Field Theory

Dionisio Bazeia

Departamento de Física, Universidade Federal da Paraíba, Caixa Postal 5008, 58051-970 João Pessoa, PB, Brazil

We offer a summary of the talks, oral communications and posters presented at the field theory section of the XXIV Brazilian National Meeting on Particles and Fields.

The XXIV Brazilian National Meeting on Particles and Fields took place in Caxambú, MG, in the period 30 September-03 October, 2003. As it is now traditional, the meeting is formed by two main parts: Part A, which contains plenary and parallel talks, and Part B, which contains shorter oral communications and posters.

The Field Theory section of the 2003 meeting offered in Part A, 2 plenary talks and 3 parallel talks, and in Part B, 36 short oral communications and 130 posters.

In Part A, the first plenary talk was split into a set of three shorter talks of 20 minutes, delivered by professors Eduardo Marino, UFRJ, Nathan Berkovits, IFT, and Marcelo Gomes, IFUSP. Professor Eduardo Marino discussed on "Applications of Field Theory in Condensed Matter," focusing mainly on complex systems involving quantum Hall effect, high-T_c superconductors, and magnetic systems, which are hard to be understood with standard, long-standing ideas in condensed matter physics. Professor Nathan Berkovits talked on "Theoretical motivations for supersymmetry and superstrings," reviewing and emphasizing several good theoretical reasons to study supersymmetry and superstrings. Professor Marcelo Gomes commented on some "Basic problems in field theory," with emphasis on ideas and difficulties involved to formulate field theory in noncommutative spacetime.

The second plenary talk was delivered by professor Peter van Nieuwenhuizen, Stone Brook, USA. In his talk, entitled "Anomalies and quantum corrections to the mass and central charge of susy kinks and vortices," professor Peter van Nieuwenhuizen has shown that quantum corrections for BPS states such as kinks and vortices in supersymmetric models engenders subtleties and pitfalls. He has concentrated on mass and central charge, to illustrate the main problems with several calculations, using regularization schemes such as dimensional regularization, dimensional reduction, energy cut-off, mode number cut-off, and heat kernels.

The first parallel talk, entitled "Some conceptual problems in field theory," was delivered by professor Walter Wreszinski, IFUSP. In this talk, professor Wreszinski has discussed on the foundations of high energy physics, on perturbative and non-perturbative problems such as divergence, mass generation, vacuum energy, and triviality, bringing to our mind old and new issues which make field theory hard but fascinating. The second parallel talk was presented by professor Marco Kneipp, UERJ. In this talk, entitled "Monopoles, flux tubes and confinement in super Yang-Mills theories," one uses duality to see confinement of particles at strong coupling as the dual counterpart of the phase which supports monopoles at weak coupling, in supersymmetric Yang-Mills theories. Finally, the third parallel talk, entitled "Solitons and instantons in noncommutative field theories," was delivered by professor Fidel Schaposnik, La Plata, AR. The talk has dealt with the calculation of BPS and other classical solutions for solitons and instantons in noncommutative gauge field theories, including an extension of Witten's construction for non-Abelian solutions, which requires nontrivial gravitational background.

In Part A, we would like to emphasize the presence of supersymmetry as a guide to conduct investigations in several different contexts, as shown by professor Peter van Nieuwenhuizen, in the task of calculating quantum corrections imposed by BPS states named kinks and vortices, by professor Nathan Berkovits in string theory, by professor Marco Kneipp, for BPS monopoles in supersymmetric Yang-Mills theories, and finally by professor Fidel Schaposnik, for BPS states named vortices and instantons.

In Part B of the Brazilian meeting, 36 short oral communications were presented, and also, 130 posters crowded the poster section. The oral communications and posters discussed several distinct specific subjects on Field Theory. To give a better view of the problems explored in the meeting, we display in the Appendix all the short oral communications, which were delivered through two parallel daily sections.

In the Field Theory section of the XXIV Brazilian national meeting, if we add talks, oral communications and posters, we get to the total of 173 works. We have seen several articles published in important journals such as the Physical Review Letters, Physical Review D, Physics Letters B, Nuclear Physics B, Journal of High Energy Physics, etc. Also, we have counted several institutions in the meeting, 7% of them representing the ratio for foreign institutions. This percentage should be compared with others, representing institutions in Brazil, which were counted by region, giving the results: Southeast, 66%; Northeast, 15%; South, 6%; North, 4%; and Centerwest, 2%. Furthermore, we have searched the hep-th archive for Brazil, 2003, and we have found 118

hits. If we compare this number with the total of 166 oral communications and posters, we see that more than 70% of them become articles in the net.

The 173 works presented in this Brazilian meeting have focused on several subjects, with distinct motivations. To hint on this issue, we have collected the works by one or two distinct main motivations. We have had difficulties to classify all the works, and some of them were collected under the keyword *other,* because they have had few hits on keywords such as *conformal, discrete interaction, Gross-Neveu, high-temperature, Kalb-Ramond, quantum mechanics, renormalization, Thirring, etc.* We have used the keyword *higher-order derivative* as the lower bound to collect keywords, and this has led to the total of 25% for the keyword *other.* Thus, we could go on and classify the remaining 75% according to one or two keywords.

We have collected the keywords by number of hits. They are displayed in the table below, where we have also included a third column, showing hits for the respective keyword in the net, hep-th/03. The number 1% that we have found for applications in condensed matter in the net is a lower bound. We have found this mark searching in cond-mat/03 for keywords such as Hall, domain wall, vortices, superconductivity, etc, and counting only the articles from hep-th/03.

