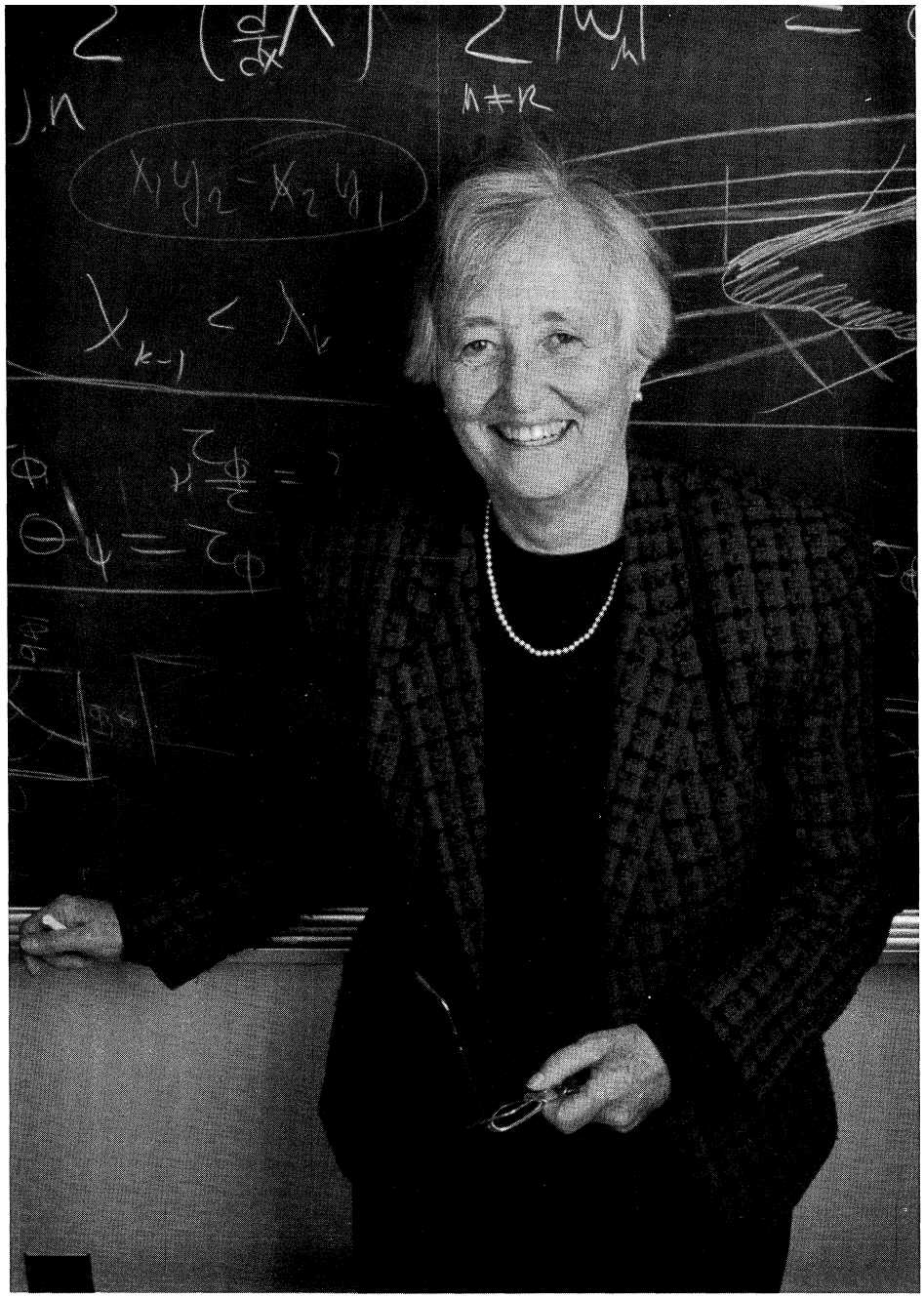
