

Communications in
**Mathematical
Physics**

Volume 116 1988

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publication, the authors agree to automatic transfer of the copyright to the publisher; and that the manuscript will not be published elsewhere in any language without the consent of the copyright holders.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
Printers: Brühlsche Universitätsdruckerei, Giessen
Printed in Germany — © Springer-Verlag Berlin Heidelberg 1988
Springer-Verlag GmbH & Co KG, D-1000 Berlin 33

Contents

- Aizenman, M., Lebowitz, J. L., Ruelle, D.: Some Rigorous Results on the Sherrington-Kirkpatrick Spin Glass Model
(*Addendum*) 527
- Albanese, C., Fröhlich, J.: Periodic Solutions of Some Infinite-Dimensional Hamiltonian Systems Associated with Non-Linear Partial Difference Equations I 475
- Balaban, T.: Renormalization Group Approach to Lattice Gauge Field Theories. II. Cluster Expansions I
- Bershadsky, M., Radul, A.: Fermionic Fields on \mathbb{Z}_N -Curves 689
- Borgs, C.: Confinement, Deconfinement and Freezing in Lattice Yang-Mills Theories with Continuous Time 309
- Bricmont, J., Kupiainen, A.: Phase Transition in the 3d Random Field Ising Model 539
- Conlon, J. G., Lieb, E. H., Yau, H.-T.: The $N^{7/5}$ Law for Charged Bosons 417
- D'Antoni, C., Doplicher, S., Fredenhagen, K., Longo, R.: Convergence of Local Charges and Continuity Properties of W^* -Inclusions (*Erratum*) 175
- David, F., Feldman, J., Rivasseau, V.: On the Large Order Behaviour of ϕ_4^4 215
- Doplicher, S., → D'Antoni, C., et al. 175
- Feldman, J., → David, F., et al. 215
- Fokas, A. S., Santini, P. M.: Recursion Operators and Bi-Hamiltonian Structures in Multidimensions. II 449
- Fredenhagen, K., → D'Antoni, C., et al. 175
- Fröhlich, J., Marchetti, P.: Bosonization, Topological Solitons and Fractional Charges in Two-Dimensional Quantum Field Theory 127
- Fröhlich, J., → Albanese, C. 475
- Gérard, C., Sjöstrand, J.: Resonances en limite semiclassique et exposants de Lyapunov 193
- Gesztesy, F., Simon, B.: On a Theorem of Deift and Hempel 503
- Giddings, S. B., Nelson, P.: The Geometry of Super Riemann Surfaces 607
- Guillot, J. C., Ralston, J., Trubowitz, E.: Semi-Classical Asymptotics in Solid State Physics 401
- Hagedorn, G. A.: High Order Corrections to the Time-Independent Born-Oppenheimer Approximation II: Diatomic Coulomb Systems 23
- Hida, T., Potthoff, J., Streit, L.: Dirichlet Forms and White Noise Analysis 235
- Isola, S.: Resonances in Chaotic Dynamics 343
- Jimbo, M., Miwa, T., Okado, M.: Solvable Lattice Models Related to the Vector Representation of Classical Simple Lie Algebras 507
- Kawamoto, N., Namikawa, Y., Tsuchiya, A., Yamada, Y.: Geometric Realization of Conformal Field Theory on Riemann Surfaces 247
- Kopper, C.: On the Borel Summability of Planar Perturbation Series: Transition to Minkowski Space 57
- Kupiainen, A., → Bricmont, J. 539
- Lebowitz, J. L., → Aizenman, M., et al. 527
- Lee, J., Sorkin, R. D.: Derivation of a Bogomol'ny Inequality in Five-Dimensional Kaluza-Klein Theory 353
- Lieb, E. H., → Conlon, J. G., et al. 417
- Lieb, E. H., Sigal, I. M., Simon, B., Thirring, W.: Approximate Neutrality of Large-Z Ions 635
- Llave, R. de la, Moriyón, R.: Invariants for Smooth Conjugacy of Hyperbolic Dynamical Systems. IV 185
- Longo, R., → D'Antoni, C., et al. 175
- Marchetti, P., → Fröhlich, J. 127
- Marchioro, C.: Euler Evolution for Singular Initial Data and Vortex Theory: A Global Solution 45

