CADERNO de RESUMOS

Oficina Temática em Teoria de Campos:

Defeitos Topológicos e suas Aplicações II

(II Workshop on Field Theory: Topological Defects and Applications)

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Universidade Federal do ABC

30 de novembro de 2015

1 Oficina Temática em Teoria de Campos: Defeitos Topológicos e suas Aplicações II - UFABC

1.1 Comitê Organizador

O Comitê Científico Organizador é listado abaixo, e consiste dos seguintes membros:

- Prof. Dr. Alvaro de Souza Dutra, DFQ-Universidade Estadual Paulista (Unesp)
- Prof. Dr. Alysson Ferrari, CCNH-Universidade Federal do ABC (UFABC)
- Prof. Dr. Dionisio Bazeia, CCEN-Universidade Federal da Paraíba (UFPB)
- Prof. Dr. Luiz Agostinho Ferreira, IFSC-Universidade de São Paulo (USP)
- Prof. Dr. Rafael Augusto Couceiro Correa, CCNH-Universidade Federal do ABC (UFABC)
- Prof. Dr. Roldão da Rocha, CMCC-Universidade Federal do ABC (UFABC) (Chairman)

1.2 Apresentação

A segunda edição da Oficina Temática em Teoria de Campos: Defeitos Topológicos e suas Aplicações II"(*II Workshop on Field Theory: Topological Defects and Applications*) (WFTTD) ocorrerá na Universidade Federal do ABC, no Campus de Santo André, de 1 a 4 de dezembro de 2015, cobrindo os seguintes tópicos: Defeitos Topológicos em Teoria de Campos, Transições de Fase em Cosmologia, Leis de Conservações Topológicas, Sólitons BPS, Teorias Topológicas e Auto-Dualidade, Kinks e Multi-kinks, Violações da Simetria de Lorentz em Defeitos Topológicos, Oscillons em Universos em Expansão, Matéria Condensada, Teorias de Campos Quasi-Integráveis e Entropia Configuracional em Estruturas Localizadas.

Maiores informações sobre a segunda edição do WFTTDA podem ser encontradas no sítio oficial

`http : //eventos.ufabc.edu.br/WFTTD2015`

Com a segunda edição deste evento, promoveremos uma integração maior entre os pesquisadores da área de Física Teórica dos diferentes temas de pesquisa correlacionados ao tópico Defeitos Topológicos. Com a participação de várias Universidades do país na segunda edição do WFTTDA, o segundo WFTTDA traz aos participantes a oportunidade de se defrontarem com debates em torno de problemas de pesquisa de fronteira em andamento, consolidando ainda núcleos com Pós-graduação Stricto-Sensu (Mestrado e Doutorado) no Brasil, em particular do Centro de Ciências Naturais e Humanas (CCNH) e Centro de Matemática, Computação e Cognição (CMCC) da UFABC.

The second edition of the *II Workshop on Field Theory: Topological Defects and Applications* (WFTTDA) shall have the Universidade Federal do ABC, Campus of Santo André as the venue, from 1 to 4 December, 2015, encompassing the topics: topological defects in Field Theory, phase transitions in Cosmology, topological conservation laws, BPS solitons, self-duality, kinks and multi-kinks, Lorentz symmetry breaking and topological defects, oscillons in expanding Universes, quasi-integrable models and configurational entropy in localized structures, condensed matter.

More information at the official homepage

`http : //eventos.ufabc.edu.br/WFTTD2015`

With the second edition, we will promote a better overlapping among researchers in Theoretical Physics that work in different, although correlated, research themes related topological defects. With participants of vseveral Universities, the second edition of the WFTTDA brings to all people involved the opportunity to be in debates around border research problems, further consolidating graduate programs, in particular regarding the graduate programs of Centro de Ciências Naturais e Humanas and Centro de Matemática, Computação e Cognição da UFABC.

Palavras-chave: defeitos topológicos, teoria de campos, sólitons, teorias topológicas e auto-dualidade, kinks.
keywords: topological defects, field theory, solitons, topological theories, self-duality, kinks.

