Communications in

Mathematical Physics

Volume 127 1990

Chief Editor A. Jaffe, Cambridge, MA

Editorial Board M. Aizenman, New York, NY

L. Alvarez-Gaumé, Genève

H. Araki, Kyoto

A. Connes, Bures-sur-Yvette

J.-P. Eckmann, Genève

M. E. Fisher, College Park, MD

J. Fröhlich, Zürich

K. Gawedzki, Bures-sur-Yvette

J. L. Lebowitz, New Brunswick, NJ

J. Mather, Princeton, NJ

G. Parisi, Roma

B. Simon, Pasadena, CA

Ya. G. Sinai, Moscow

T. Spencer, Princeton, NJ

S.-T. Yau, Cambridge, MA

Advisory Board M. F. Atiyah, Oxford

F. Hirzebruch, Bonn

G. 't Hooft, Utrecht

R. Schrieffer, Santa Barbara, CA

I. Singer, Cambridge, MA

C. N. Yang, Stony Brook, NY



Springer International

Copyright

Submission of a manuscript implies: that the work described has not been published before (except in the form of an abstract or as part of a published lecture, review, or thesis); that it is not under consideration for publication elsewhere; that its publication has been approved by all coauthors, if any, as well as by the responsible authorities at the institute where the work has been carried out; that, if and when the manuscript is accepted for publication, the authors agree to automatic transfer of the copyright to the publisher; and that the manuscript will not be published elsewhere in any language without the consent of the copyright holders.

All articles published in this journal are protected by copyright, which covers the exclusive rights to reproduce and distribute the article (e. g., as offprints), as well as all translation rights. No material published in this journal may be reproduced photographically or stored on microfilm, in electronic data bases, video disks, etc., without first obtaining written permission from the publisher.

The use of general descriptive names, trade names, trademarks, etc., in this publication, even if not specifically identified, does not imply that these names are not protected by the relevant laws and regulations.

While the advice and information in this journal is believed to be true and accurate at the date of its going to press, neither the authors, the editors, nor the publisher can accept any legal responsibility for any errors or omissions that may be made. The publisher makes no warranty, express or implied, with respect to the material contained herein.

Special regulations for photocopies in the USA:

Photocopies may be made for personal or in-house use beyond the limitations stipulated under Section 107 or 108 of U.S. Copyright Law, provided a fee is paid. This fee is US \$ 0.20 per page, or a minimum of US \$ 1.00 if an article contains fewer than five pages. All fees should be paid to the Copyright Clearance Center, Inc., 21 Congress Street, Salem, MA 01970, USA, stating the ISSN 0010-3616, the volume, and the first and last page numbers of each article copied. The copyright owner's consent does not include copying for general distribution, promotion, new works, or resale. In these cases, specific written permission must first be obtained from the publisher.

Springer-Verlag Berlin Heidelberg New York Tokyo Hong Kong Printers: Brühlsche Universitätsdruckerei, Giessen Printed in Germany — © Springer-Verlag Berlin Heidelberg 1990 Springer-Verlag GmbH & Co KG, D-1000 Berlin 33

Contents

- Alinhac, S.: Un phénomène de concentration évanescente pour des flots non-stationnaires incompressibles en dimension deux 585
- Asch, J.: On the Classical Limit of Berry's Phase Integrable Systems 637
- Baladi, V., Keller, G.: Zeta Functions and Transfer Operators for Piecewise Monotone Transformations 459
- Bauer, M., Itzykson, C.: Modular Transformations of SU(N) Affine Characters and Their Commutant 617
- Berg M. van den, Dorlas, T. C., Lewis, J. T., Pulé, J. V.: A Perturbed Mean Field Model of An Interacting Boson Gas and the Large Deviation Principle 41
- Bernard, D., Felder, G.: Fock
 Representations and BRST Cohomology in
 SL(2) Current Algebra 145
- Blokh, A. M., Lyubich, M. Yu.: Measure and Dimension of Solenoidal Attractors of One Dimensional Dynamical Systems 573
- Borchers, H. J., Yngvason, J.: Positivity of Wightman Functionals and the Existence of Local Nets 607
- Burroughs, N.: The Universal R-Matrix for U_qsl(3) and Beyond! 109
- Carlip, S., Clements, M., DellaPietra, S., Della Pietra, V.: Sewing Polyakov Amplitudes I: Sewing at a Fixed Conformal Structure 253
- Clements, M., → Carlip, S., et al. 253
- Constantin, P.: Decay Estimates for Schrödinger Equations 101
- Degiovanni, P.: Z/NZ Conformal Field Theories 71
- DellaPietra, S., → Carlip, S., et al. 253
- DellaPietra, V., → Carlip, S., et al. 253
- Dorlas, T. C., → Berg, M. van den, et al. 41

