T(R)OPICAL QCD II
CAIRNS – AUSTRALIA
26 September-01 October 2010

ABSTRACTS

1 - BASHIR, Adnan
University of Michoacan, MEXICO

Title: Number of Flavours and Dynamics of Gauge Theories
Time: Tuesday, 28 September 2010, 17.30-18.00, TALK

Abstract: Schwinger-Dyson Equations are a natural platform to study inherently non perturbative phenomena such as dynamical chiral symmetry breaking and confinement. We discuss some aspects of these phenomena in strongly interacting theories.

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2 - BURKARDT, Matthias
New Mexico State University, USA

Title: Transverse (Spin) Structure of Hadrons
Time: Monday, 27 September 2010, 15.30 – 16.00, TALK

Abstract: I will explain connections between deeply-virtual Compton scattering, the distribution of quarks in transverse position space, transverse single-spin asymmetries in DIS and DY, and twist-3 quark-gluon correlations.

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3 - CARROLL, Jonathan
CSSM, University of Adelaide, AUSTRALIA

Title: The Proton; Size Does Matter
Time: Monday, 27 September 2010, 16.00 – 16.30, TALK

Abstract: The radius of the proton has previously been constrained most precisely by atomic spectroscopy of hydrogen. In July this year, Pohl et. al. published a measurement of an energy transition in muonic hydrogen which improves the precision of the proton radius due to the Bohr radius being approximately 200 times smaller in that case, enhancing the various effects related to the finite size of the proton. To much surprise, the more precise value differs from the CODATA value by 4% which, owing to the precision of the original calculation, amounts to a difference of 5 standard deviations.

The extraction of the proton radius from these measurements relies on bound-state QED, so we are faced with three options: either the measurements are inaccurate, the most successful theory in physics is wrong, or an aspect of the theory has been overlooked. We investigate the last of these in an attempt to reconcile the measurement with theory.

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4 - CASEY, Andrew

CSSM, University of Adelaide, AUSTRALIA

Title: Gluonic Spin Contribution to Proton Spin
Time: Tuesday, 28 September 2010, 18.15-20.00, POSTER

Abstract: In 1988, when the EMC results showed that the quarks had a much smaller contribution to the spin of the proton than previously thought, the "Proton Spin Crisis" began. Since then, considerable effort has been inserted into discovering the main contributors to proton spin and how much each contributes. One such contributor is the gluonic spin component. QCD NLO Evolution Equations are combined with boundary conditions obtained from heavy quark decoupling expressions to evolve the equations from infinity to the mass of the charm quark in order to determine gluonic spin contribution to proton spin.

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5 - COHEN, Thomas

University of Maryland, USA

Title : The Large Nc Limits of QCD
Time: Tuesday, 28 September 2010, 15.00-15.30, TALK

Abstract: The large Nc limit of QCD has proven to be a useful tool giving important insights into hadronic physics. However, the large Nc limit is not unique---there is more than one way to generalize from Nc colors of quarks to an infinite number. In particular, one can consider quarks in the two-index anti-symmetric represention; at Nc=3 this agrees with quarks in the fundamental representation but it extrapolates to a distinct large Nc limit. This talk explores the theoretical and phenomenological implications of these different variants of large Nc QCD in both nuclear and hadronic physics.

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6 - CUCCHIERI, Attilio

IFSC - University of Sao Paulo, Brazil

Title: Feynman Gauge on the Lattice: New Results and Perspectives
Time: Tuesday, 28 September 2010, 9.00-9.30, TALK

Abstract: Recently we have introduced a new implementation of the Feynman gauge on the lattice, based on a minimizing functional that extends in a natural way the Landau-gauge case, while preserving all the properties of the continuum formulation. The only remaining difficulty with our approach is that, using the standard (compact) discretization, the gluon field is bounded while the four-divergence of the gluon field satisfies a Gaussian distribution, i.e. it is unbounded. This can give rise to convergence problems when a numerical implementation is attempted. In order to overcome this problem one can use different discretizations for the gluon field or consider a SU(N) group with N sufficiently large. Here we discuss these two possible solutions and present results for the transverse and longitudinal gluon propagators.

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7 - DE FORCRAND, Philippe
ETH Zurich & CERN, SWITZERLAND

Title: Nuclear Physics from Lattice QCD at Strong Coupling
Time: Thursday, 30 September 2010, 16.00-16.30, TALK

Abstract: In the strong coupling limit, the properties of lattice QCD at finite density can be completely elucidated, including the phase diagram and the properties of nuclear matter. A nuclear potential of Yukawa form appears naturally.

