Março 2012

"Amostragem em 2D: especificidades, dificuldades e aplicações"

José Manuel Rebordão
CAAUL / LOLS

As estratégias de amostragem constituem uma parte fundamental de qualquer processo de medição, uma das "artes" da Física. No âmbito do sinal (unidimensional, 1D, tipicamente o tempo), a amostragem é um processo bem controlado. A duas dimensões espaciais (imagens, 2D) e a 3 dimensões (volumes, 3D), é-se muitas vezes confrontado com objectos desconhecidos ou possuidores de formas de simetria que se põem em evidência à medida que a resolução espacial aumenta, e não é difícil obterem-se resultados do processo de medida que tanto podem descrever a realidade como podem perfeitamente ser artefactos gerados pelo processo de medida. Por outro lado, cada vez mais lidamos com informação que nos é apresentada através de "displays" de diversas tecnologias, ou gerada através de processos dinâmicos de varrimento. Pela sua natureza periódica ou quase-periódica, tais objectos matemáticos nem sempre viabilizam a aplicação natural do teorema de Shannon, confrontando-nos com a necessidade de recorrer a outras formas de análise. Este seminário tem assim como objectivo chamar a atenção - sem grandes elaborações formais - para uma gama variada de artefactos que tipicamente surgem na manipulação de imagens, e das quais decorrem aplicações diversas que beneficiam quer da sua estabilidade, quer da sua natureza singular e instabilidade.

2ª Feira , 12 Março 2012
15:30 H , Observatório Astronómico de Lisboa
(Tapada da Ajuda, Edifício Leste, 2º andar)

Centro de Astronomia e Astrofísica
Departamento de Física
Faculdade de Ciências . Universidade de Lisboa

SEMINÁRIO

10 Abril 2012

"The 11 Gyr Evolution of Star-forming galaxies"

David Sobral
Observatório de Leiden, Países Baixos

I will present new deep and wide narrow-band surveys undertaken with UKIRT, Subaru and the VLT; a unique combined effort to select large, robust samples of H-alpha (Ha) emitters at z=0.40, 0.84, 1.47 and 2.23 (corresponding to look-back times of 4.2, 7.0, 9.2 and 10.6 Gyrs) in a uniform manner over ~2 sqdeg in the COSMOS and UDS fields. The deep multi-epoch Ha surveys are sensitive to Milky-Way SFRs out to z=2.2 for the first time, while the wide area and the coverage over two independent fields allows to greatly overcome cosmic variance. Overall, the evolution seen in Ha is in good agreement with the evolution seen using inhomogeneous compilations of other tracers of star formation, such as FIR and UV, jointly pointing towards the bulk of the evolution in the last 11 Gyrs being driven by a strong luminosity/SFR increase from z~0 to z~2.2. Our uniform analysis allows to derive the Ha star formation history of the Universe, for which a simple time-parametrisation is a good approximation for the last 11Gyrs. Both the shape and normalisation of the Ha star formation history are consistent with the measurements of the stellar mass density growth, confirming that our Ha analysis traces the bulk of the formation of stars in the Universe up to z~2.2. We are also exploring the large, multi-epoch and homogeneously selected samples of Ha emitters to conduct detailed morphology, dust, clustering, environment and mass studies which are providing us with a unique view on the evolution of star-forming galaxies and what has been driving it for the past 11 Gyrs.