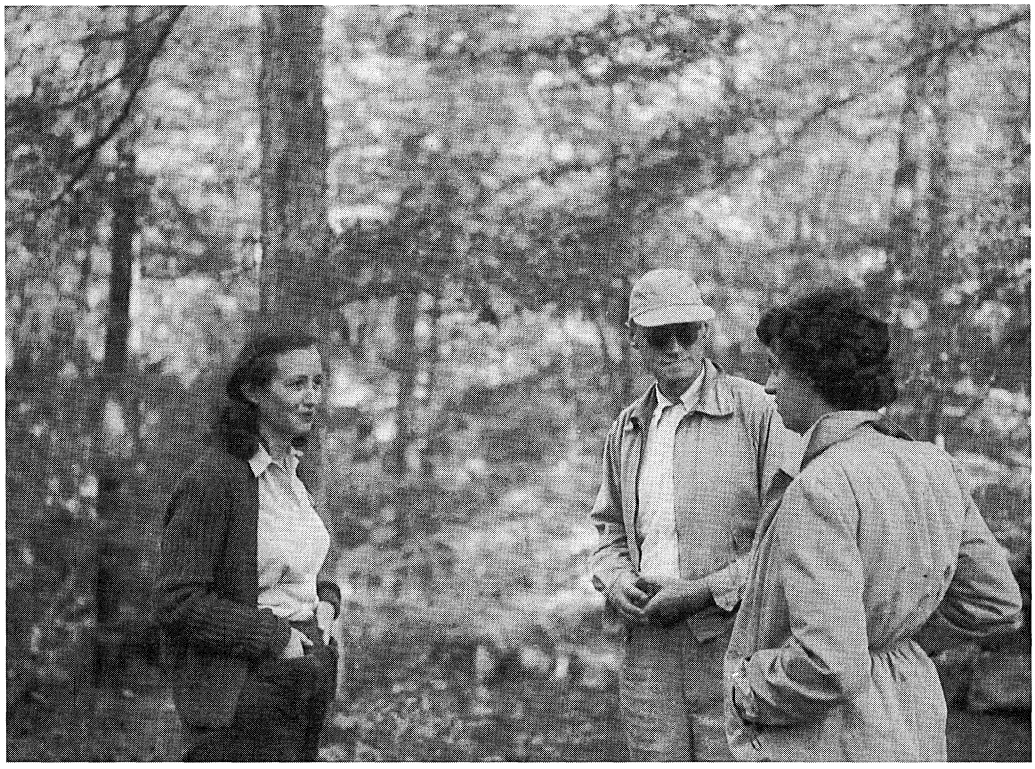


