

# Wolf Prize in Mathematics

Volume 2

Edited by

**S S Chern**

*Nankai Institute of Mathematics, Nankai University,  
China*

**F Hirzebruch**

*Universität Bonn &  
Max-Planck-Institut für Mathematik, Germany*



**World Scientific**

*New Jersey • London • Singapore • Hong Kong*

*Published by*

World Scientific Publishing Co. Pte. Ltd.

P O Box 128, Farrer Road, Singapore 912805

USA office: Suite 1B, 1060 Main Street, River Edge, NJ 07661

UK office: 57 Shelton Street, Covent Garden, London WC2H 9HE

**Library of Congress Cataloging-in-Publication Data**

Wolf prize in mathematics / edited by S.S. Chern, F. Hirzebruch.

p. cm.

Includes bibliographical references.

ISBN 9810239467 (v. 2)

1. Mathematicians--Biography. 2. Mathematics. 3. Wolf Foundation Prizes.

I. Chern, Shiing-Shen, 1911-- . II. Hirzebruch, Friedrich, 1927--

QA28.W65 2000

510.922--dc21

[B]

00-031994

**British Library Cataloguing-in-Publication Data**

A catalogue record for this book is available from the British Library.

The editors and publisher would like to thank the following organisations and publishers of the various journals and books for their assistance and permission to reproduce the selected reprints found in this volume:

Academic Press

American Institute of Physics

American Mathematical Society

B. G. Teubner Stuttgart

Birkhäuser Publishers

Duke University Press

Gauthier-Villars

Hermann Publishing

IEEE

International Mathematical Union

The Johns Hopkins University Press

MIT Press

National Academy of Sciences (USA)

Plenum Publishing Corporation

Portuguese Mathematical Society

Publish or Perish, Inc.

The Royal Society of London

The Royal Swedish Academy of Sciences

Springer-Verlag

Vandenhoeck & Ruprecht

The Wolf Foundation

While every effort has been made to contact the publishers of reprinted papers prior to publication, we have not been successful in some cases. Where we could not contact the publishers, we have acknowledged the source of the material. Proper credit will be accorded to these publishers in future editions of this work after permission is granted.

Copyright © 2001 by World Scientific Publishing Co. Pte. Ltd.

*All rights reserved. This book, or parts thereof, may not be reproduced in any form or by any means, electronic or mechanical, including photocopying, recording or any information storage and retrieval system now known or to be invented, without written permission from the Publisher.*

For photocopying of material in this volume, please pay a copying fee through the Copyright Clearance Center, Inc., 222 Rosewood Drive, Danvers, MA 01923, USA. In this case permission to photocopy is not required from the publisher.

Printed in Singapore by Mainland Press

---

**Contents**

List of Wolf Prize Winners	v
Preface	vii
<b>Raoul Bott</b>	
Autobiographical Sketch	1
Impedance Synthesis without Use of Transformers (with <i>R. J. Duffin</i> )	8
Two New Combinatorial Invariants for Polyhedra	10
On Torsion in Lie Groups	16
The Cohomology Ring of $G/T$ (with <i>H. Samelson</i> )	19
The Stable Homotopy of the Classical Groups	23
On the Parallelizability of the Spheres (with <i>J. Milnor</i> )	26
On a Theorem of Lefschetz	29
A Lefschetz Fixed Point Formula for Elliptic Differential Operators (with <i>M. F. Atiyah</i> )	35
On a Topological Obstruction to Integrability	41
On Characteristic Classes of $\Gamma$ -Foliations (with <i>A. Haefliger</i> )	46
An Equivariant Setting of the Morse Theory	52
<b>Alberto P. Calderón (prepared by <i>E. M. Stein</i>)</b>	
Curriculum Vitae	61
List of Publications	63
Singular Integrals: The Roles of Calderón and Zygmund (by <i>E. M. Stein</i> )	70
Uniqueness in the Cauchy Problem for Partial Differential Equations	81
Commutators of Singular Integral Operators	102
Cauchy Integrals on Lipschitz Curves and Related Operators (with <i>A. Zygmund</i> ) On the Existence of Certain Singular Integrals (Introduction only)	110 114
<b>Andrei N. Kolmogorov (prepared by <i>V. M. Tikhomirov</i>)</b>	
A. N. Kolmogorov (by <i>V. M. Tikhomirov</i> )	119
On Normability of a General Topological Linear Space	141
List of Works by A. N. Kolmogorov	144
Obituary (Mr. Andrei Kolmogorov – Giant of Mathematics)	162
<b>Mark Grigor'evich Krein (prepared by <i>I. Gohberg</i>)</b>	
Mark Grigorievich Krein: Recollections (by <i>I Gohberg</i> )	165
Mark Grigor'evich Krein (Recollections) (by <i>B. Ja. Levin</i> )	177