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8 - DE VITA, Raffaella
INFN – Genova, Italy

Title: Meson Spectroscopy At CLAS And CLAS12: the Present and the Future
Time: Thursday, 30 September 2010, 14.00-14.30, TALK

Abstract: Mesons are the simplest quark bound system, being made by a quark and an anti-quark pair. Studying their structure and properties is a fundamental step to reach a deep understanding of QCD. For this purpose both a precise determination of the meson spectrum for conventional states and the search for states beyond the simple $q\bar q$ configurations, as hybrids (qqg) or glueballs, are needed. Finding evidence for these unconventional states would help in understanding some of the open issues in hadronic physics, as how the quarks are confined within hadrons and what is the role of gluons. These topics are presently studied with the CLAS detector at Jefferson Lab and will be studied with the novel CLAS12 experiment after the 12 GeV upgrade of the facility. In my talk I will present the physics program that is presently in progress and the future perspectives.

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9 - El BAKRY, Ahmed
CSSM, University of Adelaide, AUSTRALIA

Title: Thermal Delocalization of the Flux Tubes in Static Mesons and Baryons
Time: Friday, 1 October 2010, 10.30-11.00, TALK

Abstract: The gluon action density in a static mesonic system is analyzed at finite temperature using lattice QCD techniques in quenched QCD. The obtained results are compared to predictions of bosonic string models for the flux-tube profiles to understand the changes of the flux-tubes profiles with temperature. The mesonic flux tube curved-width profile is found to compare well with that of the bosonic string at large distances. In the intermediate distance region, a bosonic string behaviour is observed for analysis performed on highly UV-filtered gauge configurations. Extending the analysis to the static baryon reveals a delocalization of the baryonic node in the Y-shape gluonic configuration observed at zero temperature. At finite temperature, a filled delta-shaped configuration is observed, even at large distances. Similarly, we find the baryonic string model predicts a delocalization of the baryonic node at high temperature.

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10 - FRIED, Herbert
Brown University, USA

Title: Gauge-Invariant QCD and Effective Locality
Time: Monday, 27 September 2010, 11.00 – 11.30, TALK

Abstract: A new, non-perturbative gauge-invariant method for summing over all gluon interactions between quarks and/or antiquarks is described. A new property called "effective locality" appears, in which the main functional integral is replaced by a set of ordinary integrals susceptible to numerical integration. A first application produces Binding Potentials for Q-Qbar and QQQ systems.

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11 - GLOZMAN, Leonid
University of Graz, AUSTRIA

Title: Chiral and Angular Momentum Content of ρ and ρ′ Mesons from Dynamical Lattice Simulations
Time: Tuesday, 28 September 2010, 11.00-11.30, TALK

Abstract: Chiral symmetry breaking in the ground state rho-meson indicates that its wave function in the infrared is a strong mixture of two chiral representations (0,1)+(1,0) and (1/2,1/2). It is established in dynamical lattice simulations that indeed the ρ is a superposition of both representations, has no distinct chiral partner, and in the infrared it is approximately a 3S1 partial wave which is consistent with the quark model. Effective chiral restoration in an excited ρ-meson would require that in the infrared this meson couples predominantly to one of the two representations. Our results for the first excited state of the ρ -meson, ρ(1450), point out that in the infrared a leading contribution to ρ' comes from (1/2,1/2), in contrast with ρ. Then its approximate chiral partner is a h1 (1380) meson. The rho' wave function contains a significant contribution of the 3D1 wave, while the quark model predicts ρ' to be a radial excitation of ρ , i.e., the 3S1 state.

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12 - HALL, Jonathan
CSSM, University of Adelaide, AUSTRALIA

Title: Chiral Effective Field Theory Beyond the Power Counting Regime
Time: Tuesday, 28 September 2010, 12.00-12.30, TALK

Abstract: Chiral effective field theory complements lattice QCD by providing a model-independent formalism for connecting lattice simulation results at finite volume and a variety of quark masses to the physical world. The asymptotic nature of the chiral expansion places the focus on the first few terms of the expansion. Thus, knowledge of the power counting regime (PCR) of chiral effective field theory, where higher-order terms of the expansion may be regarded as negligible, is as important as knowledge of the expansion itself. Through the consideration of a variety of renormalization schemes and associated parameters, techniques to identify the PCR where results are independent of the renormalization scheme are established. The nucleon mass is considered as a benchmark for illustrating this general approach. Because the PCR is small, the numerical simulation results are also examined to search for the possible presence of an intrinsic scale which may be used in a nonperturbative manner to describe lattice simulation results outside of the PCR. Positive results that improve on the current optimistic

application of chiral perturbation theory beyond the PCR are reported. The techniques developed for the nucleon mass renormalization are then applied to the case of the quenched rho meson mass and the nucleon isovector magnetic moment and electric charge radius.