CATHLEEN SYNGE MORAWETZ

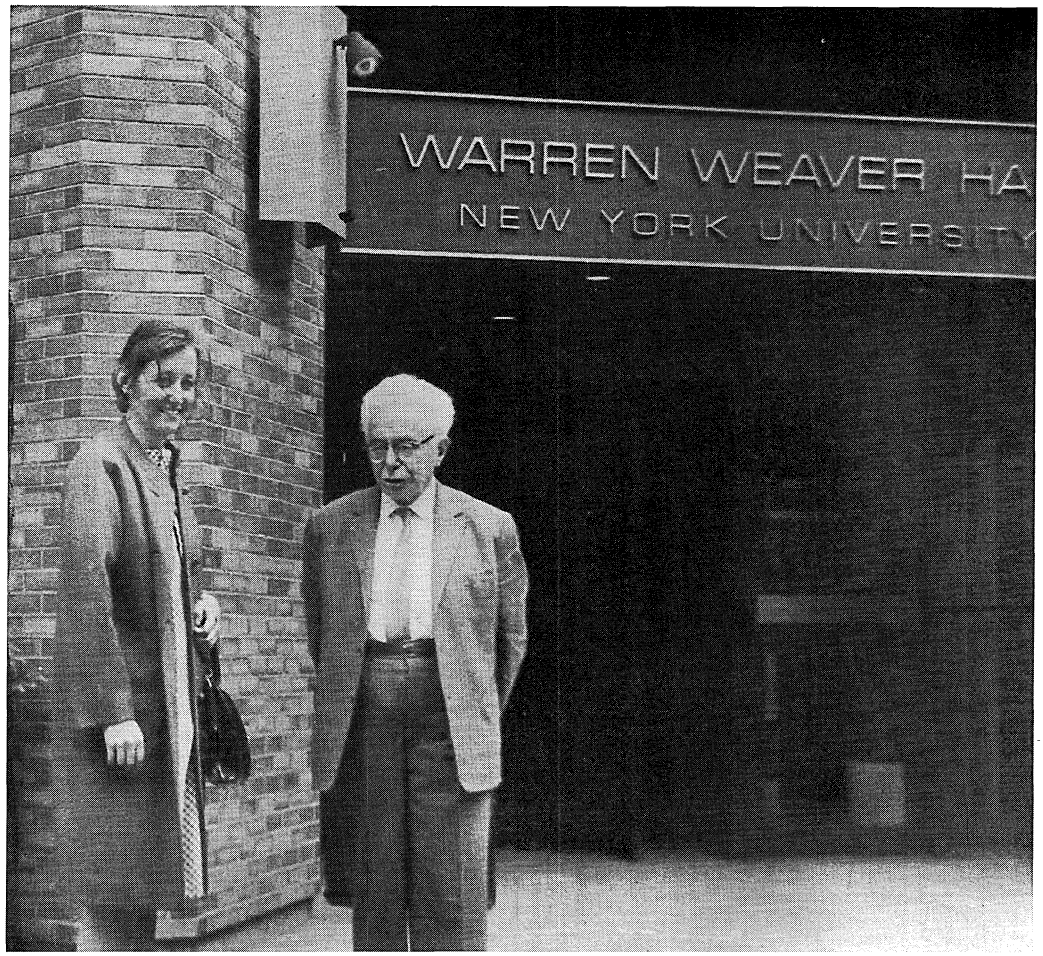
For her many pioneering contributions to the theory of partial differential equations and wave propagation, that resulted in applications in aerodynamics, acoustics, and optics. Her research accomplishments are matched by her leadership and inspiration, judgment and vision, and knowledge and generosity to colleagues and collaborators.