- Duffield N. G.: Classical and Thermodynamic Limits for Generalised Quantum Spin Systems 27
- Federbush, P.: A Phase Cell Approach to Yang-Mills Theory. V. Analysis of a Chunk 433
- Felder, G., → Bernard, D. 145
- Figueroa-O'Farrill, J. M.: A Topological Characterization of Classical BRST Cohomology 181
- Fredenhagen, K., Haag, R.: On the Derivation of Hawking Radiation Associated with the Formation of a Black Hole 273
- Gibbons, G. W., Ruiz, F. R., Vachaspati, T.: The Non-Relativistic Coulomb Problem on a Cone 295
- Gibbons, G. W., Page, D. N., Pope, C. N.: Einstein Metrics on S³, R³ and R⁴ Bundles 529
- Gravesen, J.: Loop Groups and Yang-Mills Theory in Dimension Two 597
- Haag, R., → Fredenhagen, K. 273
- Handel, M.: The Rotation Set of a Homeomorphism of the Annulus is Closed 339
- Hayashi, T.: Q-Analogues of Clifford and Weyl Algebras—Spinor and Oscillator Representations of Quantum Enveloping Algebras 129
- Hofbauer, F., Keller, G.: Quadratic Maps without Asymptotic Measure 319
- Itzykson, C., → Bauer, M. 617
- Keller, G., \rightarrow Hofbauer, F. 319
- Keller, G., → Baladi, V. 459
- Lewis, J. T., → Berg, M. van den, et al. 41

- Li, M., Yu, M.: Braiding Matrices, Modular Transformations and Topological Field Theories in 2+1 Dimensions 195
 Lyubich, M. Yu, → Blokh, A. M. 573
- Mickelsson, J.: Commutator Anomalies and the Fock Bundle 285
- Page, D. N., → Gibbons, G. W., et al. 529 Pope, C. N., → Gibbons, G. W., et al. 529 Pöschel, J.: Small Divisors with Spatial Structure in Infinite Dimensional Hamiltonian Systems 351 Pulé, J. V., → Berg, M. von den, et al. 41
- Reshetikhin, N. Yu, Turaev, V. G.:
 Ribbon Graphs and Their Invariants Derived
 from Quantum Groups 1
 Roche, P.: Ocneanu Cell Calculus and
 Integrable Lattice Models 395
 Ruiz, F. R., → Gibbons, G. W., et al. 295
- Spector D.: Supersymmetry and the Möbius Inversion Function 239
- Takasaki, K.: Hierarchy Structure in IntegrableSystems of Gauge Fields and UnderlyingLie Algebras 225

- Tanisaki, T.: Harish-Chandra Isomorphisms for Quantum Algebras 555
- Thouless, D. J.: Scaling for the Discrete Mathieu Equation 187
- Turaev, V. G., → Reshetikhin, N. Yu. 1
- Vachaspati, T., → Gibbons, G. W., et al. 295 Veerman, J. J. P.: Hausdorff Dimension of Order Preserving Sets 313
- Wayne, C. E.: Periodic and Quasi-periodic Solutions of Nonlinear Wave Equations via KAM Theory 479
- Wojtkowski, M. P.: The System of One Dimensional Balls in an External Field. II 425
- Wüller, U.: Time Boundedness of the Energy for the Charge Transfer Model 169
- Yngvason, J., \rightarrow Borchers, H. J. 607 Yu, M., \rightarrow Li, M. 195

