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Abstracts of Talks at the

2nd Bologna Workshop on 2D CFT AND INTEGRABLE MODELS

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Abstract

We collect the abstracts of the talks given at the 2nd Bologna Workshop on Conformal Field Theory and Integrable Models. Each abstract is accompanied by references to published material where one can find more details on the subject. There will be no proceedings of this Meeting.

1 List of Participants

ABDALLA Elcio (ICTP-Trieste, Italy)
ARNAUDON Daniel (ENSLAPP-Annecy, France)
BALBINOT Roberto (Univ. Bologna, Italy)
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DELIUS Gustav (King's College, London, UK)
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DOREY Patrick (Durham Univ., UK)
ECKLE Hans-Peter (Univ. Tours, France)
FEVERATI Giovanni (Univ. Bologna, Italy)
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WYDRO Tomasz (Univ. Metz, France)
ZUCCHINI Roberto (Univ. Bologna, Italy)

2 Plenary Talks

Denis Bernard
C.E.A. - Saclay (France)

2D Disorder Systems and a Large N Random Phase Sine-Gordon Model

Abstract: We will (try to) present a few open problems in the description of quenched disordered two-dimensional systems. In particular, we will describe the 2d random phase sine-Gordon model. At large distances and in the low temperature phase, the quenched correlation functions in this model have been argued to be of the form : $\overline{< [\varphi(x) - \varphi(0)]^2 >_*} = A(\log|x|) + B\epsilon^2(\log|x|)^2$ with $\epsilon = (T - T_c)$. However, renormalization group computations predict $B \neq 0$ while variational approaches (which are supposed to be exact for models with a large number of components) give $B = 0$. We

introduce a large N version of the random phase sine-Gordon model. Using non-Abelian bosonization and renormalization group techniques, we show that the correlation functions of our models have the above form but with a coefficient B suppressed by a factor $1/N^3$ compared to A.

Ref.: [1] D.Bernard, Nucl.Phys. **B441** (1995) 471;
[2] D.Bernard, hep-th/9506141.

Andrea Cappelli
INFN-Firenze, Italy

W-Infinity Minimal Models and the Hierarchy of the Quantum Hall Effect

Abstract: We describe the W-infinity symmetry, which is the characteristic symmetry of the quantum incompressible fluid of the electrons in the quantum Hall effect [1]. This is the mathematic implementation of the Laughlin physical picture for the ground state of the fractional Hall effect. We derive the (1+1)-dimensional effective field theories with such a symmetry, which describe the edge excitations, the low-energy excitations of the incompressible fluid [2]. These field theories are exactly solvable by the methods of conformal field theory [3]. In particular we build the "minimal models" of the W-infinity algebra, and show that they match the experimentally observed fractional Hall fluids [4]. Therefore, they provide a successful classification scheme for this problem, more precisely for the universality classes of the low energy excitations. Our results are compared with those of a different classification, the Jain hierarchy, which is based on the construction of trial wave functions. The new prediction is the existence of edge excitations carrying non-Abelian quantum numbers; in particular, the electron carries the quark representation of the SU(m) group, where the integer m is determined by the value of the fractional Hall conductivity.

Ref.: [1] A.Cappelli, C.A.Trugenberger e G.R.Zemba, "Infinite symmetry in the quantum hall effect", Nucl.Phys. **B396** (1993) 465, hep-th/9206027; For a review, see: A.Cappelli, G.V.Dunne, C.A.Trugenberger e G.R.Zemba, "Symmetry Aspects and Finite-Size Scaling of Quantum Hall Fluids", proc. of the conf, "Common Trends in Condensed Matter and High-Energy Physics", Chia (Sardegna), Sept. 92, ed. L.Alvarez-Gaume' et al., Nucl.Phys. B (Proc. Suppl.) **33C** (1993) 21, hep-th/9301115.
[2] For a review, see: A. Cappelli, C. A. Trugenberger G. R. Zemba, "Quantum Hall fluids as W-infinity minimal models", proc. of the conf. "Statistical mechanics and

