# Communications in Mathematical Physics

## Volume 92 Number 4 1984

E. Witten	Non-Abelian Bosonization in Two Dimensions 455		
E. H. Lieb	On Characteristic Exponents in Turbulence 473		
P. A. Perry	Exponential Bounds and Semi-Finiteness of Point Spectrum for <i>N</i> -Body Schrödinger Operators 481		
G. F. Torres del Castillo	A Note on D (k, 0) Killing Spinors 485		
A. O. Golosov	Localization of Random Walks in One-Dimensional Random Environments 491		
H. J. de Vega, H. Eichenherr, J. M. Maillet	Classical and Quantum Algebras of Non-Local Charges in $\sigma$ Models 507		
M. van den Berg	A Uniform Bound on Trace ( $e^{t\Delta}$ ) for Convex Regions in $R^n$ with Smooth Boundaries 525		
K. Gawędzki, A. Kupiainen	Lattice Dipole Gas and $( abla \phi)^4$ Models at Long Distances: Decay of Correlations and Scaling Limit 531		
R. Schrader, M. E. Taylor	Small $\hbar$ Asymptotics for Quantum Partition Functions Associated to Particles in External Yang-Mills Potentials 555		
	Indexed in Current Contents		



# Springer-Verlag Berlin Heidelberg New York Tokyo

Evaluated for Physics Briefs and INKA-PHYS data base

220 Commun. Math. Phys. ISSN 0010-3616 CMPHAY 92 (4) 455-594 (1984)

### 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authorities — tacitly or explicitly — in the institutes where the work was carried out and that, if accepted, it will not be published elsewhere in the same form, in either the same or another language, without the consent of the copyright holders.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 of the prinsion 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 Uni-
versity, Kyoto, 6	306, Japan			

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. Lascoux,* Physique Théorique, Ecole Polytechnique, F-91120 Palaiseau, 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

Prof. Ya. G. Sinai, L. D. Landau Institute for Theoretical Physics, Academy of Sciences, Vorobyevskoe Shosse, 2, SU-117334 Moscow, 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*, School of Mathematics, The Institute for Advanced Study, Princeton, NJ 08540, USA

Mathematical methods with direct relevance to 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 0023125994. 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, 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. **Microform:** Microform editions are available from: University Microfilms International, 300 N. Zeeb Road, Ann Arbor, MI 48106, USA.

### Production