## Communications in

## Mathematical Physics

## Volume 95 1984

Chief Editor A. Jaffe, Cambridge, MA

Editorial Board H. Araki, Kvoto

M. E. Fisher, Ithaca, NY

J. Fröhlich, Zürich

R. Haag, Hamburg

S. Hawking, Cambridge

O. Lanford, Bures-sur-Yvette

J. L. Lebowitz, New Brunswick, NJ

G. Mack, Hamburg

J. Mather, Princeton, NJ

L. Nirenberg, New York, NY

K. Osterwalder, Zürich

B. Simon, Pasadena, CA

Ya. G. Sinai, Moscow

T. Spencer, New York, NY

R. Stora, Geneva

S.-T. Yau, LaJolla, CA

Advisory Board

M. F. Atiyah, Oxford

A. Connes, Bures-sur-Yvette

G. 't Hooft, Utrecht

I. Singer, Cambridge, MA

C. N. Yang, Stony Brook, NY



Springer-Verlag
Berlin Heidelberg New York Tokyo

## 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 the authors and by the responsible authorities — tacitly or explicitly — in the institutes where the work was carried out and that, if accepted, it will not be published elsewhere in the same form, in either the same or another language, without the consent of the copyright holders. By submitting a manuscript, the authors agree that the copyright for their article is transferred to the publisher if and when the article is accepted for publication. The copyright covers the exclusive rights to reproduce and distribute the article, including reprints, photographic reproductions, microform, electronic data-base, video-disks, or any other reproductions of similar nature, and translations. Photographic reproduction, microform, electronic data-base, video-disks, or any other reproduction of text, figures or tables from this journal is prohibited without permission obtained from the publishers.

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 nor the editors nor the publisher can accept legal responsibility for errors or omissions that may have been made. The publisher makes no warranty, express or implied, with respect to the material contained herein.

## Special Regulations for the USA

Photocopies may be made for personal or internal use beyond that permitted by Section 107 or 108 of the U.S. Copyright Law, provided a fee is paid. This fee is \$0.20 per page or a minimum of \$1.00 if an article-consists of less than five pages. Please pay this fee to the Copyright Clearance Center, Inc., 21 Congress Street, Salem, MA 01970, USA, stating the ISSN 0010-3616, volume, and first and last page numbers of each article copied.

### Other Regulations

Authors of this journal can benefit from library and photocopy fees collected by VG WORT if certain conditions are met. If an author lives in the Federal Republic of Germany or in West Berlin it is recommended that he contact Verwertungsgesellschaft WORT, Abteilung Wissenschaft, Goethestrasse 49, D-8000 München 2, for detailed information.

Springer-Verlag Berlin Heidelberg New York Tokyo Printers: Brühlsche Universitätsdruckerei, Giessen Printed in Germany — © Springer-Verlag Berlin Heidelberg 1984 Springer-Verlag GmbH & Co KG 1000 Berlin 33

## **Contents**

Audretsch, J., Gähler, F., Straumann, N.: Wave Fields in Weyl Spaces and Conditions for the	
Existence of a Preferred Pseudo-Riemannian Structure	41
Balaban, T.: Propagators and Renormalization Transformations for Lattice Gauge Theories. I.	17
Bleher, P. M., Major, P.: Renormalization of Dyson's Hierarchical Vector Valued $\phi^4$ Model at	
Low Temperatures	487
	207
Problems	307
Bruzzo, U., Cianci, R.: Structure of Supermanifolds and Supersymmetry Transformations	
Casati, G., Guarneri, I.: Non Recurrent Behaviour in Quantum Dynamics	
Cianci, R., see Bruzzo, U.	393
Collet, P., Epstein, H., Gallavotti, G.: Perturbations of Geodesic Flows on Surfaces of Constant	
Negative Curvature and Their Mixing Properties	61
Conick, J. De: Scaling Limit of the Energy Variable for the Two-Dimensional Ising Ferromagnet	53
Epstein, H., see Collet, P., et al.	61
Figotin, A. L., Pastur, L. A.: An Exactly Solvable Model of a Multidimensional Incommensurate	
Structure	
Gähler, F., see Audretsch, J., et al.	41
Gallavotti, G., see Collet, P., et al.	61
Guarneri, I., see Casati, G.	121
Illner, R., Shinbrot, M.: The Boltzmann Equation: Global Existence for a Rare Gas in an Infinite	
Vacuum	
Isakov, S. N.: Nonanalytic Features of the First Order Phase Transition in the Ising Model	
Ito, K. R.: Analytic Study of the Migdal-Kadanoff Recursion Formula	
Lott, J.: The Yang-Mills Collective-Coordinate Potential	
Major, P., see Bleher, P. M.	
Mayer, D. H.: Approach to Equilibrium for Locally Expanding Maps in $\mathbb{R}^k$	1
Montesinos, A.: Differential Geometric Statement of Variational Equations for Abstract Fluids	185
Moreschi, O. M., Sparling, G. A. J.: On the Positive Energy Theorem Involving Mass and Electro-	
magnetic Charges	113
Palanques-Mestre, A., Pascual, P.: The $1/N_F$ Expansion of the $\gamma$ and $\beta$ Funktions in Q.E.D	
Pascual, P., see Palanques-Mestre, A.	
Pastur, L. A., see Figotin, A. L.	401
Pogosian, S.: Asymptotic Expansion of the Logarithm of the Partition Function	227
Rivasseau, V.: Construction and Borel Summability of Planar 4-Dimensional Euclidean Field	
Theory	
Rosenblatt, J.: Phase Retrieval	
Rosly, A. A., Schwarz, A. S.: Geometry of $N = 1$ Supergravity	
Saveliev, M. V.: Intergrable Graded Manifolds and Nonlinear Equations	
Schwarz, A. S., see Rosly, A. A.	
Shinbrot, M., see Illner, R.	217
Smoller, J. A., Wasserman, A. G.: Existence, Uniqueness, and Nondegeneracy of Positive Solu-	120
tions of Semilinear Elliptic Equations	
Sparling, G. A. J., see Moreschi, O. M.	
Straumann, N., see Audretsch, J., et al.	41
Taubes, C. H.: Monopoles and Maps from $S^2$ to $S^2$ ; the Topology of the Configuration Space	
Vafa, C., Witten, E.: Eigenvalue Inequalities for Fermions in Gauge Theories	
Verbeure, A.: Detailed Balance and Equilibrium	
Wasserman, A. G., see Smoller, J. A.	
Witten E. see Vafa C.	2.57