quantum field theory", Los Angeles, May 1994, e of the Summer school "Particles, fields and strings", Banff (Canada) hep-th/9502050.
[3] A. Cappelli, C. A. Trugenberger G. R. Zemba, "Classification of quantum Hall universality classes by W-infinity symmetry", Phys.Rev.Lett. **72** (1994) 1902, hep-th/9310181.
[4] A. Cappelli, C. A. Trugenberger G. R. Zemba, "Stable hierarchical quantum Hall fluids as W-infinity minimal models", preprint UGVA-DPT 1995/01-879, DFTT 09/95, Nucl.Phys. **B448** (1995) 470, in press, hep-th/9502021.

John Cardy
Oxford University, U.K.

Critical Percolation in Finite Geometries

Abstract: The probability that two disjoint segments of the boundary of a simply connected region of the plane are connected by a critical percolation cluster has been calculated in Ref.[1] using ideas of boundary conformal field theory and a certain amount of guesswork. We discuss how this result may be derived more systematically using Coulomb gas methods. The calculation illustrates the physical significance of the charge at infinity and the screening charges of the Feigin-Fuchs construction.

Ref.: [1] J. L. Cardy, "Critical Percolation in Finite Geometries", J.Phys. **A25** (1992) L201, hep-th/9111026.

Edward Corrigan
Durham University, U.K.

Integrability and Boundary Conditions

Abstract: The aim is to explore the extent to which boundary conditions may be imposed on an integrable field theory (such as affine Toda field theory), restricted to a half-line or to an interval.

Ref.: [1] For Example, 'Classically integrable boundary conditions for affine Toda field theories', P. Bowcock, E. Corrigan, P.E. Dorey and R. H. Rietdijk, Nucl.Phys. **B445** (1995) 469.

Hector De Vega
Université Paris VI, France

New Approch to the Thermodynamic Bethe Ansatz

Abstract: We present a new approach to the Thermodynamic Bethe Ansatz (TBA) that unifies the tratment of:

a) magnetic chains at finite temperature;

b) quantum field theories on a ring of length β (which is equivalent to a temperature $1/\beta$);

c) vertex models on finite size lattices.

In all cases, the free energy follows by quadratures from the solution of a **single** non-linear integral equation (NLIE). [A system of NLIE appears for nested BA].

This NLIE will be derived for: a) the six-vertex model with periodic and with twisted boundary conditions; b) the XXZ chain in an external magnetic field h_z and c) the sine-Gordon-massive Thirring model (sG-mT) in a periodic box of size $\beta \equiv 1/T$ using the light-cone approach. This NLIE is solved by iteration in one regime (high T in the XXZ chain and low T in the sG-mT model). In the opposite (conformal) regime, the leading behaviors are obtained in closed form. Higher corrections can be derived from the Riemann-Hilbert form of the NLIE that we present. This new treatment sheds new light on the intimate structure of the Bethe Ansatz solution of integrable models. Its analogy with duality in S-matrix theory as well as Wick rotations in standard QFT will be mentioned. This approach avoids the infinite number of coupled integral equations in the Takahashi approach.

Ref: [1] C. Destri and H. DeVega, Nucl.Phys. **B438** (1995) 413.

David Olive
Swansea Univ, UK

Exact Electromagnetic Duality

Abstract: This talk explains the background leading to the formulation of the exact electromagnetic duality conjecture believed to be valid in N=4 supersymmetric SU(2) gauge theory.

Ref.: [1] D.I. Olive, hep-th/9508089, Swansea preprint-no: SWAT/94-95/81.

Vladimir Rittenberg
Univ. Bonn, Germany

Representations of the Quadratic Algebra and Partially Asymmetric Diffusion with Open Boundaries

Abstract: We consider a one-dimensional system of hard core particles that hop stochastically in both directions with different rates. At both boundaries particles are injected and extracted. Following Derrida, Evans, Hakim and Pasquier, the stationary probability distribution can be expressed as a matrix-product involving two matrices subject to a quadratic algebra. We obtain the reprentations of this algebra and use the two-dimensional one to derive exact expressions for the density profile and correlation functions. Using the corrispondence between the stochastic model and a quantum spin chain, we obtain exact functions for a spin 1/2 Heisenberg XXZ chain with non-diagonal boundary terms. Generalizations to other reaction-diffusion models are discussed.