- Mickelsson, J., Rajeev, S. G.: Current Algebras in $d + 1$ -Dimensions and Determinant Bundles over Infinite-Dimensional Grassmannians 365
- Miwa, T., → Jimbo, M., et al. 507
- Moriyón, R., → Llave, R. de la 185
- Murray, M. K.: Another Construction of the Central Extension of the Loop Group 73
- Namikawa, Y., → Kawamoto, N., et al. 247
- Nelson, P., → Giddings, S. B. 607
- Okado, M., → Jimbo, M., et al. 507
- Potthoff, J., → Hida, T., et al. 235
- Radul, A., → Bershadsky, M. 689
- Rajeev, S. G., → Mickelsson, J. 365
- Ralston, J., → Guillot, J. C., et al. 401
- Rehren, K.-H.: Locality of Conformal Fields in Two Dimensions: Exchange Algebra on the Light-Cone 675
- Reisz, T.: A Power Counting Theorem for Feynman Integrals on the Lattice 81
- Reisz, T.: A Convergence Theorem for Lattice Feynman Integrals with Massless Propagators 573
- Rivasseau, V., → David, F., et al. 215
- Ruback, P. J.: Sigma Model Solitons and Their Moduli Space Metrics 645
- Ruelle, D., → Aizenman, M., et al. 527
- Santini, P. M., → Fokas, A. S. 449
- Schenk, H.: On a Generalised Fourier Transform of Instantons Over Flat Tori 177
- Sigal, I. M., → Lieb, E. H., et al. 635
- Simon, B., → Gesztesy, F. 503
- Simon, B., → Lieb, E. H., et al. 635
- Sjöstrand, J., → Gérard, C. 193
- Sorkin, R. D., → Lee, J. 353
- Streit, L., → Hida, T., et al. 235
- Thirring, W., → Lieb, E. H., et al. 635
- Trubowitz, E., → Guillot, J. C., et al. 401
- Tsuchiya, A., → Kawamoto, N., et al. 247
- Vega, H. J. de: Non-Linear Multi-Plane Wave Solutions of Self-Dual Yang-Mills Theory 659
- Yamada, Y., → Kawamoto, N., et al. 247
- Yau, H.-T., → Conlon, J. G., et al. 417
- Yoshida, H.: Non-Integrability of the Truncated Toda Lattice Hamiltonian at Any Order 529

Indexed in *Current Contents*

Evaluated and abstracted for *PHYS* on *STN*

Communications in Mathematical Physics

Volume 116 Number 1 1988

- T. Balaban Renormalization Group Approach to Lattice Gauge Field Theories. II. Cluster Expansions 1
- G. A. Hagedorn High Order Corrections to the Time-Independent Born-Oppenheimer Approximation II: Diatomic Coulomb Systems 23
- C. Marchioro Euler Evolution for Singular Initial Data and Vortex Theory: A Global Solution 45
- C. Kopper On the Borel Summability of Planar Perturbation Series: Transition to Minkowski Space 57
- M. K. Murray Another Construction of the Central Extension of the Loop Group 73
- T. Reisz A Power Counting Theorem for Feynman Integrals on the Lattice 81
- J. Fröhlich, P. Marchetti Bosonization, Topological Solitons and Fractional Charges in Two-Dimensional Quantum Field Theory 127
- C. D'Antoni, S. Doplicher, K. Fredenhagen, R. Longo Convergence of Local Charges and Continuity Properties of W^* -Inclusions (Erratum) 175

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 copying 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

Statistical physics

Prof. L. Alvarez-Gaumé, Department of Physics, Boston University, Boston MA 02215, USA

Gravitation, field theories and geometry

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

Mathematical methods with direct relevance to physics

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

Quantum physics and differential geometry

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

Dynamical systems

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

Statistical physics

Prof. J. Fröhlich, ETH-Hönggerberg, CH-8093 Zürich, Switzerland

General statistical mechanics

Prof. K. Gawędzki, I.H.E.S., F-91440 Bures-sur-Yvette, France

Quantum field theory and statistical mechanics

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

Chief Editor

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

Nonequilibrium statistical mechanics

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

Classical dynamical systems

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

General theoretical physics

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

Schrödinger operators and atomic physics

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

Statistical physics and dynamical systems

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

Disordered systems

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

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 113-118, (4 issues each) will appear in 1988. **North America.** Annual subscription rate. US \$ 1947 00, single issue price \$ 100 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. 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 3504 00, plus carriage charges. |Federal Republic of Germany DM 51 36 incl. value added tax, all other countries DM 102 00 except for the following countries to which SAL delivery (Surface Airmail Lifted) is mandatory: Japan DM 224.40, India DM 169 20, Australia/New Zealand DM 253 20. Airmail delivery to all other countries is available upon request. |Volume price. DM 584 00, single issue price DM 175.20 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. **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