

# Communications in Mathematical Physics

Volume 108 Number 1 1987

P. Collet, F. Dunlop Geometric Expansion of the Boundary Free Energy of a Dilute Gas 1

D. B. Abraham, J. De Coninck Yang—Lee Zeros of a Planar Ising Model with a Boundary Magnetic Field 13

S. Graffi, T. Paul The Schrödinger Equation and Canonical Perturbation Theory 25

R. Carmona, A. Klein, F. Martinelli Anderson Localization for Bernoulli and Other Singular Potentials 41

M. V. Wickerhauser Inverse Scattering for the Heat Operator and Evolutions in  $2 + 1$  Variables 67

K. Fredenhagen, R. Haag Generally Covariant Quantum Field Theory and Scaling Limits 91

K. Galicki A Generalization of the Momentum Mapping Construction for Quaternionic Kähler Manifolds 117

L. N. Chang, Y. Liang Topological Anomalies: Explicit Examples 139

T. P. Liu Hyperbolic Conservation Laws with Relaxation 153

Indexed in *Current Contents*  
Evaluated and abstracted for *PHYS* on *STN*



Springer International

220 Commun. Math. Phys.  
ISSN 0010-3616 CMPHAY 108 (1) 1-176 (1987)

January (I) 1987

# 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publication, the authors agree to automatic transfer of the copyright to the publisher; and that the manuscript will not be published elsewhere in any language without the consent of the copyright holders.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.

**Other regulations:** Authors publishing in this journal can, under certain conditions, benefit from library and photocopy fees collected by VG WORT. Authors of German nationality and those resident in the Federal Republic of Germany or Berlin (West), as well as citizens of Austria, Switzerland and member countries of the European Community, may apply to Verwertungsgesellschaft WORT, Abteilung Wissenschaft, Goethestraße 49, D-8000 München 2, for detailed information.

**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*, Hill Center, Busch Campus, Rutgers University, New Brunswick, NJ 08903, USA

*Statistical physics*

*Prof. L. Alvarez-Gaumé*, until August 31, 1987: Theory Division, CERN, CH-1211 Genève 23, Switzerland. After September 1, 1987: 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. J.-P. Eckmann*, Département de Physique Théorique, Université de Genève, 32, Boulevard d'Ivroy, CH-1211 Genève 4, Switzerland

*Dynamical systems*

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

*Statistical physics*

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

*General statistical mechanics*

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

*Quantum field theory and statistical mechanics*

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

*Conceptual structure*

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

*Constructive quantum field theory and general theory of quantized fields*

*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. C. H. Taubes*, Department of Mathematics, Harvard University, 1 Oxford Street, Cambridge, MA 02138, USA

*Partial differential equations*

*Prof. S.-T. Yau*, Department of Mathematics, University of California at San Diego, La Jolla, CA 92093, 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. 108-112, (4 issues each) will appear in 1987. **North America.** Annual subscription rate: US \$ 1466.00, single issue price \$ 88.00 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 2920.00, plus carriage charges. Volume price: DM 584.00, single issue price: DM 175.20, plus carriage charges. Airmail delivery on request only. Carriage charges for SAL (Surface Airmail Lifted) to Japan, India, Australia and New Zealand are available on request. — 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. **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