3ª Feira , 10 Abril 2012
15:30 H , Observatório Astronómico de Lisboa
(Tapada da Ajuda, Edifício Leste, 2º andar)

Centro de Astronomia e Astrofísica

Departamento de Física

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SEMINÁRIO

23 Abril 2012

"GPGPU Cosmological N-Body PP Simulations and other applications"

David Oliveira
CAUP

A traditional Particle-Particle (PP) algorithm, in the style of the well-known Hydra cosmological simulation code, was implemented in the new emerging technique of GPGPU (General-Purpose computing on Graphics Processing Units). This resulted in a complete PP direct-summation code with all steps and the full simulation iterative loop running on the graphics hardware in its entirety - fully-leveraging the performance potential of the GPGPU framework. This endeavor required the reengineering and recasting of the known algorithm in a parallel, vectorial form in order to fully exploit the GPU hardware. We show that by using a GPGPU approach, we transform the algorithm runtime scaling from $O(N^2)$ to $O(\sim N)$, enabling us to perform PP simulations of scales not practical before. An application of GPGPU in CMB mapmaking will also be shown. The second part of the talk will cover the current work of the Portuguese team on the Euclid Sky Survey Working Group. Finally, if time permits, we will go through some image processing and signal denoising techniques.

2ª Feira , 23 Abril 2012
15:30 H , Observatório Astronómico de Lisboa
(Tapada da Ajuda, Edifício Leste, 2º andar)

Centro de Astronomia e Astrofísica
Departamento de Física
Faculdade de Ciências . Universidade de Lisboa

SEMINÁRIO

28 Maio 2012

"Anisotropic Dark Energy"

Tomi Koivisto
ITA, Universidade de Oslo, Noruega

The paramount characteristic of dark energy is its negative pressure. If this pressure varies with the direction, new observational signatures are expected. Three categories of such models are discussed in the talk:
I) Dark energy is an imperfect fluid and has shear viscosity, however without violating the statistical isotropy of the background.
II) The dark energy stresses break the isotropy of the FRLW background: this case is stringently constrained by the CMB data.
III) The imperfect dark energy field is in the shear-free configuration. Then the anisotropy is not seen in the CMB, but still appears in the distance measurements.

2ª Feira , 28 Maio 2012
15:00 H , Observatório Astronómico de Lisboa
(Tapada da Ajuda, Edifício Leste, 2º andar)

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SEMINÁRIO

14 Junho 2012

"A thermodynamic motivation for dark energy"

Diego Pavón
Universitat Autònoma de Barcelona, Espanha

It is rather natural to expect that the Universe -as any ordinary, macroscopic system- approaches a state of maximum entropy in the long run. Realizing that the Einstein-de Sitter model cannot but dark energy dominated universes can, provided its equation of state falls in the range $-1 \leq w < -2/3$, we may conclude that the present era of cosmic accelerated expansion could have been anticipated on solid thermodynamic grounds.

5ª Feira , 14 Junho 2012
14:00 H , Observatório Astronómico de Lisboa
(Tapada da Ajuda, Edifício Leste, 2º andar)

Centro de Astronomia e Astrofísica

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SEMINÁRIO

7 Setembro 2012

"Mass profile and member identification of self-gravitating systems in their outer regions through the caustic technique"

Ana Laura Serra

Universidade de Torino, Itália

The caustic technique uses galaxy redshifts alone to measure the escape velocity profiles of galaxy clusters to clustrocentric distances beyond their virial radius, where dynamical equilibrium does not necessarily hold. This feature allows us to estimate the mass profile and to identify the members of a cluster. We analyze the ability of this technique to extract these dynamical properties and we study its possible systematic errors, by applying it to simulated clusters with mass M200 larger than 10^14 Msun/h extracted from a cosmological hydrodynamical simulation of a LCDM universe. We evaluate the systematic effects introduced by the center identification, the choice of the parameters and the projection effects and we analyze the dependence of the profiles on the number of galaxies present in the catalogs.