William J. Clinton, 1998

with Herbert, her children and grandchildren
Spring, 1999

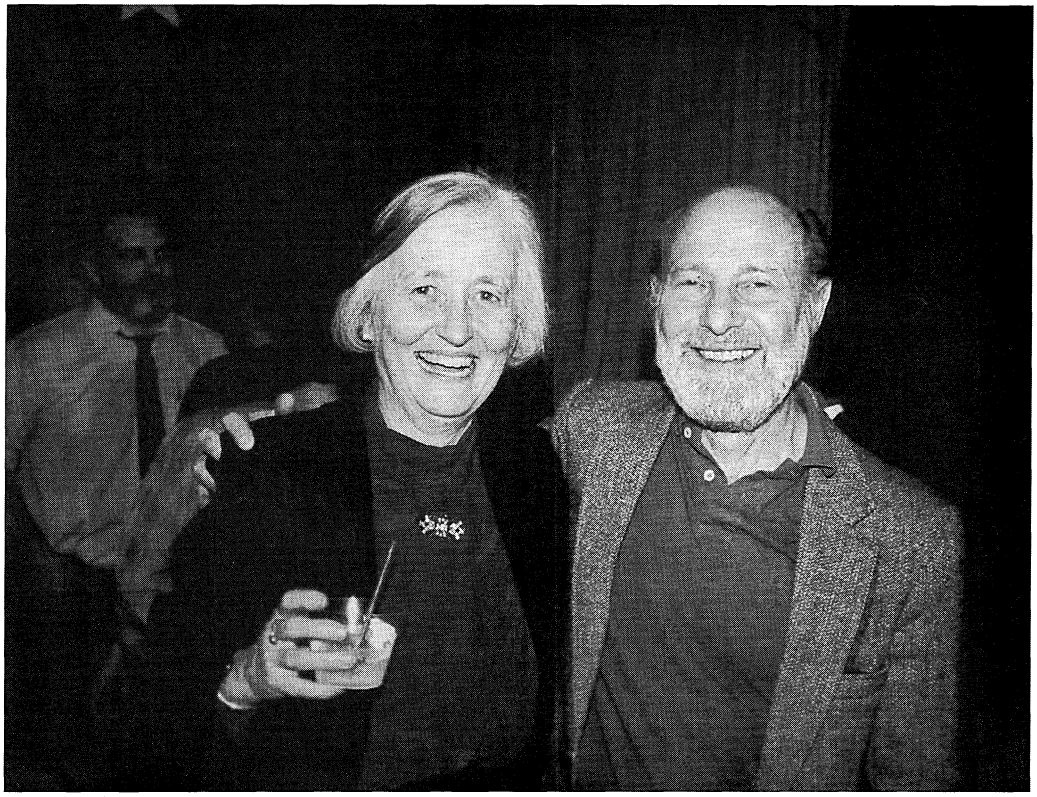


with K. O. Friedrichs, Gertrude Moser on a picnic
1955 or 1956

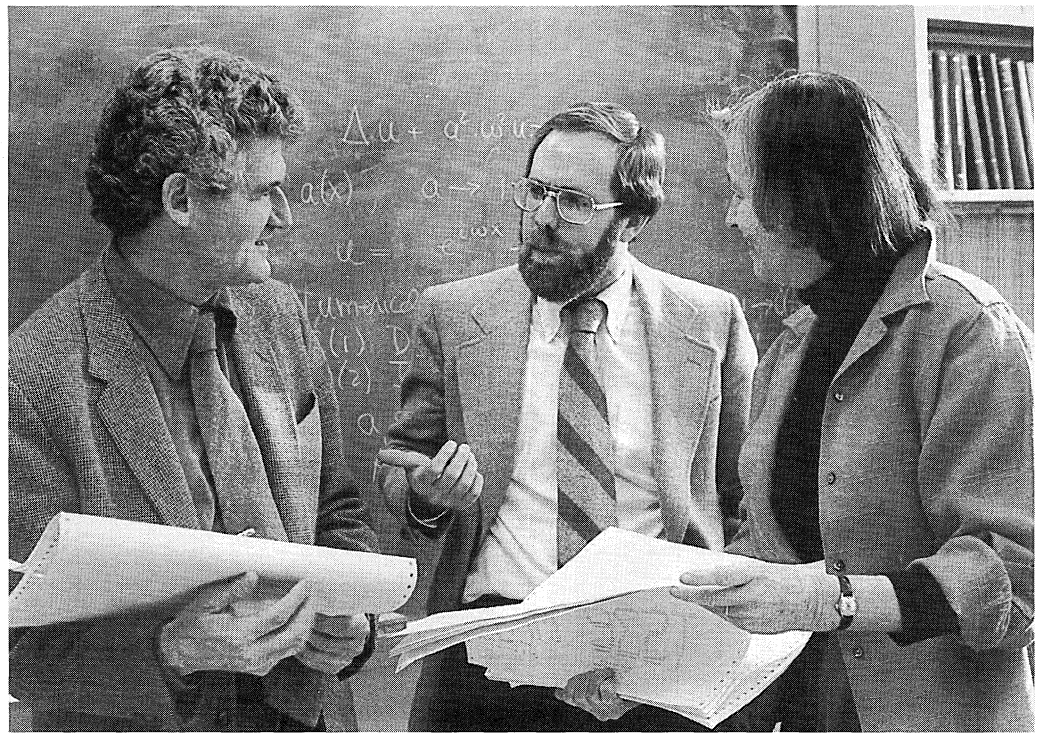


with Courant, 1965

with Nina Uraltzeva, Irene Gamba, Jürgen and Gertrude Moser
in Berlin, Summer, 1998