1.3 Resumos

Topological Origin of Double Well Tunneling and Vacuum Transitions —
Alex Eduardo de Bernardini (UFSCar)

The quantum transition between shifted zero-mode wave functions is shown to be induced by the systematic deformation of topological and non-topological defects that support the 1-dim double-well (DW) potential tunneling dynamics. The topological profile of the zero-mode ground state, ψ_0, and the first excited state, ψ_1, of DW potentials are obtained through the analytical technique of topological defect deformation. Deformed defects create two inequivalent topological scenarios connected by a symmetry breaking that support the quantum conversion of a zero-mode stable vacuum into an unstable tachyonic quantum state. Our theoretical findings reveal the topological origin of two-level models where a non-stationary quantum state of unitary evolution that exhibits a stable tunneling dynamics, is converted into a quantum superposition involving a self-vanishing tachyonic mode, that parameterizes a tunneling coherent destruction. The non-classical nature of the symmetry breaking dynamics is recreated in terms of the single particle quantum mechanics of 1-dim DW potentials.

Wide localized solutions of the parity-time-symmetric nonautonomous nonlinear Schrödinger equation —
Alvaro de Souza Dutra (UNESP)

By using canonical transformations we obtain localized (in space) exact solutions of the nonlinear Schrödinger equation (NLSE) with cubic and quintic space and time modulated nonlinearities and in the presence of time-dependent and inhomogeneous external potentials and amplification or absorption (source or drain) coefficients. We obtain a class of wide localized exact solutions of NLSE in the presence of a number of non-Hermitian parity-time (PT)-symmetric external potentials, which are constituted by a mixing of external potentials and source or drain terms. The exact solutions found here can be applied to theoretical studies of ultrashort pulse propagation in optical fibers with focusing and defocusing nonlinearities. We show that, even in the presence of gain or loss terms, stable solutions can be found and that the PT symmetry is an important feature to guarantee the conservation of the average energy of the system.

Stability of a tachyon braneworld —
André Martorano Kuerten (UFABC)

Within the braneworld paradigm the tachyonic scalar field has been used to generate models that attempt to solve some of the open problems that physics faces nowadays, both in cosmology and high energy physics as well. When these field configurations are produced by the interplay of higher dimensional gravity with some matter content, braneworld models must prove to be stable under small fluctuations of the background matter fields, among other consistency tests. Here we present a complete proof of the stability under scalar perturbations of tachyonic thick braneworlds with an embedded maximally symmetric 4D space-time, revealing its physical consistency. This family contains a recently reported tachyonic de Sitter thick braneworld which possesses a series of appealing properties. These features encompasses complete regularity, asymptotic flatness (instead of being asymptotically dS/AdS even when it contains a negative bulk cosmological constant and the relevant 3-brane has dS symmetry), and a graviton spectrum with a single bound state that accounts for the 4D graviton, separated from the continuum of Kaluza-Klein massive graviton excitations by a mass gap. Based upon arXiv: 1508.03867.

A relation between deformed superspace and Lee-Wick higher-derivative theories —
Alysson Ferrari (UFABC)

We discuss the general motivations and give a brief panorama about non commutative deformations of superspace. We then propose a non-anticommutative superspace with the interesting property of relating to Lee-Wick type of higher derivatives theories, which are known for their interesting properties, and have lead to proposals of phenomenologicaly viable higher derivatives extensions of the Standard Model.

Cosmic strings: from macroscopic to microscopic properties —
Betti Hartmann (USP)

Cosmic strings are the topological defect that seems most important from the point of view of cosmological applications, especially since there is a possibility that cosmic strings might be linked to the fundamental strings of String theory. Furthermore, inflationary models embedded in String Theory or Supergravity models always predict the formation of cosmic strings at the end of inflation. Observational data of the Cosmic Microwave background (CMB) does not (yet) rule out cosmic strings as source of the anisotropies. In fact, cosmic strings provide a viable and reasonable alternative to primordial gravitational waves as source for the observed B-mode polarization of the CMB. In this talk

I will point out that it is important to understand microscopic properties of cosmic strings in order to interpret future high precision observational data correctly.