Ref.: [1] V. Hakim, J.P. Nadal, J.Phys. **A16** (1983), L213;
[2] B. Derrida, M.R. Evans, V. Hakim, V. Pasquier, J.Phys. **A26** (1993), 1493;
[3] F. Essler, V. Rittenberg, Cond-mat/9506131.

Paul Sorba
ENSLAPP-Annecy/Lyon, France

Some Aspects of Finite and Affine W Algebras

Abstract: After rapidly rewiewing the Hamiltonian reduction procedure, today recognized as a powerful tool for the construction/realization of W (super)algebras,we focus our attention on the two following applications:

- obtention of W string theories with the BRST charge identified inside a N=2 superconformal algebra;

- non-polynomial realizations of W algebras with,in the case of finite W algebras,a connection with intermediate statistics.

Ref.: [1] F.Barbarin, E.Ragoucy and P.Sorba, "Finite W algebras and intermediate statistics", Nucl.Phys. **B 442** (1995) 425;
[2] F.Barbarin, E.Ragoucy and P.Sorba, "Non-polynomial realizations of W algebras", preprint ENSLAPP-AL-536/95, hep-th-9509088;
[3] F.Barbarin, E.Ragoucy and P.Sorba, "Strings from N=2 Hamiltonian reduction",(in preparation).

3 Communications

Elcio Abdalla
University of Sao Paulo (Brazil) and ICTP Trieste (Italy)

Towards solution of two dimensional QCD, an integrable system

Abstract: We express the determinant of the Dirac operators, as well as the Jacobians obtained in the gauge field change of variables in terms of the Wess-Zumino-Witten functional to obtain a bosonized form of QCD_2 depending on G-valued fields, where G is the gauge group. Then intensively using the Polyakov-Wiegman identity to express the Wess-Zumisno-Witten functional of a product of fields as a sum of the WZW functionals of the individual fields plus contact terms of the type current-current, as well as the Haar invariance of the measure, we obtain a factorized form of the partition function.
The BRST analysis reveals constrains coupling the different sectors. The vacuum is described by a G/G topological field theory, and a discrete (and finite in number) vacuum structure arises. The massive sector is described by a perturbed WZW action which turns out to be integrable. Progress in the direction of obtaining the exact $S-$matrix are reported.

Ref.: [1] E. Abdalla, M.C.B. Abdalla, Int.J.Mod.Phys. **A10** (1995);
[2] E. Abdalla, M.C.B. Abdalla, Phys. Rep. to appear;

[3] E. Abdalla, K.D. Rothe, Phys. Lett., to appear;
[4] E. Abdalla, M.C.B. Abdalla, Phys. Rev. D. (submited).

Daniel Arnaudon
ENSLAPP-Annecy, France

Representations of $U_q(sl(N))$ at Roots of Unity

Abstract: When q is a root of unity, the centre of $U_q(sl(2|1))$ is enlarged. The usual Casimir operators satisfy polynomial relations with the new ones. The Gelfand Zethin basis is adapted to describe reprentations with continuos parameters.

Ref.: [1] based on work done in collaboration with B. Abdesselam, M. Bauer, A. Chalarabarti, C. Chryssomalakos and L. Frappat.

