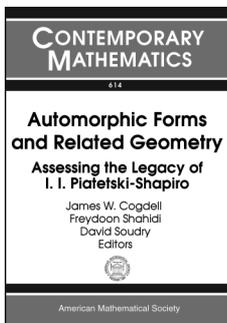


# New Publications Offered by the AMS

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## Algebra and Algebraic Geometry



### Automorphic Forms and Related Geometry

Assessing the Legacy of I. I. Piatetski-Shapiro

**James W. Cogdell**, *Ohio State University, Columbus, OH*,  
**Freydoon Shahidi**, *Purdue University, West Lafayette, IN*, and  
**David Soudry**, *Tel Aviv University, Israel*, Editors

This volume contains the proceedings of the conference Automorphic Forms and Related Geometry: Assessing the Legacy of I. I. Piatetski-Shapiro, held from April 23–27, 2012, at Yale University, New Haven, CT.

Ilya I. Piatetski-Shapiro, who passed away on February 21, 2009, was a leading figure in the theory of automorphic forms. The conference attempted both to summarize and consolidate the progress that was made during Piatetski-Shapiro's lifetime by him and a substantial group of his co-workers, and to promote future work by identifying fruitful directions of further investigation. It was organized around several themes that reflected Piatetski-Shapiro's main foci of work and that have promise for future development: functoriality and converse theorems; local and global  $L$ -functions and their periods;  $p$ -adic  $L$ -functions and arithmetic geometry; complex geometry; and analytic number theory. In each area, there were talks to review the current state of affairs with special attention to Piatetski-Shapiro's contributions, and other talks to report on current work and to outline promising avenues for continued progress.

The contents of this volume reflect most of the talks that were presented at the conference as well as a few additional contributions. They all represent various aspects of the legacy of Piatetski-Shapiro.

*This item will also be of interest to those working in number theory.*

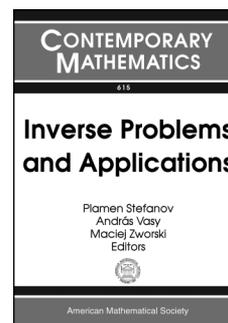
**Contents:** **J. Arthur**, On parameters for the group  $SO(2n)$ ; **J. W. Cogdell**, Piatetski-Shapiro's work on converse theorems; **S. Gelbart**, **S. D. Miller**, **A. Panchishkin**, and **F. Shahidi**, A  $p$ -adic integral for the reciprocal of  $L$ -functions; **S. Gindikin**, Harmonic analysis on symmetric spaces as complex analysis; **M. Harris**, Testing rationality of coherent cohomology of Shimura varieties; **H. Hida**,

Hecke fields of Hilbert modular analytic families; **R. Howe** and **S. T. Lee**, Structure of holomorphic unitary representations: The case of  $U_{2,2}$ ; **H. Jacquet**, Mellin transform of Whittaker functions; **D. Jiang**, Automorphic integral transforms for classical groups I: Endoscopy correspondences; **J.-L. Kim**, An inductive formula for  $\varepsilon$ -factors; **E. Lapid** and **Z. Mao**, On a new functional equation for local integrals; **C. Mœglin**, Paquets stables des séries discrètes accessibles par endoscopie tordue; leur paramètre de Langlands; **N. B. Ch au**, On a certain sum of automorphic  $L$ -functions; **A. Panchishkin**, Analytic constructions of  $p$ -adic  $L$ -functions and Eisenstein series; **J. W. Cogdell**, **F. Shahidi**, and **T.-L. Tsai**, On stability of root numbers; **C. Skinner**, Cap forms, Eisenstein series, and some arithmetic applications; **D. Soudry**, Automorphic descent: An outgrowth from Piatetski-Shapiro's vision; **M. Friedman** and **M. Teicher**, On the singularities of branch curves of  $K3$  surfaces and applications.