Two approaches to Lorentz Invariance Violation —
Carlos Alberto Santos de Almeida (UFC)

Here we discuss briefly two approaches to Lorentz Invariance Violation. First, we re-examine the issue of Lorentz Invariance Violation in the context of higher dimensional theories. We show that a six-dimensional geometry describing a string-like defect with a bulk-dependent cosmological constant can yield a massless 4D graviton, if we allow the cosmological constant variation along the bulk, and thus can provides a phenomenologically viable solution for the gauge hierarchy problem. On the other hand, we study the modified Dirac equation in the framework of very special relativity (VSR). This theory was proposed by Cohen and Glashow which preserves the usual energy-momentum dispersion relation although it is not invariant under the full Lorentz group. As a matter of fact, instead of using the Lorentz group SO(1, 3), Cohen-Glashow realized that a proper subgroup of the Lorentz group can lead to the conservation laws and the well studied effects of the Special Relativity (SR). The low-energy regime is accessed and the nonrelativistic Hamiltonian is obtained. The implications of the VSR-modi ed Lorentz symmetry on the spectrum of a hydrogen atom is determined by calculating the first-order energy corrections in the context of standard quantum mechanics. Among the results, we highlight that the modified Hamiltonian provides non-vanishing corrections which lift the degeneracy of the energy levels and allow us to find an upper bound upon the VSR-parameter.

Purcell effect: Some aspects. —
Carlos Farina de Souza (UFRJ)

After a brief survey of the spontaneous emission (SE) history we discuss the Purcell effect, which is nothing but the influence of external agents in the SE rate of an atomic system. We calculate the SE rate in a few simple cases and after that we discuss the Purcell effect in two non-trivial situations, namely: (i) an atom in the presence of a plasmonic cloaking device and (ii) an atom near a host dielectric semi-infinite medium with metallic inclusions. Particularly, in the former we show (in the dipole approximation) that the influence of a small sphere in the SE rate can be drastically suppressed when the sphere is covered by an appropriate layer, while in the latter we show that the SE rate has a maximum value at the insulator $\rightarrow$ metal transition.

Background Field Gravity in two and three dimensions —
Carlos E. Valcarcel (UFABC)

Birmingham classified the topological quantum field theories (TQFT) into two groups: the Witten-type and the Schwarz-type. There are several examples of Schwarz-type TQFT in physics: For example, in three dimensions we have the Chern-Simons theory, which is related to gravity and is also used to build Topologically Massive gauge theories. The background field (BF) model is another Schwarz-type TQFT and has been widely used due to its relation with lower dimensional gravity. In this work we will study the equivalence of the BF theories with gravity in two and three dimensions.

Elko and mass dimension one fermionic dark matter —
Cheng-Yang Lee (Unicamp)

The fermionic fields constructed from Elko (a complete set of Majorana spinors) have several unexpected properties. They satisfy the Klein-Gordon but not the Dirac equation and are of mass dimension one instead of three-half. In this talk, we discuss their symmetries and interactions. We show that the mass dimension one fermions can only interact with the Standard Model sector through the Higgs boson via the Yukawa interaction thus making them natural dark matter candidates. By studying the loop corrections induced by the Yukawa interaction and taking the mass of the Higgs boson to be 125 GeV, we show that the mass of the fermion must be at least 62.5 GeV.

BPS solution for eleven-dimensional supergravity with a Intersection AdS and conical defect configuration —
Cristine Nunes Ferreira (IFCTF)

In this work, we found the solution for the field equations of eleven- dimensional supergravity with a BPS conical topological defect configuration. We chose the solutions that corresponded to a M2-brane where the space-time presents the co-dimension two. The source of the topological defect is a sigma model where the brane tension is connected with the angular deficit. We analyzed the Killing spinor equations, a 3-form gauge potential and Einsteins equations, proving that it is possible to find a full solution for the system. We analyzed the intersection AdS space time contained the conical topological defect. We show that it is possible to obtain an $\mathrm{AdS}_4\times$ $\mathrm{AdS}_3 \times S_2 \times S_2$ with topological defect. We also discussed some applications in the strong coupling theory for condensed matter systems.