Adel Bilal
Lab. Physique Theorique, ENS, Paris (France)

Non-local extensions of conformal symmetry from integrable models

Abstract: I report on certain *non-linear* and *non-local* extensions of the conformal (Virasoro) algebra. These so-called V-algebras are matrix generalizations of W-algebras. First, in the context of two-dimensional field theory, I discuss the integrable non-abelian Toda model which possesses three conserved (chiral) "currents". The Poisson brackets of these "currents" give the simplest example of a V-algebra. The classical solutions of this model provide a free-field realization of the V-algebra. Then I show that this V-algebra is identical to the second Gelfand-Dikii symplectic structure on the manifold of 2×2-matrix Schrödinger operators $L = -d^2 + U$ (with $Tr_{sigma_3} U = 0$). This provides a relation with matrix KdV-hierarchies and allows me to obtain an infinite family of conserved charges (Hamiltonians in involution). Finally, I work out the general $V_{n,m}$-algebras as symplectic structures based on $n \times n$-matrix m^{th}-order differential operators $L = -d^m + U_2 d^{m-2} + U_3 d^{m-3} + \ldots + U_m$. It is the absence of U_1, together with the non-commutativity of matrices that leads to the non-local terms in the $V_{n,m}$-algebras. I show that the conformal properties are similar to those of W_m-algebras, while the complete $V_{n,m}$-algebras are much more complicated, as is shown on the explicit example of $V_{n,3}$.

Ref.: [1] A.Bilal, hep-th/9501033

Harry Braden
Edinburgh Univ., UK

Calogero-Moser Models

Abstract: A brief review of Calogero-Moser models (classical and quantum) was given with particular emphasis on connections with the K P hierarchy (and so W-symmetries) and the KZ equations was highlighted, with the relevant equations being deducible from the equation

$$\phi_1(x+y) = \frac{\begin{vmatrix} \phi_2(x) & \phi_2(y) \\ \phi_3(x) & \phi_4(y) \end{vmatrix}}{\begin{vmatrix} \phi_4(x) & \phi_4(y) \\ \phi_5(x) & \phi_5(y) \end{vmatrix}}. \tag{1}$$

This equation arises when constructing Lax-pairs for equations of motion of the form

$$\ddot{q}_i = \sum_{j \neq i} (a + b\dot{q}_j) V_{ij}(q_i - q_j) \tag{2}$$

which unifies (relativistic and non-relativistic) Calogero-Moser and Toda systems. Generalization to other algebras was stated.

Ref.: [1] H.W. Braden, V.M. Buchstaber, "The general analytic solution of a functional equation of addition type", funct-an/9508002;
[2] H.W. Braden, V.M. Buchstaber,"Integrable Systems with pair wise interactions and functional equations" (hep-th/9411240).

Michele Caselle
INFN-Torino, Italy

Calogero-Suthrland Techniques in the Physics of Disordered Wires

Abstract: We discuss the connection between the random matrix approach to disordered wires and the Calogero-Sutherland models. We show that different choices of random

matrix ensembles correspond to different classes of CS models. In particular, the standard transfer matrix ensembles correspond to CS model with sinh-type interaction, constructed according to the C_n root lattice pattern [1]. By exploiting this relation, and by using some known properties of the zonal spherical functions on symmetric spaces we can obtain several properties of the Dorokhov-Mello-Pereyra-Kumar equation, which describes the evolution of an ensemble of quasi one-dimensional disordered wires of increasing length L [1]. These results are in complete agreement with all known properties of disordered wires. Another interesting application of these same techniques is the description of the magnetoconductance in the strongly localized regime of disordered wires [2]. These results have been recently summarized in [3].

Ref.: [1] M.Caselle, Phys. Rev. Lett. **74** 2776 (1995);
‘ [2] M.Caselle, preprint DFTT 31/95 cond-mat/9505068;
[3] M.Caselle, preprint DFTT 43/95, Proceeding of the Conference: “Recent Developments in Statistical Mechanics and Quantum Field Theory” (Trieste, 1995) cond-mat/9509003.

Chryssomalakos Chryssomalos
ENSLAPP-Annecy, France

Remarks on Quantum Integration

Abstract: We examine aspects of integration on Hopf algebras and quantum spaces, the latter viewed as quantum group modules. We give an explicit expression for the integral on a finite dimensional Hopf algebra in terms of vacuum projector operators and find its braided analogue on the quantum plane. Fourier transforms are defined in both cases and several of their properties are derived. The transformation law for the quantum plane integral under the SL_q coaction is given and its (nontrivial) braiding properties are derived. We comment on integration on other quantum spaces and compare our approach to related work in the literature.