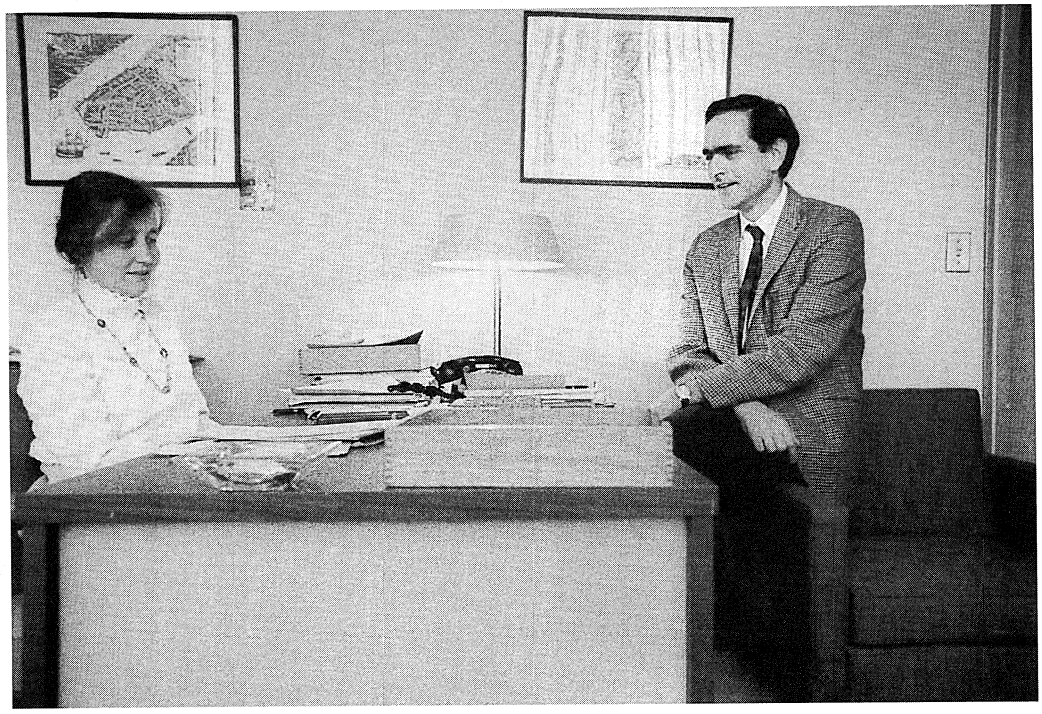


with George Papanicolaou



with Charlie Peskin and Peter Lax

with Harold Weitzner



with Joe Keller

METHODS AND APPLICATIONS OF ANALYSIS.
Vol. 7, No. 2, pp. 00i–00i, June 2000

PREFACE

Professor Cathleen Synge Morawetz turns seventy-seven this year. It is a great honour for the Methods and Applications of Analysis to dedicate these two issues to her on her seventy-seventh birthday. As her friends, colleagues, collaborators, and admirers, we all are extremely happy to take this special occasion to celebrate Professor Morawetz's longtime fundamental and profound achievements in both mathematical researches and general development of mathematical community.

Professor Morawetz has been one of the most important leaders in the field of applied analysis in the past several decades. In particular, she has made many pioneering contributions to the theory of partial differential equations and wave propagation. These include a series of fundamental studies on the asymptotic behavior of solutions to the linear wave equation, her discovery of several unusual and powerful energy estimates which are closely related to the conformal invariance of the wave equation; scattering problems for nonlinear waves; scattering theory of sound waves and electromagnetic waves by an obstacle; her important works on transonic flow and mixed type equations and her discovery of the non-existence of continuous transonic flows past profiles; and shock wave theory and shock reflection problems, etc. Her achievements have had a profound influence on subsequent works in these fields, and resulted in significant applications in various fields such as aerodynamics, magneto-hydrodynamics, acoustics, and optics, etc. Besides her outstanding achievements in research, Professor Morawetz has been well-known for her strong leadership, deep insight and vision, and generosity to colleagues and young generations of mathematicians in the mathematical community. She is a strong advocator for applied mathematics and women in mathematics. Professor Morawetz has been open and exceedingly warm and generous, and she always makes extra effort to help young generations of mathematicians. Indeed, Professor Morawetz has been a role model for many of us. Hence it is more than appropriate for the journal of Methods And Applications of Analysis to dedicate these special issues to her seventy-seventh birthday.

On this occasion, we are also grateful to all the distinguished authors who have contributed their significant articles to honour Professor Morawetz's 77th birthday. We are moved by their quick and warm responses, and appreciate their support.

We would like to express our deepest gratitude to Professor Morawetz, and wish her a happy birthday at this special occasion!

Editors of MAA

METHODS AND APPLICATIONS OF ANALYSIS.
Vol. 7, No. 2, pp. 0ii–vii, June 2000

CURRICULUM VITAE

CATHLEEN SYNGE MORAWETZ*

BORN: May 5, 1923
Toronto, Canada

EDUCATION:

University of Toronto;	B.A.	(1945)
Massachusetts Institute of Technology;	M.S.	(1946)
New York University;	Ph.D	(1951)

POSITIONS:

Inspection Board of the United Kingdom and Canada
Technical Assistant; (1943-44)

Courant Institute of Mathematical Sciences, New York University
Research Assistant; (1946-50)

Massachusetts Institute of Technology
Research Associate; (1950-51)

Courant Institute of Mathematical Sciences, New York University

Research Associate;	(1951-57)
Assistant Professor;	(1957-60)
Associate Professor;	(1960-65)
Professor;	(1965-1993)
Professor Emerita;	(1993-present)
Chairman, Department of Mathematics;	(1981-84)
Associate Director;	(1978-81)
Deputy Director;	(1981-84)
Director;	(1984-88)

HONORS AND AWARDS:

Guggenheim Fellow,	1966-67, 78-79
Lester R. Ford Award, Mathematical Association of America,	Aug. 1980
Gibbs Lecture of the American Mathematical Society,	Jan. 1981
Fellow of the American Association for the Advancement of Science,	Jan. 1982
Invited Address, Society of Industrial and Applied Mathematics 30th Anniversary,	July 1982
Emmy Noether Lecture, Association for Women in Mathematics,	Jan. 7, 1983

*New York University, Courant Institute of Mathematical Sciences, 251 Mercer Street, New York, N. Y. 10012, USA.