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13 - HALL, Nathan

CSSM, University of Adelaide, AUSTRALIA

Title: Nucleon Axial Form Factor in a Finite Volume
Time: Tuesday, 28 September 2010, 18.15-20.00, POSTER

Abstract: As part of ensuring that the results from the lattice are physically meaningful, it is important to understand what effects the finite nature of the lattice has on physical calculations. In order to get a better understanding of how the size of the lattice effects the properties of the nucleon, we look at the model known as the hedgehog and see how its form factor $G_A(Q^2)$ varies with lattice length L. In particular we study the case for which the momentum Q^2 is finite.

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14 - HATSUDA, Tetsuo

University Tokyo, JAPAN

Title: Baryon-Baryon Forces from Lattice QCD
Time: Friday, 1 October 2010, 11.30-12.00, TALK

Abstract: I discuss the recent derivation of the nuclear force and hyperon forces from (2+1)-flavor lattice QCD simulations by HAL QCD Collaboration.

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15 – JANSEN, Karl

NIC, DESY, Zeuthen, GERMANY

Title: Light Quarks with Maximally Twisted Mass Fermions
Time: Tuesday, 28 September 2010, 9.30-10.00, TALK

Abstract: We describe a particular formulation of lattice QCD, the so-called twisted mass fermion approach. We show that these kind of lattice fermions have several advantages such as automatic O(a)-improvement and an explicit infrared regularization. We demonstrate that with this approach light quark masses can be simulated and present results for the meson and baryon spectrum, decay constants, quark masses and form factors for two flavours of mass-degenerate quarks. We also discuss first results when a dynamical strange and charm quark is taken into account.

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16 - KAMLEH, Waseem

CSSM, University of Adelaide, AUSTRALIA

Title: Polynomial Filtering for a Single Fermion Flavour in Lattice QCD
Time: Tuesday, 28 September 2010, 10.00-10.30, TALK

Abstract: Polynomial filtering provides a means to separate the QCD fermion action into different scales, allowing for efficient use of a Sexton-Weingarten integration scheme. Previously this has been presented for two degenerate fermion fields. We present extensions that allow polynomial filtering for a single flavour. Of key importance is a generalised leapfrog integration scheme that allows for greater flexibility in assigning a simulation time scale to a particular component of the action.

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17 – KIZILERSU, Ayse

CSSM, University of Adelaide, AUSTRALIA

Title: Non-Perturbative QED Analysis with Schwinger Dyson Equations
Time: Thursday, 30 September 2010, 12.00-12.30, TALK

Abstract: A comprehensive summary of recent numerical studies of the Schwinger-Dyson equations for unquenched QED in four dimensions will be presented. In this study we used the regularisation-independent method with a recently proposed unquenched fermion-boson vertex that preserves multiplicative renormalisability. Besides the fermion and boson propagators, the dynamical mass generation will also be discussed within the framework of unquenched QED.

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18 - LEINWEBER, Derek

CSSM, University of Adelaide, AUSTRALIA

Title: Excited States of The Nucleon in 2+1 Flavour QCD
Time: Monday, 27 September 2010, 17.00-17.30, TALK

Abstract: Recent developments on the determination of the spin-1/2 spectrum of the nucleon in full QCD are presented. Our focus is on the PACS-CS 2+1 flavour configurations made available through the ILDG. Using correlation matrix techniques, in which a wide variety of gauge-invariant Gaussian-smeared fermion propagator sources and sinks are considered, excited states are determined. We consider several correlation matrices of various sizes, each constructed with a different set of basis interpolators, in order to demonstrate the invariance of the eigenstates on the basis choice. Of particular interest is the approach to the elusive Roper resonance and the nature of the level crossing between the lowest-lying even- and odd-parity eigenstates as the quark masses approach their physical values. We report new results in full QCD which differ significantly from that observed in the quenched approximation, providing further insight into QCD dynamics.

