## Contents

Preface	xi
Welcome letters	xiii
A Chinese Essay in Tribute to Professor Shiing-Shen Chern	xvii
Committees of ICCM 2004	xix
Morningside Lifetime Achievement Award in Mathematics	xxiii
Morningside Medal of Mathematics	xxv
${\bf Morning side\ Medal\ of\ Mathematics-Selection\ Committee}$	xxvii
Morningside Award Medalists	xxix
Chern Prize Recipients	li
ICCM International Cooperation Award Recipient	liii
Photographs	lv
List of Speakers	lxvii
Morningside Lectures	
Shock Waves and Cosmology	
J.A. Smoller and J.B. Temple	1
Plenary Lectures	
Variational Construction of Diffusion Orbits in Convex	
Hamiltonian Systems with Multiple Degrees of Freedom	
Chong-Qing Cheng and Jun Yan	11
Saddlepoint Approximations and Boundary Crossing	
Probabilities for Random Fields and Their Applications TZE LEUNG LAI	29
	29
Recognizing Certain Rational Homogeneous Manifolds of Picard Number 1 from Their Varieties of Minimal	
Rational Tangents	
NGAIMING MOK	41

vi CONTENTS

Discontinuous Galerkin Methods for Convection Dominated Partial Differential Equations	69
CHI-WANG SHU Singularity Behavior of the Mean Curvature Flow	63
XU-JIA Wang	75
Localization and Duality JIAN ZHOU	83
Surgical Ricci Flow on Four-Manifolds with Positive	
Isotropic Curvature BING-LONG CHEN AND XI-PING ZHU	101
Special Subvarieties of $\mathcal{A}g$	
ECKART VIEHWEG AND KANG ZUO	111
Invited Talks-Part 1	
Number Theory	
Local Monodromy of the Kloosterman Sheaf at $\infty$	
LEI FU AND DAQING WAN	125
Hilbert Modular Functions and Their CM Values Tonghai Yang	135
Algebraic and Complex Geometry	
Geometric Invariant Theory and Birational Geometry Yı Hu	155
Remarks on Gieseker's Degeneration and its Normalization XIAOTAO SUN	177
Bundle Rigidity of Complex Surfaces	100
Wing-Sum Cheung and Bun Wong CR Equivalence Problem of Strongly Pseudoconvex CR Manifolds	193
STEPHEN ST. YAU	197
Vector Bundles on Non-Primary Hopf Manifolds with Abelian Fundamental Group	
LIU WEIMING AND ZHOU XIANGYU	209
Geometry	
Subelliptic PDE's and SubRiemannian Geometry Der-Chen Chang and Peter Greiner	223
The $Q$ -Curvature Flow on a Closed 3-Manifold of Positive	
Q-Curvature Shu-Cheng Chang	239
The Space of Symplectic Structures on Closed 4-Manifolds	
Tian-Jun Li	259
Ancient Solutions to Kähler-Ricci Flow LEI NI	270
LET INI	279

COLUMNIC	
CONTENTS	VII

A Convergence Result of the Lagrangian Mean Curvature Flow Mu-Tao Wang	291
On Piecewise Algebraic Variety REN-HONG WANG	297
Topology	
An Introduction to Chiral Equivariant Cohomology Bong H. Lian	307
Lie Groups and Lie Algebras	
Large Scale Geometry, Compactifications and the Integral Novikov Conjectures for Arithmetic Groups LIZHEN JI	317
Operator Algebras and Functional Analysis	
Normal Dilations MD. Choi	345
On the Generator Problem of von Neumann Algebras LIMING GE AND JUNHAO SHEN	357
A Survey of Results on the Ground State of Semilinear Elliptic Equations MAN KAM KWONG	377
Separating and Extending Subgroups of a Locally Compact Group EBERHARD KANIUTH AND ANTHONY T. LAU	385
The Triangle of Operators, Topologies, Bornologies NGAI-CHING WONG	395
Mathematical Physics	
The Positive Mass Theorem Near Null Infinity XIAO ZHANG	423
Invited Talks-Part 2	
Analysis	
Dirichlet Forms and Markov Semigroups on Non-Associative Vector Bundles	
Cho-Ho Chu and Zhongmin Qian	433
Decomposition Principle and Random Cascades AI HUA FAN AND JEAN PIERRE KAHANE	447
Holomorphic Motions and Normal Forms in Complex Analysis Yunping Jiang	457
On Pseudo-Hermitian CR Manifolds Song-Ying Li	467

viii CONTENTS

Recent Progress on the Dirichlet Problem in Lipschitz Domains ZHONGWEI SHEN	483
Refinable Functions with Non-Integer Dilations	400
XIN-RONG DAI, DE-JUN FENG AND YANG WANG	493
On Whitney's Critical Sets Zhi-Ying Wen and Li-Feng Xi	513
Applications of Nevanlinna Theory to Geometric Problems PIT-MANN WONG	523
Ordinary Differential Equations and Dynamical Systems	
Some Results on Smale's Mean Value Conjecture YUEFEI WANG	595
Partial Differential Equations	
Localized Non-Blowup Conditions for the 3D Incompressible Euler Equations	
Jian Deng, Thomas Y. Hou, Xinwei Yu	603
Separation of Bound State Solutions of Systems of Nonlinear Schrödinger Equations	010
TAI-CHIA LIN AND YU-WEN HSU	613
The $C^{\alpha}$ Regularity of a Class of Ultraparabolic Equations Zhang Liqun	619
Stability of Basic Wave Patterns for Gas Motions Tong Yang and Hui-Jiang Zhao	623
Probability and Statistics	
On Strong Near-epoch Dependence ZHENGYAN LIN	647
Multifractal Analysis of Branching Measure on a Galton-Watson Tree	
Peter Mörters and Narn-Rueih Shieh	655
Convex Duality Theory for Optimal Investment JIANMING XIA AND JIA-AN YAN	663
Backward Stochastic Volterra Integral Equations JIONGMIN YONG	679
Combinatorics	
Set Addition and Set Multiplication MC. Chang	707
Collineation Groups of Translation Planes Chat Yin Ho	721
Numerical Analysis and Scientific Computing	
Intelligent and Informative Scientific Computing, Trends and Examples	
QIANG DU	731

CONTENTS	iv
CONTENTS	IA.

Scattered Data Interpolation by Box Splines ZOUWEI SHEN AND SHAYNE WALDRON	749
Piecewise Function Generated by the Solutions of Linear Ordinary Differential Equation ZONGMIN WU	769
Control Theory and Optimization	
Step-Sizes for the Gradient Method	
Ya-xiang Yuan	785
Applications of Mathematics in the Sciences	
Number-Theoretic Methods in Experimental Designs	
Kai-Tai Fang and Yuan Wang	797
Ear Modeling and Sound Signal Processing	
Jack Xin	819
The Mathematical Problem of Inertial Waves in Rapidly Rotating Planets and Stars	
XINHAO LIAO AND KEKE ZHANG	831
Mathematics Education and Popularization of Mathematics	
Mathematics, Mathematics Education and the Mouse	
Siu Man Keung	861