Ref.: [1] C.Chryssomalakos, q-alg/9601014.

Gesualdo Delfino
Oxford Univ., UK

The Spin-Spin Correlation Function in the Two Dimensional Ising Models in a Magnetic Field at $T = T_c$

Abstract: A rapidly convergent large distance expansion of the spin-spin correlator in the two-dimensional Ising model in a magnetic field at $T = T_c$ is obtained through the exact determination of the form factors of the magnetization operator. Perfect agreement is found with previous numerical simulations.

Ref.: [1] G.Delfino, G.Mussardo, hep-th/9507010, preprint OUTP-95-385, ISAS/EP/95/78.

Gustav Delius
King's College, London, UK

Quantum Lie Algebras and Quantum Roots Systems

Abstract: Motivated by the properties of quantum affine Toda theories we develop an analysis of quantum Lie algebras in terms of quantum roots. We hope to show that these quantum roots systems underlie the quantum integrability of affine Toda theories in the same way in which the classical root systems underlie the classical integrability.

Ref.: [1] G.W.Delius, M.D.Gould, A.Hüffmann, Yao-Zhong Zhang, q-alg/9508013; par[2] G.W.Delius, A.Hüffmann, q-alg/9506017.

Patrick Dorey
Durham Univ., UK

Z_N Models

Abstract: This talk describes work done in collaboration with Roberto Tateo and Kevin Thompson, both also at Durham. The generally-accepted phase diagrams for the discrete Z_N lattice models imply the existence of certain interpolating flows, both between conformal field theories and into a massive phase. TBA equations are proposed to describe these flows, and some properties of their solutions are outlined.

Ref.: [1] P.E.Dorey, R.Tatoe, K.E.Thompson, hep-th/9601123

Hans-Peter Eckle
Univ. Tours, France

Corner transfer matrices and polynomials

Abstract: We present some aspects of finite-size corner transfer matrices for free Fermion vertex systems in two-dimensional statistical mechanics. Emphasis is being laid on the role of new special polynomials among which are orthogonal polynomials well known in the mathematical literature. With the help of these polynomials we are able to verify the predictions of conformal invariance for critical systems restricted to wedge shaped geometries and also to demonstrate, for a finite system, some known facts about corner transfer matrices.

Franco Ferrari
Univ. Trento, Italy

Conformal Field Theories with Discrete Group of Symmetry

Abstract: New kinds of conformal field theories with a discrete group G of symmetry can be constructed on the complex sphere starting from conformal field theories defined on algebraic curves. As an example, their conformal blocks will be derived in the case in which the underlying field theory on the algebraic curve is provided by the simple b-c systems of string theory. It will be shown how to compute their amplitudes starting from simple normal ordering rules. In some cases it is also possible to derive the primary fields in an explicit way. They satisfy interesting examples of nonstandard statistics.

Ref: [1] M.A.Bershadsky and A.O.Radul, "Multivalued Field on the Complex Plane and Conformal Field Theories", Comm.Math.Phys. **156** (1993),
[2] F. Ferrari, "Multivalued Fields on the Complex Plane and Conformal Field Theories", Comm.Math.Phys. **156** (1993), 179.
[3] F. Ferrari, "Multivalued Fields on the Complex Plane and Braid Group Statistics", Int.J.Mod.Phys. **A9** (3) (1994), 313,
[4] F. Ferrari, J. Sobczyk and W. Urbanik, "Operator Formalism on the Z_n Symmetric Algebraic Curves", Jour.Math.Phys. **36** (1994),
[5] F. Ferrari and J. Sobczyk, "Operator Formalism on General Algebraic Curves", Preprint U.T.F. 333/94, ITF UWr 879/94, (hep-th/9409127), Jour.Geom.Phys, in press.