Fellow, American Academy of Arts and Sciences,	May 1984
Jeffrey-Williams Lecture, Canadian Mathematics Society,	June 22, 1984
Invited Address, Mathematical Association of America, 75th Anniversary,	Jan. 1990
Member, National Academy of Sciences,	1990
Fellow, Royal Society of Canada	1996–
Krieger–Nelson Lecture, Canadian Mathematics Society	June 1997
Emmy Noether Lecture, Association for Women in Mathematics, at ICM Berlin,	Aug. 1998
National Medal of Science	1998

HONORARY DOCTORAL DEGREES:

Eastern Michigan University	Dec. 1980
Smith College	May 1982
Brown University	June 1982
Princeton University	June 1986
Duke University	May 1988
New Jersey Institute for Technology	May 1988
University of Waterloo	Oct. 1993
University of Dublin, T.C.D.	July 1996
University of Toronto	Nov. 1996

PROFESSIONAL SOCIETIES:

American Mathematical Society
The Mathematical Association of America
Society for Industrial and Applied Mathematics
American Association for Advancement of Science

OFFICIAL POSITIONS:

Member, Advisory Committee for the National Science Foundation for the Mathematical Sciences	1972-76
Trustee, Princeton University	1973-78
Trustee, American Mathematical Society	1975-85
Trustee, Alfred P. Sloan Foundation	1980-Present
Member, Mathematical Advisory Committee to the National Bureau of Standards	1979-82
Director, NCR Corporation	1978-1991
Director, JSTOR	1995–1998
Mayor's Commission on Science and Technology	1984-
Member, Board on Mathematical Sciences, National Research Council	1984-1987
President Elect, American Mathematical Society	1994-1995
Chairman, Board of School of Theoretical Physics,	

DIAS, Ireland	1995-2000
President, American Mathematical Society	1995-1997
Past President, American Mathematical Society	1997-1998

FORMER EDITOR:

Journal of Mathematical Analysis and Applications
Communications in Partial Differential Equations
Advances in Applied Mathematics
Communication in Pure and Applied Mathematics

PUBLICATIONS:

1. *The eigenvalues of some stability problems involving viscosity*, J. of Rational Mechanics and Analysis, Vol. 1, Oct. 1952.
2. *Perturbations about strong spherical shock waves*, NYU Report, CIMS.
3. *Perturbation theory for implosions*, AFSWP-715-IMM-NYU- 224, CIMS.
4. *Cylindrical implosion in shallow water theory*, AFSWP- 998, CIMS.
5. *On the non-existence of limiting lines in transonic flows*, (with I. Kolodner), Comm. Pure Appl. Math., Vol. VI, Feb. 1953, pp. 97–102.
6. *A uniqueness theorem for Frankl's problem*, Comm. Pure Appl. Math., Vol. VII, Nov. 1954, pp. 697–704.
7. *Asymptotic solutions of the stability equations of a compressible fluid*, J. of Mathematics and Physics, Vol. 33, April 1954, pp. 1–26.
8. *On the non-existence of continuous transonic flows past profiles I, II, III*, Comm. Pure Appl. Math., Vol. IX, Feb. 1956, pp. 45–68; Vol. X, Feb. 1957, pp. 107–32; Vol. XI, Feb. 1958, pp. 129–144.
9. *Note on a maximum principle and a uniqueness theorem for an elliptic-hyperbolic equation*, Proc. of the Royal Society, Vol. 236, 1956, pp. 141–144.
10. *Uniqueness for the analogue of the Neumann problem for mixed equations*, Michigan Math. J., Vol. 4, 1957, pp. 5–14.
11. *On the non-existence of continuous transonic flows past profiles II*, Comm. Pure Appl. Math., Vol. X, Feb. 1957, pp. 107–132.
12. *Contracting spherical shocks treated by a perturbation method*, (abridgement of a dissertation, partial fulfillment of the requirements for the degree of Doctor of Philosophy conferred in February, 1951).
13. *On the non-existence of continuous transonic flows past profiles III*, Comm. Pure Appl. Math., Vol. XI, Feb. 1958, pp. 129–144.
14. *Hydromagnetic shock waves in high temperature plasmas*, Proc. First United nations Intl. Conf. on the peaceful Uses of Atomic Energy, 16, Nuclear Data and Reactor Theory, Sept. 1958.
15. *A weak solution for a system of equations of elliptic-hyperbolic type*, Comm. Pure Appl. Math., Vol. XI, Aug. 1958, pp. 315–322.
16. *Magneto-hydrodynamic shock structure using friction*, Jan. 1959, NYU Report 8677, AEC Computing and Appl. Math. Center.
17. *Magneto-hydrodynamic shock structure without collisions*, IMS, IMF-1, NYU-2885, AEC Research and Development Report, 1960; Phys. of Fluids, 4 (8), 1961, pp. 986–1006.
18. *The decay of solutions of exterior initial-boundary value problem for the wave equation*, Comm. Pure Appl. Math., Vol. XIV, Aug. 1961, pp. 561–568.
19. *The exponential decay of solutions of the wave equation in the exterior of a*

star-shaped obstacle, (with P. D. Lax and R. S. Phillips), Bull. of the Amer. Math. Soc., Vol. 68, Nov. 1962; Comm. Pure and Appl. Math., Vol. XVI, 1963, pp. 477–486.