Cusped lines in (AdS/)CFT —
Diego Trancanelli (USP)

The coupling to an external heavy particle represents an excellent way to probe a gauge theory. In this seminar, I will consider cusped Wilson lines in N=4 super Yang-Mills and focus on the case of particles in large representations of the gauge group. These cusped lines lead to the notions of cusp anomalous dimension and of Bremsstrahlung function. I will discuss a recent conjecture claiming that, in a particular limit, an eikonal exponentiation takes place, so that the full non-perturbative result for the Wilson line expectation value is captured by the exponential of the 1-loop result. This can be checked holographically via a D-brane computation. This conjecture opens up a new window into the strong coupling behavior of operators which are not protected by supersymmetry.

Nontopological self-dual Maxwell-Higgs vortices —
Carlos Eduardo da Hora Santos (UFMA)

We investigate the existence of self-dual nontopological vortices within the nonusual Maxwell-Higgs model introduced in Eur. Phys. J. C **71** (2011) 1833. The investigation is explicitly illustrated by choosing a sixth-order self-interaction potential which is the simplest one allowing the existence of nontopological structures. We specify some Maxwell-Higgs models yielding BPS nontopological vortices whose total energy is proportional to the magnetic flux. In particular, we study the way the new solutions approach the boundary values, from which we verify their nontopological behavior. We also show the resulting numerical profiles, highlighting the main features they present.

Thick brane models in generalized theories of gravity —
Dionisio Bazeia (UFPB)

This work deals with thick braneworld models, in an environment where the Ricci scalar is changed to accommodate the addition of two extra terms, one depending on the Ricci scalar itself, and the other, which takes into account the trace of the energy–momentum tensor of the scalar field that sources the braneworld scenario. We suppose that the scalar field engenders standard kinematics, and we show explicitly that the gravity sector of this new braneworld scenario is linearly stable. We illustrate the general results investigating two distinct models, focusing on how the brane profile is changed in the modified theories.

Quantum Compactons —
Dmitry Vasilevich (UFABC)

Compactons are solutions of the equations of motion that behave trivially outside a compact region. In general, the operators describing quantum fluctuations above compactons have singularities. However, we show that despite these singularities the quantum theory is well defined. As an example, we calculate the one-loop mass shift of a compacton in a model described by a single real scalar field.

Spontaneous emission and the Purcell effect —
Felipe Siqueira da Rosa (UFRJ)

The successful quantization of the electromagnetic field is surely one of the finest chapters in modern physics. The resulting theory - Quantum Electrodynamics (QED) - not only describes several phenomena with astounding accuracy but has also given the road map to the quantization of other fundamental forces and the establishment of the standard model. One of the key consequences of QED is that an excited system, even in complete isolation of external agents, will decay to its ground state after some time. This is known as Spontaneous Emission, and it is due to the interaction of the system with the quantum vacuum fluctuations. In this talk we shall explore a few applications of this phenomenon, like the Purcell effect, and in particular how a graphene sheet under a magnetic field can affect the spontaneous emission rate of an atomic emitter.

Non-relativistic Conformally Invariant Equations —
Francesco Toppan (CBPF)

The non-relativistic holography (the AdS/CFT correspondence applied to non-relativistic systems, such as in condensed matter) requires a detailed investigation of conformally invariant equations. The Conformal Galilei Algebras induce second-order differential equations within a pseudo-hermitian Hamiltonian framework. Their spectrum (algebraically determined by spectrum-generating subalgebras) is discrete and positive. This new class of invariant equations and their possible applications will be discussed. The talk is mostly based on the JMP 56, 031701 (2015) [arXiv:1501.00121] paper.

4D →3D → 2D cascading gravity on 2-brane —
Francisco de Assis de Brito (UFCG)

In low dimensional DGP case four-dimensional gravity, as expected, is recovered at large distances on the 2-brane. On the other hand, the small distance behavior depends on the content of the induced gravity on the 2-brane. The propagators for higher-derivative massive gravity produce a new 'cascading gravity' 4D → 3D→ 2D. The localization of gravity on a 2-brane is physically well-justified since we can see our real 3+1-dimensional universe as a stack of 2+1-dimensional branes. Furthermore, this is also in the direction of the recently proposed "vanishing dimension" scenario where at high energy (or short scales) the physics appears to be lower dimensional.

Hadrons in holographic AdS/QCD models —
Henrique Boschi Filho (UFRJ)

In this presentation we make a review of various properties of hadrons that can be obained from holographic (higher dimensional) AdS/QCD models.