6ª Feira , 7 Setembro 2012

11:00 H , Observatório Astronómico de Lisboa

(Tapada da Ajuda, Edifício Leste, 2º andar)

Centro de Astronomia e Astrofísica
Departamento de Física
Faculdade de Ciências . Universidade de Lisboa

SEMINÁRIO

17 Setembro 2012

"Three-form Cosmology"

Nelson Nunes
CAAUL

Three-forms can give rise to viable cosmological scenarios of inflation and dark energy with potentially observable signatures distinct from standard single scalar field models. I will first present an intuitive picture of the background evolution of the minimally coupled three-form in terms of an effective potential and show that it can naturally generate a variety of isotropic background dynamics, including scaling, possibly transient acceleration and phantom crossing. When applied to primordial inflation, a three-form can have a scale invariant scalar perturbations power spectrum and the consistency relation between the tensor and scalar amplitudes has a dependence on the speed of sound. Finally, I will demonstrate that a single three-form can have large non-Gaussian signatures.

2ª Feira , 17 Setembro 2012
14:30 H , Observatório Astronómico de Lisboa
(Tapada da Ajuda, Edifício Leste, 2º andar)

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Departamento de Física
Faculdade de Ciências . Universidade de Lisboa

SEMINÁRIO

29 Novembro 2012

"Stars as cosmological tools: from dark matter to modified gravity"

Jordi Casanellas
CENTRA

The present accuracy in the modelling and observations of the Sun and other stars allows us to use them as laboratories of physics. In this talk I will first discuss how the capture of dark matter particles by low-mass stars influences the stellar properties, focusing on two strategies to detect these effects: the analysis of the stellar oscillations and the changes in the global appearance of a whole stellar cluster. Remarkably, a region of the DM parameter space was excluded using an asteroseismic analysis of Alpha Cen B. To conclude, I will show how a similar approach was successfully applied to put constraints on alternative theories of gravity, using the solar neutrinos and helioseismic data.

5ª Feira , 19 Novembro 2012
14:30 H , Observatório Astronómico de Lisboa
(Tapada da Ajuda, Edifício Leste, 2º andar)

Centro de Astronomia e Astrofísica
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SEMINÁRIO

3 Dezembro 2012

"Probing the Origin, Powering and Geometry of Lyman-Alpha Blobs around High-z Radio-Loud Galaxies"

Andrew Humphrey
CAUP

Luminous high-redshift Ly-alpha blobs (LABS), often also known as Ly-alpha 'nebulae', 'halos' or 'fuzz' in the literature, promise to yield important insights into the physics of massive galaxy formation. As prodigious sources of HI Ly-alpha photons, with ~10-100 kpc spatial extents, they provide an efficient way to select distant galaxies (or proto-galaxies) expected to be undergoing significant mass-assembly. In this talk, I will present results from a recently accepted paper in which we used long slit spectroscopy from GTC+OSIRIS to examine the geometry, powering, and origin of the LAB and an absorption line system associated with a radio-loud quasar at z=2.54. I will also discuss some interesting new results from long-slit spectropolarimetry of LABs associated with z>2 radio galaxies, and their related continuum structures.

2ª Feira , 3 Dezembro 2012
14:30 H , Observatório Astronómico de Lisboa
(Tapada da Ajuda, Edifício Leste, 2º andar)

Centro de Astronomia e Astrofísica

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SEMINÁRIO

4 Janeiro 2013

"Herschel-ATLAS and ALMA: An Einstein Ring of Molecular Gas and Dust in the z=1 source G15.v2.19"

Hugo Messias

Universidade de Concépcion, Chile

Among the several contributions of the Herschel-ATLAS survey, one which stands out is the reliable selection of gravitational lens systems by means of a simple far-infrared flux cut (Negrello et al. 2010). This talk is about one of the brightest source in the sample (with S500 μm = 194 mJy), which has been observed with ALMA. Two scheduling blocks (SBs) have been delivered so far. These comprise Bands 3 (with 25 antennas) and 6 (17) setups, observed in extended configuration (maximum baseline ~450 m). The continuum emission (at 101 and 226 GHz) was successfully detected, as well as line emission from the following transitions: 12CO J:2→1 and J:4→3; CI 3P1 →3P0; and CS J:10→9. Ancillary data (HST, Keck-AO) shows a typical quad lensed system close to a fold caustic, with a nearly complete Einstein ring. However, obscuration induced by the foreground lens disc galaxy has so far prevented an acceptable lens model. Nevertheless, the CO line has a FWHM narrower than those observed in SMGs and shows a double peaked profile. This, together with an impressive CS J:10-9 detection, its observed FIR flux, and the preliminary reconstructed source velocity map, hints for a highly dense merger environment and regions of high magnification (up to factors of ~14).