Contemporary Mathematics, Volume 614

April 2014, 441 pages, Softcover, ISBN: 978-0-8218-9394-4, LC 2013039849, 2010 *Mathematics Subject Classification*: 11Fxx, 22Exx, 14Jxx, **AMS members US\$108.80**, List US\$136, Order code CONM/614

## Differential Equations



### Inverse Problems and Applications

**Plamen Stefanov**, *Purdue University, West Lafayette, IN*,  
**Andr as Vasy**, *Stanford University, CA*, and  
**Maciej Zworski**, *University of California, Berkeley, CA*, Editors

This volume contains the proceedings of two conferences on Inverse Problems and Applications, held in 2012, to celebrate the work of Gunther Uhlmann. The first conference was held at the University of California, Irvine, from June 18–22, 2012, and the second was held at Zhejiang University, Hangzhou, China, from September 17–21, 2012.

The topics covered include inverse problems in medical imaging, scattering theory, geometry and image processing, and the mathematical theory of cloaking, as well as methods related to inverse problems.

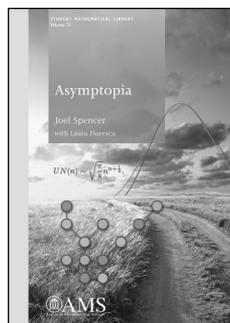
This item will also be of interest to those working in applications.

**Contents:** H. Ammari, G. Ciraolo, H. Kang, H. Lee, and G. W. Milton, Spectral theory of a Neumann-Poincaré-type operator and analysis of cloaking by anomalous localized resonance II; G. Bal, Hybrid inverse problems and redundant systems of partial differential equations; G. Bao, K. Huang, P. Li, and H. Zhao, A direct imaging method for inverse scattering using the generalized Foldy-Lax formulation; F. Cakoni, D. Colton, and X. Meng, The inverse scattering problem for a penetrable cavity with internal measurements; E. Chung, C. Y. Lam, and J. Qian, A Neumann series based method for photoacoustic tomography on irregular domains; S. J. Hamilton and S. Siltanen, Nonlinear inversion from partial EIT data: Computational experiments; V. Isakov, S. Nagayasu, G. Uhlmann, and J.-N. Wang, Increasing stability of the inverse boundary value problem for the Schrödinger equation; H. Isozaki, Y. Kurylev, and M. Lassas, Recent progress of inverse scattering theory on non-compact manifolds; A. Jollivet and V. Sharafutdinov, On an inverse problem for the Steklov spectrum of a Riemannian surface; C. Kenig and M. Salo, Recent progress in the Calderón problem with partial data; M. Lassas and L. Oksanen, Local reconstruction of a Riemannian manifold from a restriction of the hyperbolic Dirichlet-to-Neumann operator; J. Li, H. Liu, and H. Sun, Damping mechanisms for regularized transformation-acoustics cloaking; S. Moskow and J. C. Schotland, Hybrid inverse problem for porous media; J. Qian, C. Yang, A. Schirotzek, F. Maia, and S. Marchesini, Efficient algorithms for ptychographic phase retrieval; S. Zelditch, Matrix elements of Fourier integral operators.

Contemporary Mathematics, Volume 615

May 2014, 309 pages, Softcover, ISBN: 978-1-4704-1079-7, LC 2013039861, 2010 *Mathematics Subject Classification*: 35R30, AMS members US\$81.60, List US\$102, Order code CONM/615

## Discrete Mathematics and Combinatorics



### Asymptopia

Joel Spencer, *New York University, NY*  
with Laura Florescu, *New York University, NY*

Asymptotics in one form or another are part of the landscape for every mathematician. The objective of this book is to present the ideas of how to approach asymptotic problems that arise in discrete

mathematics, analysis of algorithms, and number theory. A broad range of topics is covered, including distribution of prime integers, Erdős Magic, random graphs, Ramsey numbers, and asymptotic geometry.

