# Mathematical Physics

# Volume 123 1989

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publication, the authors agree to automatic transfer of the copyright to the publisher; and that the manuscript will not be published elsewhere in any language without the consent of the copyright holders.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 1989 Springer-Verlag GmbH & Co KG, D-1000 Berlin 33

### Contents

- Albeverio, S., Høegh-Krohn, R., Zegarlinski,B.: Uniqueness and Global Markov Propertyfor Euclidean Fields: The Case of GeneralPolynomial Interactions 377
- Bach, A., Srivastav, A.: A Characterization of the Classical States of the Quantum Harmonic Oscillator by Means of de Finetti's Theorem 453
- Bakas, I.: Higher Spin Fields and the Gelfand-Dickey Algebra 627
- Bolthausen, E.: A Note on the Diffusion of Directed Polymers in a Random Environment 529
- Bonora, L., Lugo, A., Matone, M., Russo, J.: A Global Operator Formalism on Higher Genus Riemann Surfaces: *b—c* Systems 329
- Borgs, Ch., Imbrie, J. Z.: A Unified Approach to Phase Diagrams in Field Theory and Statistical Mechanics 305
- Cassandro, M., Nicolò, F., Scoppola, B.: The *(N=I)* Supersymmetric Sine-Gordon Model in Two Dimensions. II 123
- Chayes, J. T., Chayes, L., Kivelson, S. A.: Valence Bond Ground States in a Frustrated Two-Dimensional Spin-1/2 Heisenberg Antiferromagnet 53
- Chayes, L., → Chayes, J. T., et al. 53
- Desvillettes, L.: Entropy Dissipation Rate and Convergence in Kinetic Equations 687
- Dijkgraaf, R., Vafa, C., Verlinde, E., Verlinde,H.: The Operator Algebra of OrbifoldModels 485
- Driver, B. K.: YM<sub>2</sub>: Continuum Expectations, Lattice Convergence, and Lassos 575
- Felder, G., Silvotti, R.: Modular Covariance of Minimal Model Correlation Functions 1
- Ginibre, J., Velo, G.: Scattering Theory in the Energy Spase for a Class of Non-Linear Wave Equations 535

- Golin, S., Knauf, A., Marmi, S.: The Hannay Angles: Geometry, Adiabaticity, and an Example 95
- Gregg, J. N.: The Existence of the Thermodynamic Limit in Couloumb-like
  Systems 255
- Høegh-Krohn, R., → Albeverio, S., et al. 377
- Holley, R. A., Stroock, D. W.: Uniform and
   L<sup>2</sup>Convergence in One Dimensional Stochastic Ising Models 85
- Horuzhy, S. S., Voronin, A. V.: Remarks on Mathematical Structure of BRST Theories 677
- Hubacher, A.: Classical Scattering Theory in One Dimension 353
- Imbrie, J. Z., → Borgs, Ch. 305
- Kivelson, S. A.,  $\rightarrow$  Chayes, J. T., et al. 53 Knauf, A.,  $\rightarrow$  Golin, S., et al. 95
- Labastida, J. M. F.: Morse Theory Interpretation of Topological Quantum Field Theories 641
  Lugo, A., → Bonora, L., et al. 329
- Manin, Yu. I.: Multiparametric Quantum Deformation of the General Linear Supergroup 163
  Marmi, S., → Golin, S., et al. 95
  Matone, M., → Bonora, L., et al. 329
- Matone, M., → Bonora, L., et al. 329 Moore, G., Seiberg, N.: Classical and Quantum Conformal Field Theory 177
- Newman, R.P.A.C.: The Global Structure of Simple Space-Times 17
- Nicolò, F.,  $\rightarrow$  Cassandro, M., et al. 123 Nicolò, F., Perfetti, P.: The Sine-Gordon Field Theory Model at  $\alpha^2 = 8\pi$ , the Non-Superrenormalizable Theory 425

Perfetti, P., → Nicolò, F.425 Pickrell, D.: On the Mickelsson-Faddeev Extension and Unitary Representations 617

Russo, J., → Bonora, L., et al. 329

Scoppola, B., → Cassandro, M., et al. 123
Seiberg, N., → Moore, G. 177
Silvotti, R., → Felder, G. 1
Smits, L.: A Remark on Smoothing of Magnetic Schrödinger Semigroups 527
Spohn H.: Ground State(s) of the Spin-Boson Hamiltonian 277
Srivastav, A., → Bach, A. 453
Stroock, D.W., → Holley, R.A. 85

Vafa, C.,  $\rightarrow$  Dijkgraaf, R., et al. 485 Velo, G.,  $\rightarrow$  Ginibre, J. 535 Verlinde, E., → Dijkgraaf, R., et al. 485 Verlinde, H., → Dijkgraaf, R., et al. 485 Vladimirov, V. S., Volovich, I. V.: *p*-Adic Quantum Mechanics 659 Volovich, I. V., → Vladimirov, V. S. 659 Voronin, A. V., → Horuzhy, S. S. 677

Yang, Y.: Existence, Regularity, and Asymptotic Behavior of the Solutions to the Ginzburg-Landau Equations on  $\mathbb{R}^3$  147

Zabrodin, A.V.: Non-Archimedean Strings and Bruhat-Tits Trees 463
Zegarlinski, B., → Albeverio, S., et al. 377

Indexed in Current Contents
Evaluated and abstracted for PHYS on STN

# Communications in Mathematical Physics

# Volume 123 Number 4 1989

E. Bolthausen A Note on the Diffusion of Directed Polymers in a Random

Environment 529

J. Ginibre, G. Velo Scattering Theory in the Energy Space for a Class of Non-

Linear Wave Equations 535

B. K. Driver YM2: Continuum Expectations, Lattice Convergence, and

Lassos 575

D. Pickrell On the Mickelsson-Faddeev Extension and Unitary

Representations 617

I. Bakas Higher Spin Fields and the Gelfand-Dickey Algebra 627

J. M. F. Labastida Morse Theory Interpretation of Topological Quantum Field

Theories 641

V.S. Vladimirov, I.V. Volovich p-Adic Quantum Mechanics 659

S. S. Horuzhy, A. V. Voronin Remarks on Mathematical Structure of BRST Theories 677

L. Desvillettes Entropy Dissipation Rate and Convergence in Kinetic

Equations 687

Contents of Vol. 123

Indexed in Current Contents

Evaluated and abstracted for PHYS on STN



# Springer International

### 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,* Département 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 Univer-

sity, 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 Tech-

nology, Pasadena, CA 91125, USA Prof. Ya. G. Sinai, L. D. Landau Institute for Theoretical Physics, ul. Kosy-

gina, dom 2, SU-117334 Moscow, V-334, USSR *Prof. T. Spencer*, School of Mathematics, Institute for Advanced Study,

Prof. 1. 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. 119-125, (4 issues each) will appear in 1989. North America. Annual subscription rate: US \$ 2387.00, single issue price \$ 105.00 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)3 48-45 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 4249.00, plus carriage charges: Federal Republic of Germany: DM 62.92 incl. value added tax; all other countries. DM 121.80 except for the following countries to which SAL delivery (Surface Airmail Lifted) is mandatory: Japan DM 268.80, India DM 203.00, Australia /New Zealand DM 303.80, Airmail delivery to all other countries is available you request. Volume price: DM 67.00, single issue price: DM 182.10 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)30/821 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 accompanied by a 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