Two scalar field cosmology from coupled one-field models —
João Rafael Lúcio dos Santos (UFCG)

A possible description for the current accelerated expansion of the universe is quintessence dynamics. The basic idea of quintessence consists of analyzing cosmological scenarios driven by scalar fields. In this work we present some interesting features on the cosmological scenario obtained from the solutions of an effective two scalar field model in a flat space-time. This effective model was constructed by coupling two single scalar field systems in a nontrivial way via an extension method. The solutions related to the fields allowed us to compute analytical cosmological parameters. The behavior of these parameters are highlighted, as well as the different epochs obtained from them.

Fermionic Representation Space —
Júlio Marny Hoff da Silva (UNESP)

The attempt to establish the equivalent of a target space for fermions, culminating in a possible sigma model for fermions, resulted in a geometric approach to spinor space. After a quick review of this topic, we will show how we can make use of the topological classification of fermionic representation of space to connect invariants of the space to physical invariants.

Some aspects of self-duality and generalised BPS theories —
Luiz Agostinho Ferreira (USP)

If a scalar field theory in (1+1) dimensions possesses soliton solutions obeying first order BPS equations, then, in general, it is possible to find an infinite number of related field theories with BPS solitons which obey closely related BPS equations. We point out that this fact may be understood as a simple consequence of an appropriately generalised notion of self-duality. We show that this self-duality framework enables us to generalize to higher dimensions the construction of new solitons from already known solutions. By performing simple field transformations our procedure allows us to relate solitons with different topological properties. We present several interesting examples of such solitons in two and three dimensions.

New developments on topological defects in Lorentz-violating Field Scenarios —
Manoel Messias Ferreira (UFMA)

We begin reassing some developments on topological defects under the influence of Lorentz-violating terms accomplished in the latest years, highlighting the main new features induced by such violation. In the sequel we discuss the formation of topological BPS configurations in a gauged O(3) nonlinear sigma model, where CPT-even Lorentz-violating (LV) terms are introduced in both the gauge and σ-field non-Abelian sectors. Such as it happens in the usual gauged σ-model, purely magnetic self-dual configurations are allowed, maintaining some qualitative features of the standard ones. In a more involved configuration, Lorentz-violation provides new self-dual magnetic solutions carrying electric field but null total electric charge. In both cases, the total energy of the self-dual configurations turns out proportional to the topological charge of the model and to the LV parameters introduced in the σ-sector. It is shown that the LV terms yield magnetic flux reversion as well.

Five Dimensional $f(R)$ Braneworld Models —
Marco Dias (Unifesp)

After incorporating the $f(R)$ gravity into the general braneworld sum rules scope, it is shown that some particular class of warped five dimensional nonlinear braneworld models, which may be interesting for the hierarchy problem solution, still require a negative tension brane. For other classes of warp factors (suitable and not suitable for approaching the hierarchy problem) it is not necessary any negative brane tension in the compactification scheme. In this vein, it is argued that in the bulk $f(R)$ gravity context, some types of warp factors may be useful for approaching the hierarchy problem and for evading the necessity of a negative brane tension in the compactification scheme.

Radiation of particle in the wormhole spacetime —
Nail Khusnutdinov (Kazan Fed. Univ./UFABC)

We consider the total energy loss and spectral density of uniformly moving electrically charged particles in the spacetime of a wormhole with an infinitely short throat. We show that the total energy loss $\mathcal{E} \sim e^2 v\gamma a^2/b^3$, where γ is relativistic factor, a is the radius of the wormhole's throat and b is the impact factor. The spectrum of the energy for particles radially moving through the wormhole's throat $\mathcal{E} \sim e^2 v\gamma/a$. The spectral density of the total energy has a maximum at frequency $\omega_m \sim v\gamma/b$ and at $\omega_m \sim v\gamma/a$ for radial motion

Anomalous dimensions at high spin in AdS/CFT with flavour —
Nelson Ricardo de Freitas Braga (UFRJ)

