

Communications in  
**Mathematical  
Physics**

Volume 66 1979

Chief Editor A. Jaffe, Cambridge, MA

Editorial Board H. Araki, Kyoto  
E. Brézin, Saclay  
R. Geroch, Chicago, IL  
J. Ginibre, Orsay  
J. Glimm, New York, NY  
R. Haag, Hamburg  
J. L. Lebowitz, New Brunswick, NJ  
E. Lieb, Princeton, NJ  
J. Moser, New York, NY  
K. Osterwalder, Zürich  
D. Ruelle, Bures-sur-Yvette  
B. Simon, Princeton, NJ  
Ya. G. Sinai, Moscow  
R. Stora, Geneva

Advisory Board M. F. Atiyah, Oxford  
G. 't Hooft, Utrecht  
C. N. Yang, Stony Brook, NY



Springer-Verlag  
Berlin Heidelberg New York

### **Copyright**

It is a fundamental condition that submitted manuscripts have not been published and will not be simultaneously submitted or published elsewhere. 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 or any other reproductions of similar nature, and translations. Photographic reproduction, microform, or any other reproduction of text, figures, or tables from this journal is prohibited without permission obtained from the publisher.

#### *Special Regulations for the USA*

The Article Fee Code on the first page of an article in this journal indicates the copyright owner's consent that in the USA copies may be made for personal or internal use, provided the stated fee for copying beyond that permitted by Section 107 or 108 of the United States Copyright Law is paid through the Copyright Clearance Center, Inc.

If a code does not appear, copies of the article may be made without charge, provided permission is obtained from the publisher.

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.

Alle Rechte, einschließlich das der Übersetzung in fremde Sprachen und das der fotomechanischen Wiedergabe oder einer sonstigen Vervielfältigung, auch in Mikroform, vorbehalten. Jedoch wird gewerblichen Unternehmen für den innerbetrieblichen Gebrauch nach Maßgabe des zwischen dem Börsenverein des Deutschen Buchhandels e. V. und dem Bundesverband der Deutschen Industrie abgeschlossenen Rahmenabkommens die Anfertigung einer fotomechanischen Vervielfältigung gestattet. Wenn für diese Zeitschrift kein Pauschalabkommen mit dem Verlag vereinbart worden ist, ist eine Wertmarke im Betrage von DM 0,40 pro Seite zu verwenden.

Springer-Verlag Berlin Heidelberg New York

Printers: Brühlsche Universitätsdruckerei, Lahn-Gießen

Printed in Germany — © by Springer-Verlag Berlin Heidelberg 1979

# Contents

Boel, R. J., see Kasteleyn, P. W. ....	167
Bricmont, J., Lebowitz, J. L., Pfister, C. E., Olivieri, E.: Non-Translation Invariant Gibbs States with Coexisting Phases. I. Existence of Sharp Interface for Widom-Rowlinson Type Lattice Models in Three Dimensions .....	1
Bricmont, J., Lebowitz, J. L., Pfister, C. E.: Non-Translation Invariant Gibbs States with Coexisting Phases. II. Cluster Properties and Surface Tension .....	21
Dell, J., Smolin, L.: Graded Manifold Theory as the Geometry of Supersymmetry .....	197
Fröhlich, J.: The Charged Sectors of Quantum Electrodynamics in a Framework of Local Observables .....	223
Gibbons, G. W., Pope, C. N.: The Positive Action Conjecture and Asymptotically Euclidean Metrics in Quantum Gravity .....	267
Gibbons, G. W., Hawking, S. W.: Classification of Gravitational Instanton Symmetries .....	291
Ginibre, J., Velo, G.: The Classical Field Limit of Scattering Theory for Non-Relativistic Many-Boson Systems. I .....	37
Hagedorn, G. A.: Born Series for (2 Cluster) $\rightarrow$ (2 Cluster) Scattering of Two, Three, and Four Particle Schrödinger Operators .....	77
Hawking, S. W., see Gibbons, G. W. ....	291
Holsztynski, W., Slawny, J.: Phase Transitions in Ferromagnetic Spin Systems at Low Temperatures	147
Kashiwara, M., Kawai, T., Stapp, H. P.: Micro-Analyticity of the S-Matrix and Related Functions	95
Kasteleyn, P. W., Boel, R. J.: Extremal $A$ -Inequalities for Ising Models with Pair Interactions ..	167
Kawai, T., see Kashiwara, M., et al. ....	95
Lebowitz, J. L., see Bricmont, J., et al. ....	1
Lebowitz, J. L., see Bricmont, J., et al. ....	21
Marchioro, C., Pellegrinotti, A., Pulvirenti, M., Suhov, Yu.: Time Evolution of Gibbs States for an Anharmonic Lattice .....	131
Newman, C. M.: Critical Point Inequalities and Scaling Limits .....	181
Olivieri, E., see Bricmont, J., et al. ....	1
Pellegrinotti, A., see Marchioro, C., et al. ....	131
Pfister, C. E., see Bricmont, J., et al. ....	1
Pfister, C. E., see Bricmont, J., et al. ....	21
Pope, C. N., see Gibbons, G. W. ....	267
Pulvirenti, M., see Marchioro, C., et al. ....	131
Slawny, J., see Holsztynski, W. ....	147
Smolin, L., see Dell, J. ....	197
Stapp, H. P., see Kashiwara, M., et al. ....	95
Suhov, Yu., see Marchioro, C., et al. ....	131
Velo, G., see Ginibre, J. ....	37