20. *Modification for magneto-hydrodynamic shock structure without collisions*, Phys. of Fluids, Vol. 5, 1962, pp. 1447–1450.
21. *The limiting amplitiude principle*, Comm. Pure Appl. Math., Vol. XV, Aug. 1962, pp. 349–362.
22. *A uniqueness theorem for the relativistic wave equation*, Comm. Pure Appl. Math., Vol. XVI, Aug. 1963, pp. 353–362.
23. *Non-existence of transonic flow past a profile*, Comm. Pure Appl. Math., Vol. XVII, Aug. 1964.
24. *Collisionless shocks and solitary waves*, Proc. of the 11th Intl. Congress of Appl. Mechanics, 1964, pp. 980–983; and Springer 1966, NYO Report No. 1480-1512, MF-44.
25. *The limiting amplitude principle for arbitrary finite bodies*, Comm. Pure Appl. Math., Vol. XVIII, 1/2, February/May 1965.
26. *Transonic flow and mixed equations*, Rendiconti del Seminario Matematico dell'Universita del Politecnico de Torino, Vol. 25, April 1965/66, 73–74.
27. *Mixed equations and transonic flow*, Rendiconti di Matematica [3-4], Vol. 25, 1966, 28 pages.
28. *Exponential decay of solutions of the wave equation*, Comm. Pure Appl. Math., Vol. XIX, 1966, pp. 439–444.
29. *Energy identities for the wave equation*, NYU Report, IMM-346, 1966. Appendix in "Scattering Theory", (with P. D. Lax and R. S. Phillips), Academic Press, 1967.
30. *Time decay for the nonlinear Klein-Gordon equation*, Proc. Royal Society, A, 306, 1968, pp. 291–296.
31. *An inequality for the reduced wave operator and the justification of geometrical optics*, (with D. Ludwig), Comm. Pure Appl. Math., Vol. XXI, 1968, pp. 187–203.
32. *The generalized Huyghens' principle for reflecting bodies*, (with D. Ludwig), Comm. Pure Appl. Math., Volume XXII, 1969, pp. 189–205.
33. *Two Lsubp inequalities*, Bull. Amer. Math. Soc., Nov. 1969, Vol. 75, pp. 1299–1302.
34. *Energy flow: Wave motion and geometrical optics*, Bull. Amer. Math. Soc., July 1970, Vol. 76, pp. 661–674.
35. *The Dirichlet problem for the Tricomi equation*, Comm. Pure Appl. Math., Vol. XXIII, 1970, pp. 587–601.
36. *Profile problems for transonic flows with shocks*, Rendiconti della Classe di Scienze Fisiche, Matematiche e Naturali, Roma, Serie VIII, Vol. XLIX, Dec. 1970.
37. *Notes on charge-neutral self-consistent plasmas and fields*, NYO-1480-139, MF-60, Jan. 1970.
38. *Asymptotics of a nonlinear relativistic wave equation*, (with W. A. Strauss), Bull. AMS, 77 (5), Sept. 1971, pp. 797–798.
39. *Decay and scattering of solutions of a nonlinear relativistic wave equation*, (with W. A. Strauss), Comm. Pure and Appl. Math., Vol. XXV, 1972, pp. 1–31.
40. *Well-posed problems and transonic flow*, in Fluid Dynamics Transactions, Vol.

6, Part I, Polish Academy of Sciences, 1972, pp. 325–333.