Indexed in Current Contents
Evaluated and abstracted for PHYS on STN

Mathematical Physics

Volume 127 Number 3 1990

P. Federbush

A Phase Cell Approach to Yang—Mills Theory V. Analysis of a Chunk 433

V. Baladi, G. Keller

Zeta Functions and Transfer Operators for Piecewise Monotone Transformations 459

C. E. Wavne

Periodic and Quasi-periodic Solutions of Nonlinear Wave Equations via KAM Theory 479

G. W. Gibbons, D. N. Page.

Einstein Metrics on S^3 , R^3 and R^4 Bundles 529

C. N. Pope

T. Tanisaki Harish-Chandra Isomorphisms for Quantum Algebras 555

A. M. Blokh, M. Yu. Lyubich

Measure and Dimension of Solenoidal Attractors of One Dimensional Dynamical Systems 573

S Alinhac

Un phénomène de concentration évanescente pour des flots non-stationnaires incompressibles en dimension deux 585

J. Gravesen

Loop Groups and Yang-Mills Theory in Dimension Two 597

H. J. Borchers, J. Yngvason

Positivity of Wightman Functionals and the Existence of Local Nets 607

OI LOCALIN

M. Bauer, C. Itzykson Modular Transformations of SU(N) Affine Characters

and Their Commutant 617
On the Classical Limit of Berry's Phase Integrable

J. Asch

On the Classical Limit of Berry's Phase Integrable Systems 637

Contents of Vol. 127

Indexed in Current Contents

Evaluated and abstracted for PHYS on STN



Springer International

220 Commun, Math. Phys. ISSN 0016중점에 CMPHAY 127 (3) 433-652 (1990) Printed on acid-free paper

Communications in Mathematical Physics

Copyright. Submission of a manuscript implies: that the work described has not been published before (except in the form of an abstract or as part of a published lecture, review, or thesis); that it is not under consideration for publication elsewhere; that its publication has been approved by all coauthors, if any, as well as by the responsible authorities at the institute where the work has been carried out; that, if and when the manuscript is accepted for publication, the authors agree to automatic transfer of the copyright to the publisher; and that the manuscript will not be published elsewhere in any language without the consent of the copyright holders.

All articles published in this journal are protected by copyright, which covers the exclusive rights to reproduce and distribute the article (e.g., as offprints), as well as all translation rights. No material published in this journal may be reproduced photographically or stored on microfilm, in electronic data bases, video disks, etc., without first obtaining written permission from the publisher.

The use of general descriptive names, trade names, trademarks, etc., in this publication, even if not specifically identified, does not imply that these names are not protected by the relevant laws and regulations.

While the advice and information in this journal is believed to be true and accurate at the date of its going to press, neither the authors, the editors, nor the publisher can accept any legal responsibility for any errors or omissions that may be made. The publisher makes no warranty, express or implied, with respect to the material contained herein.

Special regulations for photocopies in the USA: Photocopies may be made for personal or in-house use beyond the limitations stipulated under Section 107 or 108 of U.S. Copyright Law, provided a fee is paid. This fee is US \$ 0.20 per page, or a minimum of US \$ 1.00 if an article contains fewer than five pages. All fees should be paid to the Copyright Clearance Center, Inc., 21 Congress Street, Salem, MA 01970, USA, stating the ISSN 0010-3616, the volume, and the first and last page numbers of each article copied. The copyright owner's consent does not include copyring for general distribution, promotion, new works, or resale. In these cases, specific written permission must first be obtained from the publisher.