Giovanni Feverati
Univ. Bologna, Italy

Infrared Behaviour of Massless Integrable Entering the Minimal Models from Φ_{31}

Abstract: It is known that any minimal model M_p receives along its ϕ_{31} irrelevant direction *two* massless integrable flows: one from M_{p+1} perturbed by ϕ_{13}, the other from Z_{p-1} parafermionic model perturbed by its generating parafermion field. By comparing Thermodynamic Bethe Ansatz data and "predictions" of infrared Conformal Perturbation Theory we show that these two flows are received by M_p with opposite coupling constants of the ϕ_{31} irrelevant perturbation. Some comments on the massless S-matrices of these two flows are added.

Ref.: [1] G.Feverati, E.Quattrini, F.Ravanini, hep-th 9512104, Bologna preprint DFUB 95-09

Roberto Floreanini
INFN-Trieste, Italy

Symmetries of Finite-Difference Equations

Abstract: We discuss the symmetry properties of various finite-difference equations on the lattice, in diverse dimensions. While ordinary Lie algebras are sufficient to describe the symmetries of discrete equations on uniform lattices, quantum algebras are needed on non-uniform lattices. Solutions with definite symmetry transformation properties can be easily obtained; they can be expressed in term of known (basic) special functions.

Luc Frappat
ENSLAPP-Annecy, France

$U_q(sl(1|2)$-Invariant Quantum Chain Hamiltonians

Abstract: After examining the two parameter deformed superalgebra $U_{qs}(sl(1|2))$, we use the results in the construction of quantum chain hamiltonians. We find that there

exists an infinite number of Casimir opertors which generate the center of $U_{qs}(sl(1|2))$, which lead to quantum chain hamiltonians describing deformed $t-J$ models.

Ref.: [1] D.Arnaudon, C.Chryssomalakos, L.Frappat, q-alg/9503021

Jose Gaite
CSIC-Madrid, Spain

Landau-Ginzburg Lagrangians of Perturbed W-Models and Toda Theories

Abstract: It is shown how to obtain in a systematic way Landau-Ginzburg Lagrangians for perturbed W-models that describe regime III of integrable Jimbo-Miwa-Okado statistical models. Since integrable affine Toda field theories (ATFT) can be considered alternative descriptions of these models, the relation between Landau and ATFT potentials is explored.

Ref.: [1] J.Gaite, "Landau-Ginzburg Lagrangians for W-algebra Models", Nucl.Phys. **B411** 321 (1994);
[2] J.Gaite, "Singularity theory for W-algebra potentials", Phys.Lett. **B325** 51 (1994);
[3] J.Gaite, "Deformed 2d CFT: Landau-Ginzurg Lagrangians and Toda theories", Report ITFA-94-31, hep-th/9412191.

Georg M. Gandenberger
Cambridge Univ., UK

Exact S-Matrices for Affine Toda Solitons and their Bound States

Abstract: We conjecture a set of exact S-matrices for the scattering of solitons in imaginary couple affine Toda field theory (ATTF). These S-matrices have quantum affine symmetry and are written in terms of spectral decompositions of trigonometric $R-$matrices. By detailed examination of the pole structure we obtain the full spectrum and construct bound state $S-$matrices. By comparing these bound state $S-$matrices with the $S-$matrices for the elementary quantum particles we estabilish a breather-particle identification.

Ref.: [1] G.M.Gandenberger, Nucl.Phys. **B449** (1995) 375; hep-th/9501136;
[2] G.M.Gandenberger, and N.J.MacKay , hep-th/9506169; Nucl.Phys. **B**, in press;
[3] G.M.Gandenberger, N.J.MacKay and G.M.T.Watts, hep-th/9509007.

Günter von Gehlen
Physikalisches Institut der Universität Bonn, Bonn (Germany)

Integrable Z_n-symmetrical Chiral Potts-Model: Phase-Diagram for various n and Rapidity-Momentum Relation

Abstract: Using the McCoy-Roan integral representation for gaps of the general integrable Z_n-symmetrical Chiral Potts model, we study various features of the spectra of these models for different value of n. In the limit $n \to \infty$ we find a simple analytic expression for the curve along which the $\triangle Q = 1$-gap vanishes and the ground state is not translationally invariant. Comparing the McCoy-Roan formula to high-temperature expansions and finite-size data, we obtain detailled information about the relation between the rapidity parameter and the physical momentum. For the superintegrable case with all $n \leq 7$ we find stable high-lying levels from our finite-size data in all $Q \neq 0$-charge sectors at particular momentum values. This suggests that the limited momentum range of higher charge quasiparticles observed in the Z_3-case generalizes in a simple way to the cases $n \geq 4$.