6ª Feira , 4 Janeiro 2013

14:30 H , Observatório Astronómico de Lisboa

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SEMINÁRIO

4 Março 2013

"The Newtonian limit of general relativity: implications for cosmology"

Ugo Bertello
CAAUL

Numerical simulations of large scale structure formation rely today on codes based on Newtonian gravity. The most reliable theory of gravity that we have developed is however general relativity. It is therefore important to understand which degrees of freedom and which features are lost when the relativistic "real" universe is approximated, or better replaced, by a Newtonian one.
In the talk we give an overview on Newtonian cosmology and general relativity, we show how these two theories deal with inhomogeneous cosmological models and the dark energy problem through the backreaction conjecture. Finally, we remark that the weak-fields, small-velocities limit of general relativity does not coincide with Newtonian gravity per se.

2ª Feira , 4 Março 2013
14:30 H , Observatório Astronómico de Lisboa
(Tapada da Ajuda, Edifício Leste, 2º andar)

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SEMINÁRIO

18 Março 2013

"A (im)possibilidade da comunicação de ciência"

Adalberto Fernandes
OAL

A ciência é realmente comunicável?
Procuraremos explorar as ramificações desta questão através de uma travessia pelos modelos da comunicação de ciência: Literacia de Ciência, Compreensão Pública de Ciência e Envolvimento Público com Ciência e Tecnologia.

2ª Feira , 18 Março 2013
14:30 H , Observatório Astronómico de Lisboa
(Tapada da Ajuda, Edifício Leste, 2º andar)

Centro de Astronomia e Astrofísica

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SEMINÁRIO

22 Abril 2013

"Cosmological applications of space-time torsion"

Francisco Cabral
CAAUL

In this talk I will make a brief review on the basics of gravitational theories with torsion with special focus on the Einstein-Cartan-Sciama-Kibble theory and its cosmological applications. Most cosmological applications of torsion theories consist in allowing the existence of cosmic acceleration without any kind of dark energy, however, we will see that the Einstein-Cartan theory applied to spatially homogeneous and isotropic models provides an interesting path to solve many other problems in cosmology such as, for example, the singularity problem, the matter/anti-matter asymmetry, dark matter, the flatness and horizon problems (without inflation). I will try to show the potential importance of gravity theories with torsion in cosmology (and astrophysics) and briefly expose some other issues such as experimental tests of space-time torsion.

2ª Feira , 22 Abril 2013
14:30 H , Observatório Astronómico de Lisboa
(Tapada da Ajuda, Edifício Leste, 2º andar)

Centro de Astronomia e Astrofísica
Departamento de Física
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SEMINÁRIO

6 Maio 2013

"Da Biblioteca ao Real Observatório de Lisboa"