Indexed in Current Contents Evaluated for Physics Briefs and INKA-PHYS data base

# Communications in Mathematical Physics

## Volume 95 Number 4 1984

U. Bruzzo, R. Cianci

Structure of Supermanifolds and Supersymmetry Transformations 393

A. L. Figotin, L. A. Pastur

An Exactly Solvable Model of a Multidimensional Incommensurate Structure 401

S. N. Isakov

Nonanalytic Features of the First Order Phase Transition in the Ising Model 427

V. Rivasseau

Construction and Borel Summability of Planar 4-Dimensional Euclidean Field Theory 445

---

Renormalization of Dyson's Hierarchical Vector Valued 64

P. M. Bleher, P. Major

Model at Low Temperatures 487

Indexed in Current Contents
Evaluated for Physics Briefs and INKA-PHYS data base



## Springer-Verlag Berlin Heidelberg New York Tokyo

## 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 the authors and by the responsible authorities — tacitly or explicitly — in the institutes where the work was carried out and that, if accepted, it will not be published elsewhere in the same form, in either the same or another language, without the consent of the copyright holders. By submitting a manuscript, the authors agree that the copyright for their article is transferred to the publisher if and when the article is accepted for publication. The copyright covers the exclusive rights to reproduce and distribute the article, including reprints, photographic reproductions, microform, electronic data-base, video-disks, or any other reproductions of similar nature, and translations. Photographic reproduction, microform, electronic data-base, video-disks, or any other reproduction of text, figures or tables from this journal is prohibited without permission obtained from the publishers.

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

Special Regulations for the USA. Photocopies may be made for personal or internal use beyond that permitted by Section 107 or 108 of the U.S. Copyright Law, provided a fee is paid. This fee is \$ 0.20 per page or a minimum of \$ 1.00 if an article consists of less than five pages. Please pay this fee to the Copyright Clearance Center, Inc., 21 Congress Street, Salem, MA 01970, USA, stating the ISSN 0010-3616 volume, and first and last page numbers of each article copied.

The copyright owner's consent does not extend to copying for general distribution, for promotion, for creating new works, or for resale. Specific written permission must be obtained from the publisher for such copying.

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

*Prof. M. E. Fisher,* Baker Laboratory, Department of Chemistry, Cornell University, Ithaca, NY 14850, USA

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

Prof. R. Haag, II. Institut für Theoretische Physik, Luruper Chaussee 149, D-2000 Hamburg 50, Federal Republic of Germany

*Prof. S. Hawking,* Department of Applied Mathematics and Theoretical Physics, University of Cambridge, Silver Street, Cambridge CB3 9EW, England

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

Prof. O. Lanford, I. H. E. S., F-91440 Bures-sur-Yvette, France

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

Prof. G. Mack, II. Institut für Theoretische Physik, Luruper Chaussee 149, D-2000 Hamburg 50, Federal Republic of Germany

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

Prof. L. Nirenberg, Courant Institute, New York University, 251 Mercer Street, New York, NY, 10012, USA

Prof. K. Osterwalder, E.T.H. Zentrum, CH-8092 Zürich, Switzerland

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

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

Prof. T. Spencer, Courant Institute, New York University, 251 Mercer Street, New York, NY 10012, USA

*Prof. R. Stora,* CERN, Theory Division, CH-1211 Geneva 23, Switzerland *Prof. S.-T. Yau,* Department of Mathematics, University of California at San Diego, La Jolla, CA 92093, USA

Mathematical methods with direct relevance to physics

Statistical physics

Equilibrium statistical mechanics Conceptual structure

Gravitation and field theories

Chief Editor

Dynamical systems

Nonequilibrium statistical mechanics

Quantum field theory and statistical mechanics

Classical dynamical systems

Partial differential equations

Constructive quantum field theory and general theory of quantized fields

Schrödinger operators and atomic physics

Statistical physics and dynamical systems

Disordered systems

Lagrangian quantum field theory 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. 92-96, (4 issues each) will appear in 1984. The price of each volume is DM 394.00 or approx. US \$ 151.60. Prices for back volumes are available on request. Correspondence concerning subcriptions should be addressed to the publisher. North America. Annual subscription rate: US \$ 802.00, 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 0023 125994. 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 1970.00, plus carriage charges. Airmail delivery on request only. For Japan, carriage charges (Surface Airmail Lifted) are DM 191.40; for India DM 108.50. Single issue price DM 118.20 plus carriage charges. — Orders for all countries except North America can either be placed with your bookdealer or sent directly to: Springer-Verlag, Heidelberg 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. 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 87-3 26, Telex 04 61 723