Abstract	183
Solution on the Inverse Sturm–Liouville Problem	195
On a Fundamental Approximation Problem in the Theory of Extrapolation and Filtration of Stationary Random Processes	199
On the Determination of the Potential of a Particle from Its $S$ -Function	204
Continual Analogues of Propositions on Polynomials Orthogonal on the Unit Circle	208
Analytic Problems and Results in the Theory of Linear Operators in Hilbert Space	212
Notes by <i>I. Gohberg</i>	217
<b>Peter D. Lax</b>	
Curriculum Vitae	219
Short Mathematical Essays	221
List of Publications	240
A Sample of Lax's Contributions to Classical Analysis, Linear Partial Differential Equations and Scattering Theory (by <i>P. Sarnak</i> )	252
<b>Hans Lewy (prepared by <i>S. Hildebrandt</i>)</b>	
Curriculum Vitae Mathematicae (by <i>D. Kinderlehrer</i> )	264
The Music in Hans Lewy's Life (by <i>Helen Lewy</i> )	269
Crises in Mathematics	272
Further Reading	276
Bibliography (by <i>D. Kinderlehrer</i> )	277
Publications Dedicated to Hans Lewy	284
Neuer Beweis des analytischen Charakters der Lösungen elliptischer Differentialgleichungen	285
On the Existence of a Closed Convex Surface Realizing a Given Riemannian Metric	296
On the Boundary Behavior of Minimal Surfaces	299
An Example of a Smooth Linear Partial Differential Equation without Solution	307
<b>László Lovász</b>	
Curriculum Vitae	311
List of Publications	313
Kneser's Conjecture, Chromatic Number, and Homotopy	327
On the Shannon Capacity of a Graph	333
Algorithmic Mathematics: An Old Aspect with a New Emphasis	340
One Mathematics: There is No Natural Way to Divide Mathematics	353
<b>John W. Milnor</b>	
Curriculum Vitae	359
Publications of John Milnor (Through 1992)	360
On Manifolds Homeomorphic to the 7-Sphere	367

Some Consequences of a Theorem of Bott	374
Algebraic $K$ -Theory and Quadratic Forms	380
Groups which Act on $S^n$ without Fixed Points	407
Eigenvalues of the Laplace Operator on Certain Manifolds	415
<b>Jürgen K. Moser (prepared by <i>E. Zehnder</i>)</b>	
Curriculum Vitae	417
Bibliography	419
Cantor-Medaille für Jürgen Moser (by <i>E. Zehnder</i> )	428
Dynamical Systems – Past and Present	438
<b>Ilya Piatetski-Shapiro</b>	
Curriculum Vitae	461
List of Publications	462
Étude on Life and Automorphic Forms in the Soviet Union	474
Regions of the Type of the Upper Half-Plane in the Theory of Functions of Several Complex Variables	487
Automorphic Functions and Arithmetic Groups	496
Tate Theory for Reductive Groups and Distinguished Representations	513
Two Conjectures on $L$ -Functions	519
<b>Jean-Pierre Serre</b>	
Short Note	523
Curriculum Vitae	524
Cours au Collège de France (1955–1994)	525
Publications	526
Lettre à John McCleary, 11 Mars 1997	527
Lettre à David Goss, 12 Décembre 1991	530
Lettre à Pierre Deligne, 24 Juillet 1967	532
Lettre à David Goss, 30 Mars 2000	537
Extrait du discours de réception du prix Balzan, Berne, 1985	540
Entretien avec Jean-Pierre Serre	542
Lettre à Jacques Tits, 13 Mars 1993	550
<b>Carl L. Siegel (prepared by <i>H. Klingen</i>)</b>	
Curriculum Vitae (by <i>H. Klingen</i> )	553
Honours and Awards (by <i>H. Klingen</i> )	554
Nachruf auf Carl Ludwig Siegel (by <i>Th. Schneider</i> )	555
Bibliography	565
Approximation algebraischer Zahlen	573
Analytische Theorie der quadratischen Formen	578
Meromorphe Funktionen auf kompakten analytischen Mannigfaltigkeiten	585
Iteration of Analytic Functions	592

<b>Yakov G. Sinai</b>	
Curriculum Vitae	599
Bibliography	601
Markov Partitions and $C$ -Diffeomorphisms	609
Structure of the Spectrum of the Schrödinger Operator with Almost-Periodic Potential in the Vicinity of Its Left Edge	631
A Random Walk with Random Potential	637
Probabilistic Approach to the Analysis of Statistics for Convex Polygonal Lines	641
<b>Elias M. Stein</b>	
Curriculum Vitae	647
Bibliography	648
Some Problems in Harmonic Analysis Suggested by Symmetric Spaces and Semi-Simple Groups	660
Problems in Harmonic Analysis Related to Curvature and Oscillatory Integrals	677
<b>Jacques Tits</b>	
Short Note	703
Curriculum Vitae	704
Résumé des travaux antérieurs à 1972 (réf. [1] à [92])	706
Publications	730
Groupes et Géométries de Coxeter	740
<b>André Weil (prepared by <i>J.-P. Serre</i>)</b>	
Curriculum Vitae	755
Weil's Work	756
Publications	757
André Weil and Algebraic Topology (by <i>A. Borel</i> )	763
André Weil (by <i>J.-P. Serre</i> )	769
<b>Hassler Whitney (prepared by <i>J. Milnor and J. Eells</i>)</b>	
Academic Appointments and Awards	781
Bibliography of Hassler Whitney	782
Moscow 1935: Topology Moving Toward America	785
A Function Not Constant on a Connected Set of Critical Points	806
Singularities of Mappings of Euclidean Spaces	810
Elementary Structure of Real Algebraic Varieties	827
Hassler Whitney (23 March 1907–10 May 1989) (by <i>S. S. Chern</i> )	839
<b>Andrew J. Wiles</b>	
Bibliography	845
Modular Forms, Elliptic Curves, and Fermat's Last Theorem	847
Twenty Years of Number Theory	850

<b>Oscar Zariski (prepared by <i>D. Mumford</i>)</b>	
Curriculum Vitae	865
Preface (to Volume IV of the Collected Works)	867
Bibliography	875
Oscar Zariski (1899–1986)	883
The Fundamental Ideas of Abstract Algebraic Geometry	887
The Compactness of the Riemann Manifold of an Abstract Field of Algebraic Functions	900
Analytical Irreducibility of Normal Varieties	909
Correction (for Lars Hörmander’s Contribution, Vol. 1)	919
Photos of Wolf Prize Winners	921