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19 - LIU, Yu-Xin

Peking University, CHINA

Title: Phase Transitions of Strong Interaction System in Dyson-Schwinger Equation Approach
Time: Tuesday, 28 September 2010, 17.00-17.30, TALK

Abstract: The theoretical approaches implemented to study the phase transitions in strong interaction system should, in principle, possess not only the dynamical breaking of chiral symmetry and its restoration, but also the feature of color confinement and deconfinement. It has been shown that Dyson-Schwinger (DS) equation approach of QCD is the one with solid enough QCD foundation and satisfies the above two requirements simultaneously. On the other hand, the aspects influencing the phase structure of strong interaction system include not only the temperature and the density (or chemical potential) but also the running coupling strength, the current quark mass, the color-flavor structure and other intrinsic ones. We study the phase transitions of strong interaction system in the DS equation approach. We show that, if the running coupling strength is larger than a critical value, on a bounded, measurable domain of non-negative current-quark mass, the QCD's gap equation admits simultaneously two inequivalent dynamical chiral symmetry broken (DCSB, or Nambu) solutions with different signs and a Wigner solution that is unambiguously connected with the realization of dynamical chiral symmetry(DCS) as the current quark mass is small. However, the Wigner solution and the negative Nambu solution are destabilized by a current-quark mass and they disappear when the current mass exceeds a critical value. Meanwhile, the dynamical chiral quark condensate vanishes. It indicates that this critical current mass bounds the domain on which the surviving DCSB solution possesses a chiral expansion and only the explicit chiral symmetry breaking plays role as the current mass is larger than such a critical value. We also find that once the chemical potential reaches a critical value, the matter with DCSB appears and chiral symmetry is partially restored. As the chemical increases further, the DCS can be restored completely. We give then the QCD phase diagram with the coexisting (or quarkyonic) region and the critical end-point being represented well. In addition, we provide an astronomical signal which can distinguish the newly born strange quark star from the neutron star, or in other word, identify the deconfinement phase transition in dense matter.

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20 - MATEVOSYAN, Hrayr

CSSM, University of Adelaide, AUSTRALIA

Title: Fragmentation Functions from NJL-Jet Model
Time: Friday, 1 October 2010, 15.00-15.30, TALK

Abstract: NJL-jet model provides a sound framework for calculating the fragmentation functions in an effective chiral quark theory, where the momentum and isospin sum rules are satisfied without the introduction of ad hoc parameters. The earlier studies of the Pion fragmentation functions using the Nambu-Jona-Lasinio (NJL) model within the framework showed good qualitative agreement with the empirical parameterizations. Here we extend the NJL-jet model by including the strange quark as well as the quark fragmentation channels into vector mesons. The corrections to the pion fragmentation function and corresponding Kaon fragmentation functions are calculated using the elementary quark to quark-meson splitting functions from NJL. The results for the Kaon fragmentation function exhibit a qualitative agreement with the empirical parameterizations, while the unfavored strange quark fragmentation to Pions is shown to be of the same order of magnitude as the unfavored light quark's.

21 - MELNITCHOUK, Wally
Jefferson Lab, USA

Title: Weak Charge of the Proton: Loop Corrections to Parity-Violating Electron Scattering
Time: Friday, 1 October 2010, 12.00-12.30, TALK

Abstract: Electromagnetic two-photon exchange corrections have been found to play an important role in the resolution of the proton electric to magnetic form factor discrepancy from Rosenbluth and polarization transfer experiments. More recently corrections to parity-violating electron scattering from the interference of photon and Z-boson exchange have been computed using dispersion relations in the forward scattering limit. We review the status of the two boson-exchange corrections and assess their impact on planned experiments aiming to extract the weak charge of the proton.

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22 - MENADUE, Benjamin
CSSM, University of Adelaide, AUSTRALIA

Title: Extracting Low-Lying Lambda Resonances Using Correlation Matrix Techniques
Time: Tuesday, 28 September 2010, 18.15-20.00, POSTER

Abstract: The first excited state of the Lambda particle lies low in mass at 1405 MeV, generating decades of speculation on its internal structure. Not only does this resonance lie lower than the first-excited state of the nucleon (which has no strange valence quarks), it also has negative parity, usually associated with orbital angular momentum which tends to increase the energy. The first excited state usually has positive parity. As such there have been many studies of the Lambda particle using Lattice QCD, in an attempt to determine the structure and properties of this resonance. However, all studies to date have failed to extract a low-lying state. Recent work by the CSSM Lattice Collaboration has shown that correlation-matrix techniques with smeared operators can produce a strong coupling to the low-lying states of the nucleon. Here we apply this approach to the Lambda particle to isolate this otherwise elusive state.