Halima Naimova
OAL

O Real Observatório Astronómico de Lisboa (1857), Observatório Nacional, pertence a rede das instituições modernas projectadas no país pelas políticas do rei esclarecido D. PedroV (1837-1861). A sua biblioteca e arquivo científicos nasceram com a própria instituição abarcando colecções fundamentais no campo de astronomia de posição e áreas afins. Serviu de referência para a constituição das suas colecções a Biblioteca do Observatório Astronómico Imperial Russo em Pulkovo (Rússia), onde Frederico Augusto Oom (1830-1890), o astrónomo e o primeiro director do Real Observatório Astronómico de Lisboa permaneceu, na sua missão internacional, entre 1858-1863. Embora tivesse lugar a troca de livros e mapas antes entre a Comissão Instaladora do ROAL e F.G.W. Struve (1793-1864), o primeiro Director do Observatório Astronómico Imperial Russo, as primeiras compras de livros para a biblioteca do ROAL foram efectuadas durante a viagem por Frederico Augusto Oom . O perfil específico que distingue o fundo bibliográfico reside no seu projecto inicial de contribuição para o avanço da astronomia sideral. A assinatura dos periódicos especializados, compra, recepção via trocas bibliográficas e algumas ofertas dos catálogos de estrelas dos séculos XIX e primeiras décadas do XX dos observatórios europeus, suas colonias e das duas Americas contribuiu para a sua unicidade no panorama nacional.

2ª Feira , 6 Maio 2013
15:30 H , Observatório Astronómico de Lisboa
(Tapada da Ajuda, Edifício Leste, 2º andar)

Centro de Astronomia e Astrofísica
Departamento de Física
Faculdade de Ciências . Universidade de Lisboa

SEMINÁRIO

24 Maio 2013

"Towards a general classification of atmospheric waves on Venus "

Javier Peralta
IAA-CSIC, Granada, Espanha

The atmospheric superrotation of Venus goes on being a puzzling phenomenon in the Solar system and is still considered an open problem in geophysical fluid dynamics.
A general agreement exists among numerous works concerning the main role that atmospheric waves should have in the generation and maintenance of the superrotation, although most of them try to study the impact of the waves with complex GCMs or using adapted terrestrial dispersion relations by considering frames fixed to the winds.
In this work I derive, for the first time, the dispersion relations for a wide variety of possible atmospheric waves in Venus. These dispersion relations are analytically extracted from the primitive equations under reasonable assumptions valid for the cloud region of Venus and above, and the effect of the meridional shear of the wind and the vertical variation of the static stability are also considered. Moreover, these dispersion relations allow building dispersion graphs for different regions of the atmosphere of Venus and classifying a number of waves identified in Venus Express remote sensing data.

6ª Feira , 24 Maio 2013
14:30 H , Observatório Astronómico de Lisboa
(Tapada da Ajuda, Edifício Leste, 2º andar)

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SEMINÁRIO

27 Maio 2013

"Galaxy properties as a fingerprint of cosmology and fundamental physics"

Martin Stringer
Observatório de Paris, França

Any viable theory of the formation and evolution of galaxies should be able to broadly account for the emergent properties of the galaxy population, and their evolution with time, in terms of fundamental physical quantities. Yet, when citing the key processes we believe to be central to the story, we often find ourselves listing from a vast and confusing melee of modelling strategies & numerical simulations, rather than appealing to traditional analytic derivations where the connections to the underlying physics are more tangible. By re-examining both complex models and recent groundbreaking observational surveys in the spirit of the classic theories, we investigate to what extent the trends in the galaxy population can still be seen as an elegant fingerprint of cosmology and fundamental physics.

2ª Feira , 27 Maio 2013
15:30 H , Observatório Astronómico de Lisboa
(Tapada da Ajuda, Edifício Leste, 2º andar)

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SEMINÁRIO

31 Maio 2013

"(New) Borders for Quantum Cosmology"

Paulo Moniz
Universidade da Beira Interior

Quantum Cosmology tackles the quantum description of the early universe. This talk is aimed as an accessible primer that covers the basics, critically discussing ideas and concepts that comprise our current knowledge in a supersymmetric framework.
As much as possible, it summarizes what we know, what we think we know and what we think we do not know on an equal footing. It is focused for 'young', inquisitive minds eager to embark on in-depth research in this field. It is hoped to suggest the tools researchers will need to go on their own, pushing them to ask the right questions rather than seek definitive answers.

6ª Feira , 31 Maio 2013
14:30 H , Observatório Astronómico de Lisboa
(Tapada da Ajuda, Edifício Leste, 2º andar)