Ref.: [1] B.M.McCoy, *The Chiral Potts Model: from Physics to Mathematics and back*, Special functions ICM 90, Satellite Conf. Proc.; *ed.* M.Kashiwara and T. Miwa, Springer (1991) 245;
[2] A.Honecker and G. von Gehlen, Nucl.Phys. **B435** (1995) 505.
[3] G. von Gehlen, hep-th/9601001.

Domenico Giuliano
Univ. Napoli, Italy

Dissipative 2D Electron on a Plane and on a Torus in External Magnetic Field in the Presence of Dissipation

Abstract: A coherent state approach is presented to analyze the behavior of a 2D electron subject to a transverse magnetic field in the presence of dissipation. The phenomenon of the shrinking of the Gaussian (localization), describing the electron ground-state, takes place on large time scales. Its relation with the transport properties of such system is analyzed.
Furthermore, the effect of the dissipation on the electron ground-state on the torus is analyzed. Its extension to the multiparticle center-of-charge wavefunction is also given. The novel transport properties of the system are then analyzed by applying Laughlin gauge argument with thw use of finite magnetic translation operators.

Ref.: [1] G.Cristofano, D.Giuliano, G.Maiella, L.Valente, Int.J.Mod.Phys. **B9** (1995) 707;
[2] G.Cristofano, D.Giuliano, G.Maiella, L.Valente, Naples preprint DSF-T-95/04 (to appear in Int.J.Mod.Phys. **B**).

Jens Ole Madsen
ENSLAPP-Annecy, France

Secondary Quantum Hamiltonian Reduction and Linearization of W-Algebras

Abstract: We show that if certain technical conditions are satisfied, a W-algebra W(G,H') can be reduced to W(G,H) if H' is a regular subalgebra of H. The result is used to linearize W-algebras in a systematic way.

Ref.: [1] J.O.Madsen, E.Ragoucy, hep-th/9503042;
[2] J.O.Madsen, E.Ragoucy, hep-th/9501061.

Vincenzo Marotta
Univ. Napoli, Italy

Borcherds Algebras and Quasi-particles Hierarchy

Abstract: We show a relationship between Borcherds algebras (or generalized Kac-Moody algebras) and a Hierarchy of quasi-particles in Conformal Field Theory. We use Gebert-Teschner theorem to give a second quantization interpretation of structure of

fundamental representation of a simple Borcherds algebra. We show also how algebraic structure and fusion rules for the underlying Kac-Moody algebra can be considerated in the same fundamental representation of Borcherds algebras. This very simple structure is a conseguence of the absence of Serre relations for the Borcherds simple root. We hope that this interpretation can be useful to apply these algebras to more physical theories as Haldane-Shastry chain, Calogero-Sutherland models and related systems.

Ref.: [1] Gebert-Teschner, Lett.Math.Phys. **31** (1994) 327;
[2] V. Marotta and A. Sciarrino, DSF-T-94/47 to appear in Int.J.Mod.Phys. **A**.

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Integrals of Motion for Sine-Gordon with Boundary

Abstract: Work in progress with R. Nepomechie and A. B. Zamolodchikov on fractional spin integrals of motion for sine-Gordon model with boundary.

Ref.: [1] S. Ghoshal and A. B. Zamolodchikov, Int.J.Phys. **A9** (1994) 3841;
[2] D. Bernard and A. LeClair, Commun.Math.Phys. **142** (1991) 99.