41. *On the modes of decay for the wave equations in the exterior of a reflecting body*, Proc. Royal Irish Academy, Vol. 72, Section A, 9, 1972, pp. 113–122.
42. *On a nonlinear scattering operator*, (with W. A. Strauss), Comm. Pure Appl. Math., Vol. XXVI, 1973, pp. 47–54.
43. *Estimates for a slowly-varying wave equation with a periodic potential*, Comm. Pure Appl. Math., Vol. XXVI, 1973, 4/5.
44. *A decay theorem for Maxwell's equation*, USPECHI Mat. Nauk No. 2, in honor of I. G. Petrovskii, pp. 233–240.
45. *Notes on time decay and scattering for some hyperbolic problems*, Regional Conference, Series in Applied Mathematics 19, SIAM, Buffalo, June 3-7, 1973.
46. *Nouveaux Problemes Sur Les Equations Mixtes*, Seminaire Goulaouic-Lions-Schwartz, Centre de Mathematiques, Paris, March 1975.
47. *Decay for solutions of the exterior problem for the wave equation*, Comm. Pure Appl. Math., Vol. XXVIII, 1975, pp. 229–264.
48. *Properties of Shock Waves, Mathematical and Numerical Methods in Fluid Dynamics*, International Atomic Energy Agency, Vienna, 1986.
49. *Time decay and relaxation schemes*, Adv. in Mathematics, Vol. 24 (1), April 1977, pp. 63–73.
50. *Geometrical optics and the singing of Whales*, Summer meeting of the MAA, Toronto, Aug. 1976.
51. *Decay of solutions of the wave equation outside nontrapping obstacles*, (with J. V. Ralston and W. A. Struass), Comm. Pure Appl. Math., Vol. XXX, 1977, pp. 447–508.
52. *Correction to "Decay of solutions of the wave equation outside nontrapping obstacles"*, Comm. Pure Appl. Math., Vol. XXXI, 1978, p. 795.
53. *Numerical solutions of exterior problems with the reduced wave equation*, (with G. A. Kriegsmann), J Comp. Physics, Vol. 28, pp. 181–197.
54. *A regularization for a simple model of transonic flow*, Comm. in Partial Diff. Equations, 4 (1), 1979, pp. 79–111.
55. *Nonlinear conservation equations*, Amer. Math. Monthly, Vol. 86 (4), April 1979, pp. 284–287.
56. *Numerical methods for solving the wave equation with variable index of refraction*, (with G. A. Kriegsmann), Proc. BAIL I Conference, Trinity College, Dublin, 1980, J. J. H. Miller (ed), Boundary and Interior Layers - Computational and Asymptotic Methods, pp. 118–125.
57. *Solving the Helmholtz equation for exterior problems with variable index of refraction: I*, (with G. Kriegsmann), SIAM J of Stat. and Sci. Computing, Vol. 1 (3), September 1980.
58. *Computations with the nonlinear Helmholtz equation*, (with G. A. Kriegsmann), J of the Optical Soc. of America, Vol. 71, No. 8, Aug. 1981, pp. 1015–1019.
59. *A formulation for higher dimensional inverse problems for the wave equation*, Computers and Mathematics with Appl., Vol. 7, 1981, pp. 319–331.
60. *Lectures on nonlinear waves and shocks*, TATA Institute of Fundamental Research, Bombay, 1981, p. 137.
61. *The mathematical approach to the sonic barrier*, Bull. of the AMS, March 1982, pp. 127–145.
62. *Strange boundary layer effects on the edge of a nonlinear plasma*, Proc. of

BAIL II Conference, Trinity College, Dublin, June 1982, pp. 3–12.
63. *The calculations of an inverse potential problem*, (with G. A. Kriegsmann), SIAM Journal on Applied Mathematics, Vol. 43, No. 4, Aug. 1983, pp. 844–854.
64. *The nonlinear interaction of a laser beam with a plasma pellet*, (with A. Bayliss and G. A. Kriegsmann), Comm. Pure Appl. Math., Vol. 36, 1983, pp. 399–414.
65. *On a weak solution for a transonic flow problem*, Comm. Pure Appl. Math., Vol. 38, 1985, pp. 797–818.
66. *Mathematical problems in transonic flow*, Canadian Mathematical Bulletin, Vol. 29 (2), 1986.
67. *Scattering by a potential by hyperbolic methods*, (with Alvin Bayliss and Yanyan Li), Mathematics of Computation, Vol. 52, 1986, pp. 321–338.
68. *An Alternative proof of Di Perna's Theorem*, Comm. Pure Appl. Math., Vol. 44, 1991, pp. 1081–1090.
69. *A Numerical experiment on a second-order partial differential equation of mixed type*, (with D. C. Stevens and H. Weitzner), Comm. Pure Appl. Math., Vol. 44, 1991, pp. 1091–1106.
70. *"Giants", an address given at the 75th anniversary of the founding of the MAA*, Columbus, Ohio, The American Mathematical Monthly, Nov. 1992, pp. 819–828.
71. *Potential Theory for Regular and Mach Reflection of a Shock at a Wedge*, Comm. Pure Appl. Math., Vol. 47, 1994, pp. 593–624.
72. *On Steady Transonic Flow by Compensated Compactness*, Methods and Applications of Analysis, Vol. 2, No. 3, pp. 257–268.
73. *A viscous approximation for a 2-D steady semiconductor or transonic gas dynamic flow; Existence theorem for potential flow*, (with Irena Gamba), Comm. Pure and Appl. Math., Vol. 49, 1996, pp. 999–1049.