The AdS/CFT duality provides an interesting way of calculating anomalous dimensions at high spin, for a gauge theory at strong coupling. A high spin operator, made of adjoint fields, is represented by (or dual to) a rotating open string in anti-de Sitter space. The anomalous dimension shows up, in the string side of the correspondence, simply as the difference between string energy and spin. On the other hand it is also know that it is possible to introduce matter degrees of freedom - fields in the fundamental representation of the gauge group - in the AdS/CFT duality by introducing probe (flavour) branes. This approach leads to a nice description of meson states. So, a natural question to be asked is: can one calculate the anomalous dimension for operators in the fundamental representation, like a quark anti-quark, using AdS/CFT? This question will be the main issue of this seminar. We will see that the presence of an energy scale makes it a non trivial task the identification of a quantity representing, in the string side, the dimension of the gauge theory operator. Searching for the solution to this problem, we found a new entry in the dictionary of AdS/CFT: the anomalous dimension at high spin is proportional to the string proper length. Also, we found strong indications that, in the case of a non conformal duality, the operator properties are obtained from measurements made by a local observer (not sensible to energy scales) in the anti-de Sitter space, while the description of the states comes from a coordinate time observer. (reference: JHEP 1408, 104 (2014) at ArXiv:1405.7388)

Cosmological solutions from Induced Matter Model applied to 5D $f(R, T)$ gravity and the shrinking of the extra coordinate —
Pedro Henrique Ribeiro da Silva Moraes (ITA)

In this work, I present exact cosmological solutions from Wesson's Induced Matter Model application to a general 5D metric in f(R,T) theory of gravity. The non-conservation of the energy-momentum tensor, predicted by f(R,T) theory, allows the derivation of a relation that describes the time evolution of the extra coordinate, revealing its compactification. It is showed that such a compactification could induce the effects of an accelerated expansion in the observable universe.

D-Oscillons in the Standard Model-Extension —
Rafael A. C. Correa (UFABC)

In this work we investigate the consequences of the Lorentz symmetry violation on extremely long-living, time-dependent, and spatially localized field configurations, named oscillons. This is accomplished in $(D+1)$ dimensions for two interacting scalar field theories in the so-called Standard Model-Extension context. We show that D-dimensional scalar field lumps can present a typical size $R_{min} \ll R_{\{KK\}}$, where $R_{\{KK\}}$ is the associated length scale of extra dimensions in Kaluza-Klein theories. Here, the size R_{min} is shown to strongly depend on the terms that control the Lorentz violation of the theory. This implies either contraction or dilation of the average radius R_{min}, and a new rule for its composition, likewise. Moreover, we show that the spatial dimensions for existence of oscillating lumps have an upper limit, opening new possibilities to probe the existence of a D -dimensional oscillons at TeV energy scale. Moreover, in a cosmological scenario with Lorentz symmetry breaking, we argue that in the early Universe with an extremely high energy density and a strong Lorentz violation, the typical size R_{min} was highly dilated. With the expansion and subsequent cooling of the Universe, we propose that it passed through a phase transition towards a Lorentz symmetry, wherein R_{min} tends to be compact.

Força entre átomos mediados por fótons massivos —
Reinaldo Farina de Melo Souza (UFRJ)

A interação entre átomos neutros e sem dipolos permanentes no vácuo somente é possvel devido à mecânica quântica. Esta interação é qualitativamente diferente nos regimes em que os átomos estão próximos (regime não-retardado ou força de van der Waals) ou quando estão distantes (regime retardado ou força de Casimir-Polder). A força se dá devido aos dipolos flutuantes presentes nos átomos e, portanto, possui um caráter eletromagnético. Os cálculos usuais lidam com campos descritos pela eletrodinâmica de Maxwell. Nesta apresentação estudamos a influncia de uma eventual massa do fóton na interação entre os átomos a partir da eletrodinâmica quãntica de Proca. Mostramos que a transição entre os limites retardado e não-retardado fica bastante mais rica neste quadro teórico. Além da motivação conceitual, mostramos que diversos resultados recentes na interação dispersiva podem ser interpretados a partir de nosso formalismo.

Another kind of analogue model: conformal smectics —
Ricardo A. Mosna (Unicamp)

We establish that equally-spaced smectic configurations enjoy an infinite-dimensional conformal symmetry and show that there is a natural map between them and null hypersurfaces in maximally-symmetric spacetimes. By choosing the appropriate conformal factor it is possible to restore additional symmetries of focal structures only found before for smectics on flat substrates.