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23 – MIRANSKY, Vladimir
University of Western Ontario, CANADA

Title: Chiral Asymmetry of the Fermi Surface in Dense Relativistic Matter in a Magnetic Field
Time: Tuesday, 28 September 2010, 16.30-17.00, TALK

Abstract: It is revealed that in the normal phase of dense relativistic matter in a magnetic field, there exists a contribution to the axial current associated with a relative shift of the longitudinal momenta in the dispersion relations of opposite chirality fermions. Unlike the topological contribution in the axial current at the lowest Landau level, recently discussed in the literature, the dynamical one appears only in interacting matter and affects the fermions in all Landau levels, including those around the Fermi surface. The induced axial current and the shift of the Fermi surfaces of the left-handed and right-handed fermions are expected to play an important role in transport and emission properties of matter in various types of compact stars as well as in heavy ion collisions.

24 - MORNINGSTAR, Colin
Carnegie Mellon University, USA

Title: Excited States Using the Stochastic Laph Method
Time: Thursday, 30 September 2010, 9.30-10.00, TALK

Abstract: Progress in extracting excited-state hadron masses in lattice QCD using sets of spatially-extended single- and multi-hadron operators is presented. Stochastic estimates of quark propagators with variance reduction and Laph smearing of the quark fields are used. Such techniques are crucial for incorporating multi-hadron operators into the correlation matrices.

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25 - MU, Chengfu
Peking University, CHINA

Title: Evaluating the Phase Diagram at Finite Isospin and Baryon Chemical Potentials in the Nambu-Jona-Lasinio Model
Time: Thursday, 30 September 2010, 16.30-17.00, TALK

Abstract: We study the phase diagram of two flavor dense QCD at finite isospin and baryon chemical potentials. The μ_I - μ_B phase diagram shows a rich phase structure since the system undergoes a crossover from a Bose-Einstein condensate of charged pions to a BCS superfluid with condensed quark, Antiquark Cooper pairs. We observe a gapless pion condensation phase near a quadruple point. An inhomogeneous LOFF superfluid phase appears in a window of μ_B. Between the gapless and the LOFF phases, the pion superfluid phase and the normal quark matter phase are connected by a first order phase transition.

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26 - NEUBERT, Sebastian
TU Munich, GERMANY

Title: Hadron Spectroscopy at COMPASS
Time: Friday, 1 October 2010, 17.00-17.30, TALK

Abstract: COMPASS is a large-acceptance fixed-target experiment at the CERN SPS, which investigates the structure and spectroscopy of hadrons. In 2004, 2008 and 2009 COMPASS took dedicated spectroscopy data using diffractive dissociation of 190 GeV hadronic beams on protons and nuclear targets to access meson resonances with masses up to 3 GeV c^2. The status of the data analysis in several channels will be presented and the employed amplitude analysis techniques will be discussed.

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27 - OHTA, Shigemi
IPNS/KEK and SOKENDAI and RBRC, JAPAN

Title: Nucleon Structure from 2+1f Dynamical DWF Lattice QCD
Time: Thursday, 30 September 2010, 14.30-15.00, TALK

Abstract: Current status of nucleon structure calculations with RBC+UKQCD 2+1f dynamical DWF lattice QCD will be reported: with a new combination of Iwasaki and dislocation suppressing determinant ratio (DSDR) gauge actions, the calculations are performed at pion mass of about 180 and 250 MeV at a lattice cut off of about 1.4 GeV and spatial volume of about 4.6 fm across.

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28 - PEPE, Michele

INFN-Milan Bicocca, ITALY

Title: String Effects in the Yang-Mills Theory
Time: Friday, 1 October 2010, 10.00-10.30, TALK

Abstract: The low-energy dynamics of the color flux tube connecting a quark-antiquark pair in the Yang-Mills theory can be described by an effective 2-dimensional string theory. This picture has far-reaching consequences and provides precise quantitative predictions. I will present the results of numerical investigations in SU(N) Yang-Mills theory on the following topics:

- The broadening of the color flux tube
- The decay of unstable strings
- The Luescher term for k-strings

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29 - PRIMER, Thomas

CSSM, University of Adelaide, AUSTRALIA

Title: Magnetic Properties of the Proton and Neutron
Time: Tuesday, 28 September 2010, 18.15-20.00, POSTER

Abstract: The magnetic moment and magnetic polarisability are important fundamental properties of particles such as the proton. They describe the interaction with and response to an applied magnetic field. The ability to calculate values for these observables from the first principles of QCD at the quark level is at the leading edge of lattice QCD research. An overview of how these calculations are performed on the lattice is presented. A quantised magnetic field is applied to the periodic space-time lattice using the background-field method. Values of the magnetic moment and magnetic polarisability for the proton and neutron are reported using this method. These values are calculated on a large lattice, allowing for a reasonably small magnetic field strength, making these some of the world's first quantitative results.