Keyword	Brazilian Meeting	hep-th/03
Appl. Cond. Mat.	15%	1%
Casimir	12%	2%
Noncommutative	10%	8%
Defects	9%	7%
QCD/YM	9%	5%
String	8%	25%
Chern-Simons	7%	3%
Duality	7%	6%
CPT/Lorentz viol.	6%	1%
Brane	4%	16%
Higher-order deriv.	3%	1%

The results displayed in this table show that the numbers for the Field Theory section of the 2003 Brazilian Meeting on Particles and Fields are very good, except for the keywords string and brane, which are well below the respective international marks.

Appendix

In this appendix we display all the short oral communications delivered in the meeting. They were presented in two parallel daily sections, as follows:

Day1.A. Chairman: Elcio Abdalla, IFUSP.

1. V.O. Rivelles, *Noncommutative field theories and gravity.*

2. E. Batista, *Noncommutative geometry and three dimensional quantum gravity.*

3. L.C.M. Albuquerque, J.L. de Lyra, P. Teotonio-Sobrinho, *Computing the dimension of space-time.*

4. I. Alves Jr., A.E. Gonçanves, *Entropy bounds for scalar fields in noncommutative flat manifolds.*

5. H.O. Girotti, M.Gomes, A.Yu. Petrov, V.O. Rivelles, A.J. da Silva, *Spontaneous symmetry breaking in three- and four-dimensional noncommutative field theory.*

6. M. Moriconi, *Teorias de campo não-comutativas e modelos integráveis em 2d.*

Day1.B. Chairman: Carlos Farina de Souza, UFRJ.

1. N.F. Svaiter, *The strong-coupling expansion and the ultra-local approximation in scalar theories.*

2. S. Joffily, *A conjectura de Hilbert-Polya e o vácuo quântico.*

3. R.O. Ramos, M.B. Pinto, J-L. Kneur, *Convergence of optimized perturbation theory in the critical O(N) $(\phi_i^2)_{3d}^2$ model.*

4. M.M. de Souza, *Discrete interactions in central force fields.*

5. A. Bytsenko, V.S. Mendes, A.C. Tort, *Thermodynamic of Abelian gauge fields in real hyperbolic spaces.*

6. F.A.B. Rangel, R.M. Cavalcanti, C. Farina, *Correções radiativas à energia de Casimir do modelo $\lambda\phi^4$ submetido a condições de contorno quase-periódicas.*

Day2.A. Chairwoman: Maria Tereza Thomaz, UFF.

1. A. Francisco Neto, P.A. Faria da Veiga, M.L. O'Carrol, *Existence of mesons and mass splitting in lattice QCD.*

2. A.P.C. Malbouisson, J.M.C. Malbouisson, A.E. Santana, J.C. da Silva, *Confinement in the 3-dimensional Gross-Neveu Model.*

3. M.T. Thomaz, O. Rojas, S.M. de Souza, E. V. C. Silva, *Thermodynamics of the anisotropic spin-S XXZ chain in the high temperature limit.*

4. L.S. Fassarella, *Estrutura modular da Física quântica local e a construção de modelos.*

5. J.L. Acebal, D.H.T. Franco, *Renormalization as an extension problem on the contour ordered formalism in FTFT.*

6. V.E.R. Lemes, M.S. Sarandy, R.F. Sobreiro, S.P. Sorella, D. Dudal, H. Vercshelde, M. Picariello, J.A. Gracey, *A dimensão anômala do operador gluon-ghost de Yang-Mills.*

Day2.B. Chairman: Itzhak Roditi, CBPF.

1. F.J. Vanhecke, C. Sigaud, A.R. da Silva, *Classical principal fibre bundles from a quantum group viewpoint.*

2. F. Toppan, *Exceptional structures in mathematics and physics.*

3. J. Jayaraman, R. de Lima Rodrigues, A.N. Vaidya *The non-relativistic limit of the Dirac oscillator in terms of Clifford.*

4. G.J. Ananos, H.E. Camblong, C.R. Ordonez, *SO(2,1) conformal anomaly: beyond contact interactions.*

5. G. Berredo-Peixoto, I.L. Shapiro, *Conformal quantum gravity with the Gauss-Bonnet term.*

6. C.Wotzasek, M.S. Guimaraes, D.D. Rocha, J.L. Noronha, *On the dimensional dependence of duality groups for massive p-forms.*

Day3.A. Chairman: Victor Rivelles, IFUSP.

1. F.A. Brito, D. Bazeia, J.R. Nascimento, *Tachyons and braneworlds.*

2. M.D. Maia, *Modos de Kaluza-Klein massivos em teoria de branas.*

3. W. Spalenza, O. Piguet, C.P. Constantinidis, *Generalized Blau-Thompson gauge-fixing with Batalin-Vilkovisky method on superspace.*

4. E.R. Bezerra de Mello, A.A. Saharian, *Spinor Casimir densities for a spherical shell in the global monopole spacetime.*

5. V. Pershin, *Superstrings corrections to super-Yang-Mills and supergravity from the pure spinors formalism.*

6. R. Medina, *Towards the R^5 terms in the closed superstring effective action.*

Day3.B. Chairman: Carlos Alberto Almeida, UFC.

1. A.T. Suzuki, J.H.O. Sales, *Can two or more gauge bosons propagate in the light-front?*

2. R. Bentin, *Non decoupling ghosts in the light cone gauge.*

3. R. Casana, B.M. Pimentel, J.S. Valverde, V.G. Zima, *Massless DKP theory and pseudoclassical mechanics.*

4. F.E.A. Santos, C.A.S. Almeida, *Propriedades estatísticas de sólitons topológicos em cadeias poliméricas.*

5. H.A. Tarôco, A.L. Mota, *Application of the $\lambda \phi^4$ model to electrochemical deposition.*

6. S. Gavrilov, R. Fresneda, D. Gitman, P. Moshin, *Quantization of spinning particle in 2+1 dimensions.*