Gravitação a partir da Teoria BF —
Ricardo Paszko (UFABC)

Nesta apresentação, veremos como a gravitação pode ser obtida, através de uma quebra de simetria do grupo SO(d+1) para SO(d), a partir da teoria BF topológica em d dimensões. Discutiremos também alguns problemas encontrados em sua quantização, bem como possíveis soluções.

TBA —
Roberto Menezes Serra (UFABC)

From Kinks to Compactons —
Roberto Menezes da Silva (UFPB)

This work deals with the presence of localized structures in relativistic systems described by a single real scalar field in two-dimensional spacetime. We concentrate on kinks and compactons in models with standard kinematics, and we develop a procedure that help us to smoothly go from kinks to compactons in the suggested scenario. We also show how the procedure works in the braneworld scenario, for flat brane in the five-dimensional spacetime with a single extra dimension of infinite extent. The brane unveils a hybrid profile when the kink becomes a compacton, behaving as a thick or thin brane, depending on the extra dimension being inside or outside a compact space.

Aspectos geométricos das ambiguidades de Gribov em teorias de Yang-Mills —
Rodrigo Ferreira Sobreiro (UFF)

Nas teorias de Yang-Mills, a quantização de Faddeev-Popov falha no regime de baixas energias. Nesta escala, a integral de caminho ainda sofre de configurações espúrias que não são eliminadas apenas pela fixação de calibre. Este problema é conhecido como ambiguidades de Gribov e as configurações espúrias são chamadas cópias de Gribov. Eliminar essas cópias é um problema altamente não trivial de resolver. De uma maneira geral, é sabido que para eliminar (pelo menos uma parte) essas cópias, é necessário alterar a geometria do espaço de configurações do campo de calibre de maneira que a integração funcional deve ser feita sobre um subespaço do espaço total de configurações. Ademais, este subespaço pode variar de calibre para calibre e possuir propriedades topológicas interessantes.

Opening the spinor Pandora's box —
Roldão da Rocha (UFABC)

An up-to-date status of regular and singular spinor fields and their vast applications is presented, based upon the unexpected plethora of new matter fields throughout the last decade. In particular, dark spinor fields shall be emphasized as well as their topological unique features.

Noncommutative $\mathbb{R}^d$ via closed star product —

Vladislav Kupriyanov (UFABC)

We consider linear star products on R^d of Lie algebra type. First we derive the closed formula for the polydifferential representation of the corresponding Lie algebra generators. Using this representation we define the Weyl star product on the dual of the Lie algebra. Then we construct a gauge operator relating the Weyl star product with the one which is closed with respect to some trace functional, $\mathrm{Tr}(f \star g) = \mathrm{Tr}(f \cdot g)$. We introduce the derivative operator on the algebra of the closed star product and show that the corresponding Leibnitz rule holds true up to a total derivative. As a particular example we study the space R^3_θ with $\mathfrak{su}(2)$ type noncommutativity and show that in this case the closed star product is the one obtained from the Duflo quantization map. As a result a Laplacian can be defined such that its commutative limit reproduces the ordinary commutative one. The deformed Leibnitz rule is applied to scalar field theory to derive conservation laws and the corresponding noncommutative currents.

Jordan Deformations in Quantum Systems —

Zhanna Kuznetsova (UFABC)

We consider non-commutative deformations of quantum systems via Drinfeld twist of associated algebras which contain Heisenberg algebra as a subalgebra. The Drinfeld twist deformations R matrix can be presented as a sum os basic R matrixcs of 2 types: abelian and Jordanian. The abelian deformation leads to non-commutativity with constant parameter and a Moyal product between functions. In physics it can be applied both on relativistic and non relativistic systems. The Jordanian has clear physical meaning if it is applied to relativistic systems. Snyder deformation is the most known example of this type. In the talk I will introduce Drinfeld twist deformations of the both type and discuss basic properties of them, including deformed multiparticle systems. After a short review on Jordanian deformation in literature I will discuss our recent results on light-cone Jordanian deformations, and its contribution on the properties of deformed systems: hermiticity, additivity, Casimir operators, etc.

Índice Remissivo