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30 - QIN, Sixue

Peking University, CHINA

Title: Excitation Properties of Hot Quark Matter
Time: Tuesday, 28 September 2010, 18.15-20.00, POSTER

Abstract: In this paper we study excitation properties of hot quark matter by DSE at finite temperature. Through extracting spectral functions of quark propagator via the Maximum Entropy Method (MEM), we can analyze excitation modes of the system and their

dispersion relations. Our results show that there is a new excitation mode beyond quenched lattice QCD and hard-thermal-loop perturbative calculations. We find that the new mode corresponds to long-rang correlations which may be responsible for the properties of QGP.

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31 - QUINTERO, Jose-Rodriguez

Universidad de Huelva, SPAIN

Title: The Low-Momentum Ghost Dressing Function, the Gluon Mass and the Transition Between Decoupling and Scaling IR Solutions
Time: Thursday, 30 September 2010, 11.30-12.00, TALK

Abstract: We study both regular (the zero-momentum ghost dressing function not diverging), also named decoupling, and critical (diverging), also named scaling, Yang-Mills propagators solutions by analyzing the low-momentum behaviour of the ghost propagator Dyson-Schwinger equation (DSE) in Landau gauge, assuming for the truncation a constant ghost-gluon vertex, as it is extensively done, and a simple model for a massive gluon propagator. The asymptotic expression obtained for the regular or decoupling ghost dressing function up to the order ${\cal O}(q2)$ is proven to fit pretty well the low-momentum ghost propagator obtained through the numerical integration of the coupled gluon and ghost DSE in the PT-BFM scheme. A transition from decoupling solutions to the scaling one, when the size of the coupling renormalized at some scale approaches some critical value, seems to be indicated by the PT-BFM results; although the scaling solution only emerges at the critical value when the zero-momentum gluon propagator is assumed to vanish as a consequence of the ghost dominance in the gluon propagator DSE.

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32 – REINHARDT, Hugo

Tubingen University, GERMANY

Title: Hamiltonian Approach to Yang-Mills Theory in Coulomb Gauge
Time: Friday, 1 October 2010, 9.30-10.00, TALK

Abstract: I review recent results obtained within the Hamiltonian approach to Yang-Mills theory in Coulomb gauge. In particular, a general method for treating non-Gaussian wave functionals in quantum field theory is presented and applied to include 3- and 4- gluon vertices in the exponential of the vacuum wave functional. Furthermore a new Hamiltonian renormalisation group flow equation for Yang-Mills theory in Coulomb gauge is derived and solved for the static gluon and ghost propagators under the assumption of a bare ghost gluon vertex and ghost dominance. The resulting propagators are compared with lattice data and results obtained from the Dyson-Schwinger equations following from the variational solution of the Yang-Mills Schrodinger equation.

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33 - RIBEIRO, Jose Emilio F.T.

CFIF-IST, Universidade Tecnica de Lisboa, PORTUGAL

Title: QCD Relics of Astrophysical Relevance
Time: Tuesday, 28 September 2010, 11.30-12.00, TALK

Abstract: Chiral symmetry breaking in QCD suggests the possibility of the astrophysical existence of domains with radius of the order of few kilometres. Effective action formalism together with the Tolman-Oppenheimer-Volkoff equations are used to describe such objects in the presence of gravity. It turns out that these domains would appear dark to an external observer.

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34 - RICHARDS, David

Jefferson Laboratory, USA

Title: First-Principles Calculations of the Excited-State Spectrum of QCD
Time: Thursday, 30 September 2010, 9.30-10.00, TALK

Abstract: The low-lying spectrum of QCD has long been the benchmark calculation of lattice QCD. Recently, there has been a resurgence of interest in spectroscopy, with major experimental initiatives in both the heavy and light-quark sectors. In this talk, I describe recent advances by the Hadron Spectrum Calculation aimed at ab initio calculations of the excited spectrum of QCD. In particular, I present results on both the excited meson spectrum, including states with exotic quantum numbers, and the excited baryon spectrum, for hadrons composed of the light (u,d,s) quarks. I describe how the lattice calculations provide insight into the effective degrees of freedom of QCD, and the prospects for future calculations.