Indexed in Current Contents



Communications in  
**Mathematical  
 Physics**

Volume 66 Number 1 1979

- J. Bricmont, J. L. Lebowitz,  
 C. E. Pfister, E. Olivieri    Non-Translation Invariant Gibbs States with  
 Coexisting Phases. I. Existence of Sharp  
 Interface for Widom-Rowlinson Type Lattice  
 Models in Three Dimensions    1
- J. Bricmont, J. L. Lebowitz,  
 C. E. Pfister    Non-Translation Invariant Gibbs States with  
 Coexisting Phases. II. Cluster Properties and  
 Surface Tension    21
- J. Ginibre, G. Velo    The Classical Field Limit of Scattering  
 Theory for Non-Relativistic Many-Boson  
 Systems. I    37
- G. A. Hagedorn    Born Series for (2 Cluster)  $\rightarrow$  (2 Cluster)  
 Scattering of Two, Three, and Four Particle  
 Schrödinger Operators    77

Indexed in Current Contents



Springer-Verlag  
 Berlin Heidelberg New York

# Communications in Mathematical Physics

## Copyright

It is a fundamental condition that submitted manuscripts have not been published and will not be simultaneously submitted or published elsewhere. 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 or any other reproductions of similar nature, and translations.

Photographic reproduction, microform, or any other reproduction of text, figures, or tables from this journal is prohibited without permission obtained from the publisher.

*Special Regulations for the USA.* The Article Fee Code on the first page of an article in this journal indicates the copyright owner's consent that in the USA copies may be made for personal or internal use, provided the stated fee for copying beyond that permitted by Section 107 or 108 of the United States Copyright Law is paid through the Copyright Clearance Center, Inc.

If a code does not appear, copies of the article may be made without charge, provided permission is obtained from the publisher.

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" and may send manuscripts to:

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

*Mathematical methods with direct relevance to physics*

*Prof. E. Brézin*, Service de Physique Théorique, CEN Saclay, B. P. 2, F-91190 Gif-sur-Yvette, France

*Quantum fields and statistical mechanics*

*Prof. R. Geroch*, E. Fermi Institute, University of Chicago, 933 East 56 Street, Chicago, IL 60637, USA

*General relativity, cosmology*

*Prof. J. Glimmer*, Laboratoire de Physique Théorique et Hautes Énergies, Université de Paris IX, Batiment 211, F-91405 Orsay, France

*Quantum mechanics*

*Prof. J. Glimm*, The Rockefeller University, 1230 York Avenue, New York, NY 10021, USA

*Fluid 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. E. Lieb*, Physics Department, Princeton University, P. O. Box 708, Princeton, NJ 08540, USA

*Equilibrium statistical mechanics*

*Prof. J. Moser*, New York University, Courant Institute of Mathematical Sciences, 251 Mercer Street, New York, NY 10012, 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. D. Ruelle*, IHES, F - 91440 Bures-sur-Yvette, France

*Dissipative dynamical systems*

*Prof. B. Simon*, Jadwin Physics Laboratory, Princeton University, Princeton, NJ 08540, USA

*Scattering theory and atomic physics*

*Prof. Ya. G. Sinai*, L. D. Landau Institute for Theoretical Physics, Academy of Sciences, Vorobyevskoe Shosse, 2, 117334 Moscow, USSR

*Statistical physics and dynamical systems*

*Prof. R. Stora*, from Sept. 1, 78 to Aug. 31, 79: CERN, Theory Division, CH-1211 Geneva 23, Switzerland

*Lagrangian quantum field theory*

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

Volumes 64-70 (3 issues each) will appear in 1979. The price of each volume is DM 158.— or \$ 79.00. Information about obtaining back volumes and microform editions is available upon request.

*North America.* Subscription rate: \$ 576.50, including postage and handling. 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.

*All Other Countries.* Subscription rate: DM 1106.—, plus postage and handling. Orders can either be placed with your bookdealer or sent directly to: Springer-Verlag, Heidelberger Platz 3, D-1000 Berlin 33.

### Springer-Verlag

Journal Production Dept. I  
Postfach 105280  
D-6900 Heidelberg 1  
Telephone (06221) 487300  
Telex 04-61690

### Springer-Verlag

Heidelberger Platz 3  
D-1000 Berlin 33  
Telephone (030) 822001  
Telex 01-83319

### Springer-Verlag New York Inc.

17 Fifth Avenue  
New York, NY 10010, USA  
Telephone (212) 477-8200  
Telex 0023232235