Authors should mark manuscripts according to the "Instructions to Authors." They should be aware that manuscripts which are not properly marked require additional time for publication. Manuscripts should be sent to:

Prof. M. Aizenman, Courant Institute of Mathematical Sciences, 251 Mercer Street, New York, NY 10012, USA

Prof. L. Alvarez-Gaumé, Theory Division, CERN, CH-1211 Genève 23, Switzerland

Prof. H. Araki, Research Institute for Mathematical Sciences, Kyoto University, Kyoto, 606, Japan

Prof. A. Connes, I.H.E.S., F-91440 Bures-sur-Yvette, France

Prof. J.-P. Eckmann, Departement de Physique Théorique, Université de Genève, 32, Boulevard d'Ivoy, CH-1211 Genève 4, Switzerland

Prof. M. E. Fisher, Institute for Physical Science and Technology, University of Maryland, College Park, MD 20742, USA

Prof. J. Fröhlich, ETH-Hönggerberg, CH-8093 Zürich, Switzerland Prof. K. Gawedzki, I.H.E.S., F-91440 Bures-sur-Yvette, France

Prof. A. Jaffe, Lyman Laboratory of Physics, Harvard University, Cambridge, MA 02138, USA

Prof. J. L. Lebowitz, Department of Mathematics, Rutgers University, New Brunswick, NJ 08903, USA

Prof. J. Mather, Department of Mathematics, Fine Hall, Princeton University, Princeton, NJ 08544, USA

Prof. G. Parisi, Dipartimento di Fisica, Università di Roma II, Tor Vergata, I-00173 Roma, Italy

Prof. B. Simon, Department of Mathematics, California Institute of Technology, Pasadena, CA 91125, USA

Prof. Ya. G. Sinai, L. D. Landau Institute for Theoretical Physics, ul. Kosygina, dom 2, SU-117334 Moscow, V—334, USSR

Prof. T. Spencer, School of Mathematics, Institute for Advanced Study, Princeton, NJ 08540, USA

Prof. S.-T. Yau, Department of Mathematics, Harvard University, 1 Oxford Street, Cambridge, MA 02138, USA

Statistical physics

Gravitation, field theories and geometry

Mathematical methods with direct relevance to physics Quantum physics and differential geometry

Dynamical systems

Statistical physics

General statistical mechanics Quantum field theory and statistical mechanics

Chief Editor

Nonequilibrium statistical mechanics

Classical dynamical systems

General theoretical physics

Schrödinger operators and atomic physics

Statistical physics and dynamical systems

Disordered systems

Relativity; geometry and physics

100 offprints of each article will be supplied to the author free of charge and additional copies may be obtained at cost price if ordered before the issue goes to press.
Subscription Information. Vols. 126-133, (3 issues each) will appear in 1990. North America. Annual subscription rate: US \$ 2505.00, single issue price \$ 128.00 including carriage charges. Subscriptions are entered with prepayment only. Orders should be addressed to: Springer-Verlag New York Inc., Service Center Secaucus, 44 Hartz Way, Secaucus, NJ 07094, USA, Telephone (201) 348-4033, Telex 023 125 994, FAX (201) 348-45 05. Members of the International Association of Mathematical Physics (IAMP) are entitled to receive the journal strictly for their own personal use at a special reduced rate. The orders must be placed through the IAMP. All Other Countries. Annual subscription rate: DM 4560.00, plus carriage charges: [Federal Republic of Germany: DM 62.92 incl. value added tax; all other countries: DM 103.20 except for the following countries to which SAL delivery (Surface Airmail Lifted) is mandatory: Japan DM 232.80, India DM 175.20, Australia/New Zealand DM 264.00. Airmail delivery to all other countries is available upon request. Volume price: DM 570.00, single issue price. DM 228.00 plus carriage charges. Orders for all countries except North America can either be placed with your bookdealer or sent directly to: Springer-Verlag, Heidelberger Platz 3, D-1000 Berlin 33, Tel. 0 30/82 07-1, Telex 01 83 319, FAX (0)30/82 1 4091. Changes of Address: Allow six weeks for all changes to become effective. All communications should include both old and new addresses (with Postal Codes) and should be ya mailing label from a recent issue. Back Volumes. Prices are available on request. Microform: Microform editions are available from: University Microfilms International, 300 N. Zeeb Road, Ann Arbor, MI 48106, USA

Production

Journal Production Department I, Springer-Verlag, Postfach 10 52 80, D-6900 Heidelberg 1, Federal Republic of Germany, Tel. 0 62 21/4 87-5 25, Telex 04 61 723, FAX (0)6221/4 39 82; FAX (0)6221-487 624