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35 - ROBERTS, Craig

Argonne National Laboratory, USA

Title: T(r)opical Dyson-Schwinger Equations
Time: Thursday, 30 September 2010, 11.00-11.30, TALK

Abstract: Quantum Chromodynamics (QCD) is supposed to describe the physics of pions, neutrons, protons; indeed, all hadrons. Hadron physics is unique at the cutting edge of modern science because Nature has provided us with just one instance of a fundamental strongly interacting theory; i.e., QCD. The community of science has never before confronted such a challenge as solving this theory. The physics of hadrons is dominated by two emergent phenomena: confinement; namely, the theory's elementary degrees-of-freedom have never been detected in isolation; and dynamical chiral symmetry breaking (DCSB), which is a remarkably effective mass generating mechanism that is responsible for the mass of more than 98% of visible matter in the Universe. These phenomena are not apparent in QCD, Äôs Lagrangian, yet they play a principal role in determining Nature, Âôs observable characteristics. I will describe how the Dyson-Schwinger equations (DSEs) of QCD: explain the origin and nature! of DCSB; and have been used to elucidate some of its far-reaching consequences. The DSEs make plain that, in solving QCD, a constructive feedback between theory and extant and forthcoming experiments will most rapidly enable progress.

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36 - ROBERTS, Dale

CSSM, University of Adelaide, AUSTRALIA

Title: Shape of the Proton in a Uniform Magnetic Field
Time: Tuesday, 28 September 2010, 18.15-20.00, POSTER

Abstract: We calculate the wave functions of the quarks in the ground state of the proton, and how they are affected in the presence of a uniform background magnetic field. We focus on wave functions in the Landau and Coulomb gauges. When the quarks are annihilated at different lattice sites, we observe the formation of a scalar u-d diquark pair within the proton in the Landau gauge, which is not present in the Coulomb gauge. The overall distortion of the wave function under a very large magnetic field, as demanded by the quantization conditions of the field, is quite small.

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37 – SANTOPINTO, Elena

INFN (Genoa), ITALY

Title: Unquenched Quark Model
Time : Thursday, 30 September 2010, 13.30-14.00, TALK

Abstract: The formalism for a new generation of unquenched quark models for baryons in which the effects of quark-antiquark pairs($u\bar{u}$,$d \bar{d}$ and $s \bar{s}$) are taken into account at the quark level in an explicit form via a microscopic, QCD-inspired, quark-antiquark creation mechanism, has been constructed [1]. Applications [1] to the spin of the proton, magnetic moments of the baryons and flavour asymmetry will be discussed.

[1] Bijker R, Santopinto E , PHYSICAL REVIEW C Volume: 80 Issue: 6 Article Number: 065210 Published: DEC 2009

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38 - SCHIERHOLZ, Gerrit

DESY, GERMANY

Title: Hadron Resonances and Decays from the Lattice
Time: Thursday, 30 September 2010, 9.00-9.30, TALK

Abstract: Using established relations between the scattering matrix in infinite volume and the two-particle spectrum in a periodic box, masses and decay widths of low-lying meson and baryon resonances are determined.

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39 – SHEPHERD, Matthew

Indiana University, USA

Title: Exploring QCD in Decays of Charmonium
Time: Monday, 27 September 2010, 11.30-12.00, TALK

Abstract: In recent years both the CLEO-c and BES III collaborations have acquired large data samples in the Charmonium region. These data have proven useful in studying a variety of QCD phenomenon. I'll present a summary of recent QCD-related results from

these experiments in addition to discussing techniques for doing light hadron spectroscopy using Charmonium.

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40 - SZCZEPANIAK, Adam

Indiana University, USA

Title: Application of Dispersion Relations in Partial Wave Analysis
Time Tuesday, 28 September 2010, 15.30-16.00, TALK

Abstract: I will discuss DR in PWA of meson pair production. In particular will focus on the role of inelasticities and re-scattering in 3pi production

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41 - TAYLOR, Geoff

University of Melbourne, AUSTRALIA

Title: Plans for the ARC Centre of Excellence for Particle Physics at the Tera-Scale
Time: Thursday, 30 September 2010, 15.30-16.00, TALK

Abstract: TBA

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42 - THOMAS, Tony

CSSM, University of Adelaide, AUSTRALIA

Title: Low Energy Tests of the Standard Model
Time: Friday, 1 October 2010, 17.30-18.00, TALK

Abstract: TBA

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43 - TSUSHIMA, Kazuo

CSSM, University of Adelaide, AUSTRALIA

Title: In-Medium J / Ψ Mass and J / Ψ -Nuclear Bound States
Time: Monday, 27 September 2010, 17.30-18.00, TALK

Abstract: J / Ψ mass shift in a cold nuclear matter is computed. Contributions from the color-singlet mechanism, the D and D* meson loops are evaluated in the J / Ψ self-energy, using the in-medium D and D* masses obtained in the quark-meson coupling model. The J / Ψ mass shift due to the loops at normal nuclear matter density is found to range -16 to -24 MeV. We also plan to report the J / Ψ -nuclear bound state energies calculated for several nuclei.