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On Perturbative Quantum Equivalence of Dual Sigma Models

Abstract: It was shown on some specific examples that the naively expected quantum equivalence between sigma models related by abelian or non abelian duality transformations is usually broken beyond the one loop order of perturbation theory. This may indicate that for renormalized quantitites Buschiev's formulae have to be modified in higher loop orders.

Ref.: [1] J.Balog, P.Forgács, Z.Horváth, L.Palla, hep-th/9601091.

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Quantum Integrability in Two-Dimensional Systems with Boundary

Abstract: For Toda-like systems defined on the half plane we construct higher-spin conserved currents in the presence of a boundary perturbation at the quantum level. We find that, exept for the sinh-Gordon case, the quantum integrability of the system requires a finite renormalization of the boundary potential.

Ref.: [1] S.Penati, A.Refolli, D.Zanon, hep-th/9510084.

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A 6-Vertex Local Lattice Regularization of Massive Thirring Model

Abstract: ¿From the commuting family of alternating transfer matrix (constructed with the 6-vertex R-matrix) it is possible to obtain a complete hierarchy of local charge in involution, beginning with the Hamiltonian that is the charge of level 1. We investigated the local Hamiltonian showing its equivalence to a fermionic theory of two free massless plus a massive with Thirring-like interaction fermionic fields in perfect agreement with the Bethe Ansatz results.

Ref.: [1] C.Destri, T.Segalini, hep-th/9506120.

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Generalized KdV Hierarchies and QIST in CFT

Abstract: We propose an alternative description of 2 dimensional Conformal Field Theory in terms of Quantum Inverse Scattering. It is based on the generalized KdV systems

attached to $A_2^{(2)}$, yielding the classical limit of Virasoro as Poisson bracket structure. The corresponding T-system is shown to coincide with the one recently proposed by Kuniba and Suzuki. We classify the primary operators of the minimal models that commute with ll the Integrals of Motion, and that are therefore candidates to perturb the model by keeping the conservation laws. For our $A_2^{(2)}$ structure these happen to be $\phi_{1,2}, \phi_{2,1}, \phi_{1,5}$, in contrast to the $A_1^{(1)}$ case, studied by Bazhanov, Lukyanov and Zamolodchikov, related to $\phi_{1,3}$.

Ref.: [1] D. Fioravanti, F. Ravanini and M. Stanishkov, hep-th/9510047, preprint DFUB-95-08 to be published in Phys.Lett. **B**.

Roberto Tateo
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Thermodynamic Bethe Ansatz and Threefold Triangulations

Abstract: In the Thermodynamic Bethe Ansatz approach to 2D integrable, ADE-related quantum field theories one derives a set of algebraic functional equations (Y-system) which play a prominent role . These equations are mapped into the problem of finding finite triangulations of certain 3D manifolds.

Ref: [1] F.Gliozzi, R.Tateo, Phys.Lett. **B348** (1995) 84;
[2] R.Tateo, Phys.Lett. **B355** (1995) 157;
[3] F.Gliozzi, R.Tateo, hep-th/9505102.

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RCFT and Massive Solitons

Abstract: We suggest a new family of RSOS scattering models which is obtained by placing the SO(N) critical models in "electric" or "magnetic" field. These fields are associated with two dual operators from the space of the SO(N) RCFT. We construct the fundamental kink S-matrices for these models and compute it's spectrum. We show that these models can be viewed as affine imaginary Toda models for non-simply-laced and twisted algebras taken at rational points (roots of unity). As a byproduct in the

SO(4) case we obtain the S-matrix describing an integrable coupling of two minimal CFT's.

Ref.: [1] I.Vaysburd, Nucl.Phys. **B446** (1995) 387.

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Critical Correlation of the Two Dimensional 3-State Potts Model

Abstract: We exploit the identification between the critical theory of the 3-state Potts model and the D_5 conformal model. This allows us to determine 3-point correlations involving any combination of fields associated with the order parameter or the energy density. The calculation uses screened Coulomb gas correlations. The $\mathbf{Z_3}$ symmetry of the 3-state Potts model is manifestly preserved.

Ref.: [1] J.McCabe, T.Wydro, ENSLAPP-L-526-95.

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