Journal Of Aifferential Beometry

C. B. Croke, Area and the length of the shortest closed	
geodesic	1
G. Warner, Application of the Selberg trace formula to the Riemann-Roch theorem	23
R. C. Penner, Perturbative series and the moduli space of Riemann surfaces	35
QM. Wang, On the topology of Clifford isoparametric hyper- surfaces	55
D. B. A. Epstein & R. C. Penner, Euclidean decompositions of noncompact hyperbolic manifolds	67
R. Brooks, Some remarks on volume and diameter of Rieman- nian manifolds	81
J. Roe, An index theorem on open manifolds. I	87
, An index theorem on open manifolds. II	115
D. Gieseker, A construction of stable bundles on an algebraic surface	137
M. L. Green, A new proof of the explicit Noether-Lefschetz theorem	155
J. G. Wolfson, Harmonic sequences and harmonic maps of surfaces into complex Grassmann manifolds	161

Nol. 27 · No. 1

Hannary 1988

JOURNAL OF DIFFERENTIAL GEOMETRY

Editors

ROBERT L. BRYANT Duke University Durham, North Carolina 27706 SIMON K. DONALDSON University of Oxford Oxford, England OX1 3LB PHILLIP A. GRIFFITHS Duke University Durham, North Carolina 27706 C. C. HSIUNG Lehigh University Bethlehem, Pennsylvania 18015 H. BLAINE LAWSON, JR. State University of New York Stony Brook, New York 11794
RICHARD M. SCHOEN Standord University Stanford, California 94305
Y. T. SIU Harvard University Cambridge, Massachusetts 02138
S. T. YAU Harvard University
Cambridge, Massachusetts 02138

Associate Editors

MICHAEL H. FREEDMAN	David Mumford
University of California	Harvard University
La Jolla, California 92093	Cambridge, Massachusetts 02138
RICHARD B. MELROSE	Roger Penrose
Massachusetts Institute of Technology	University of Oxford
Cambridge, Massachusetts 02139	Oxford, England OX1 3LB
DAVID RUELLE	

Institut des Hautes Études Scientifiques 91440 Bur-Sur-Yvette, France

The Journal of Differential Geometry, published bimonthly by Lehigh University in January, March, May, July, September and November, is devoted to the publication of research papers in differential geometry and related subjects such as differential equations, mathematical physics, algebraic geometry and geometric topology.

The subscription price for Vols. 27-28 (1988) is \$190.00 list, \$48.00 for personal use of individuals; each volume consists of three numbers. Back number prices per volume (with a 40% reduction for members of the American Mathematical Society): Vols. 1–2 (1967–1968), \$21.00; Vols. 3–6 (1969–1972), \$27.00; Vols. 7–9 (1972–1974), \$36.00; Vol. 10 (1975), \$45.00; Vol. 11 (1976), \$52.00; Vol. 12 (1977), \$60.00; Vols. 13–15 (1978–1980), \$63.00; Vol. 16 (1981), \$72.00; Vol. 17 (1982), \$78.00; Vols. 18–20 (1983–1984), \$120.00; Vols. 21-22 (1985), \$135.00; Vols. 23–26 (1986–1987), \$143.00.

Subscriptions and orders should be addressed to the American Mathematical Society, P. O. Box 1571, Annex Station, Providence, Rhode Island 02901-9930. All orders must be accompanied by payment, and check should be made payable to the American Mathematical Society. General correspondence and changes of address should be sent to the American Mathematical Society, P. O. Box 6248, Providence, Rhode Island 02940.

Instructions for submission of manuscripts are given inside of the back cover of this issue.

Journal Of Differential Beometry

Published by LEHIGH UNIVERSITY Bethlehem, Pennsylvania

Holume 27 · 1988

JOURNAL OF DIFFERENTIAL GEOMETRY

Editors

ROBERT L. BRYANT Duke University Durham, North Carolina 27706 SIMON K. DONALDSON University of Oxford Oxford, England OX1 3LB PHILLIP A. GRIFFITHS Duke University Durham, North Carolina 27706 C. C. HSIUNG	H. BLAINE LAWSON, JR. State University of New York Stony Brook, New York 11794 RICHARD M. SCHOEN Standord University Stanford, California 94305 Y. T. SIU Harvard University Cambridge, Massachusetts 02138 S. T. YAU		
Lehigh University	Harvard University		
Bethlehem, Pennsylvania 18015	Cambridge, Massachusetts 02138		
Associate Editors			
MICHAEL H. FREEDMAN University of California La Jolla, California 92093	DAVID MUMFORD Harvard University Cambridge, Massachusetts 02138		
RICHARD B. MELROSE Massachusetts Institute of Technology Cambridge, Massachusetts 02139	ROGER PENROSE y University of Oxford Oxford, England OX1 3LB		
David Ruelle Institut des Hautes É 91440 Bur-Sur-Yvette	tudes Scientifiques e. France		

The Journal of Differential Geometry, published bimonthly by Lehigh University in January, March, May, July, September and November, is devoted to the publication of research papers in differential geometry and related subjects such as differential equations, mathematical physics, algebraic geometry and geometric topology.

The subscription price for Vols. 27-28 (1988) is \$190.00 list, \$48.00 for personal use of individuals; each volume consists of three numbers. Back number prices per volume (with a 40% reduction for members of the American Mathematical Society): Vols. 1-2 (1967–1968), \$21.00; Vols. 3-6 (1969–1972), \$27.00; Vols. 7-9 (1972–1974), \$36.00; Vol. 10 (1975), \$45.00; Vol. 11 (1976), \$52.00; Vol. 12 (1977), \$60.00; Vols. 13-15 (1978–1980), \$63.00; Vol. 16 (1981), \$72.00; Vol. 17 (1982), \$78.00; Vols. 18-20 (1983–1984), \$120.00; Vols. 21-22 (1985), \$135.00; Vols. 23-26 (1986–1987), \$143.00.

Subscriptions and orders should be addressed to the American Mathematical Society, P. O. Box 1571, Annex Station, Providence, Rhode Island 02901-9930. All orders must be accompanied by payment, and check should be made payable to the American Mathematical Society. General correspondence and changes of address should be sent to the American Mathematical Society, P. O. Box 6248, Providence, Rhode Island 02940.

Instructions for submission of manuscripts are given inside of the back cover of this issue.

Copyright © 1988 Lehigh University. All rights reserved. ISSN 0022-040X Printed in the United States of America. The paper used in this journal is acid-free and falls within the guidelines established to ensure permanence and durability. ∞