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44 – WANG, Ping
Institute of High Energy Physics, CAS, CHINA

Title: The First Moments of Nucleon GPDs
Time: Friday, 1 October 2010, 15.30-16.00, TALK

Abstract: We extrapolate the first moments of the generalized parton distributions using heavy baryon chiral perturbation theory. The calculation is based on the one loop level with the finite range regularization. The description of the lattice data is satisfactory and the extrapolated moments at physical pion mass are consistent with the results obtained with dimensional regularization.

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45 – WEBER, Fridolin
San Diego State University, USA

Title: QCD in Neutron Stars and Strange Stars
Time: Monday, 27 September 2010, 10.00-10.30, TALK

Abstract: This work is supported by the National Science Foundation under Grant PHY-0854699.

Neutron stars contain matter in one of the densest forms found in the Universe. This feature, together with the unprecedented progress in observational astrophysics, makes such stars superb astrophysical laboratories for a broad range of exciting physical studies, several of which are intimately connected to QCD. This talk summarizes the role of QCD for neutron stars and strange stars. Particular emphasis is put on the role of strangeness. Strangeness is carried by hyperons, mesons, color superconducting strange quark matter, and strange quark matter nuggets, and may leave its mark in the masses, radii, cooling behavior, pycno-nuclear reactions, and the spin evolution of neutron stars. I also discuss the effects of a net electric charge distribution on the bulk properties of strange quark stars. Depending on the amount of electric charge distributed over the surface of such objects, the mass-radius relationship of strange quark stars may deviate substantially from the standard mass-radius relationship of electrically uncharged stars. This finding is of key importance for the properties of hypothetical strange quark stars made of color superconducting quark matter, since these objects could possess electric surface fields strong enough to alter the mass-radius relationship significantly.

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46 - YOUNG, Ross
CSSM, University of Adelaide, AUSTRALIA

Title: Precision Measurement of the Weak Charges of Quarks
Time: Monday, 27 September 2010, 12.00-12.30, TALK

Abstract: The Standard Model has been enormously successful at predicting the outcomes of experiments in nuclear and particle physics. The search for new physical phenomena and a fundamental description of nature which goes beyond the Standard Model is driven by two complementary experimental strategies. The first is to build increasingly energetic colliders, such as the Large Hadron Collider (LHC) at CERN, which aim to excite matter into a new form. The second, more subtle approach is to perform precision measurements at moderate energies, where an observed discrepancy with the

Standard Model will reveal the signature of these new forms of matter. Here we use precision parity-violating electron scattering measurements on nuclear targets to extract the weak charges of the quarks. The result is found to be in excellent agreement with the predictions of the Standard Model. Combining this result with earlier measurements of the low-energy weak force, most notably data on parity violation in atomic cesium, lifts the relevant energy scale for physics beyond the Standard Model to almost 1 TeV.

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47 – ZANOTTI, James

The University of Edinburgh, UK

Title: Hyperon Structure in 2+1 QCD
Time: Thursday, 30 September 2010, 10.00-10.30, TALK

Abstract: We present preliminary results from the QCDSF collaboration on form factors and moments of structure functions using 2+1 flavours of O(a) improved Wilson fermions. Of particular interest are the axial charges of the hyperons and hyperon semileptonic form factors.

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48 - ZOU, Bingsong

IHEP, CHINA

Title: Five-Quark Components and Breathing Mode for Baryons
Time: Friday, 1 October 2010, 16.30-17.00, TALK

Abstract: Evidence has been accumulating for the existence of significant intrinsic non-perturbative five-quark components in various baryons. The inclusion of the five-quark components gives a natural explanation of the excess of $\bar d$ over $\bar u$, significant quark orbital angular momentum in the proton, the problematic mass and decay pattern of the lowest $1/2^-$ baryon nonet, etc.. A breathing mode of $qqq\leftrightarrow qqqq\bar q$ is suggested for the lowest $1/2^-$ baryon octet. Evidence of a predicted member of the new scheme, $\Sigma^*(1/2^-)$ around 1380 MeV, is introduced.