The author is a disciple of Paul Erdős, who taught him about Asymptopia. Primes less than  $n$ , graphs with  $v$  vertices, random walks of  $t$  steps—Erdős was fascinated by the limiting behavior as the variables approached, but never reached, infinity. Asymptotics is very much an art. The various functions  $n \ln n$ ,  $n^2$ ,  $\frac{\ln n}{n}$ ,  $\sqrt{\ln n}$ ,  $\frac{1}{n \ln n}$  all have distinct personalities. Erdős knew these functions as personal friends. It is the author's hope that these insights may be passed on, that the reader may similarly feel which function has the right temperament

for a given task. This book is aimed at strong undergraduates, though it is also suitable for particularly good high school students or for graduates wanting to learn some basic techniques.

Asymptopia is a beautiful world. Enjoy!

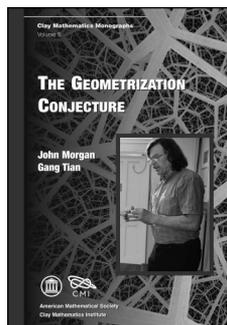
This item will also be of interest to those working in analysis and probability and statistics.

**Contents:** An infinity of primes; Stirling's formula; Big Oh, little Oh and all that; Integration in Asymptopia; From integrals to sums; Asymptotics of binomial coefficients  $\binom{n}{k}$ ; Unicyclic graphs; Ramsey numbers; Large deviations; Primes; Asymptotic geometry; Algorithms; Potpourri; Really Big Numbers!; Bibliography; Index.

Student Mathematical Library, Volume 71

June 2014, approximately 195 pages, Softcover, ISBN: 978-1-4704-0904-3, LC 2013049249, 2010 *Mathematics Subject Classification*: 05-01, 05A16; 05C80, 68W40, 11A41, 60C05, AMS members US\$31.20, List US\$39, Order code STML/71

## Geometry and Topology



### The Geometrization Conjecture

John Morgan, *Simons Center for Geometry and Physics, Stony Brook University, NY*, and Gang Tian, *Princeton University, NJ*, and *Peking University, Beijing, China*

This book gives a complete proof of the geometrization conjecture, which describes

all compact 3-manifolds in terms of geometric pieces, i.e., 3-manifolds with locally homogeneous metrics of finite volume. The method is to understand the limits as time goes to infinity of Ricci flow with surgery. The first half of the book is devoted to showing that these limits divide naturally along incompressible tori into pieces on which the metric is converging smoothly to hyperbolic metrics and pieces that are locally more and more volume collapsed. The second half of the book is devoted to showing that the latter pieces are themselves geometric. This is established by showing that the Gromov-Hausdorff limits of sequences of more and more locally volume collapsed 3-manifolds are Alexandrov spaces of dimension at most 2 and then classifying these Alexandrov spaces.

In the course of proving the geometrization conjecture, the authors provide an overview of the main results about Ricci flows with surgery on 3-dimensional manifolds, introducing the reader to this difficult material. The book also includes an elementary introduction to Gromov-Hausdorff limits and to the basics of the theory of Alexandrov spaces. In addition, a complete picture of the local structure of Alexandrov surfaces is developed. All of these important topics are of independent interest.

Titles in this series are co-published with the Clay Mathematics Institute (Cambridge, MA).

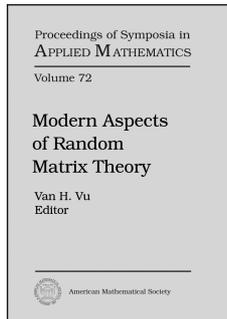
**Contents:** Introduction; *Geometric and analytic results for Ricci flow with surgery*: Ricci flow with surgery; Limits as  $t \rightarrow \infty$ ; Local results valid for large time; Proofs of the three propositions; *Locally volume collapsed 3-manifolds*: Introduction to part II; The collapsing theorem; Overview of the rest of the argument; Basics of Gromov-Hausdorff

convergence; Basics of Alexandrov spaces; 2-dimensional Alexandrov spaces; 3-dimensional analogues; The global result; *The equivariant case*: The equivariant case; Bibliography; Glossary of symbols; Index.

Clay Mathematics Monographs, Volume 5

May 2014, 291 pages, Hardcover, ISBN: 978-0-8218-5201-9, LC 2013045837, 2010 *Mathematics Subject Classification*: 53C21, 53C23, 53C30, 53C44, 53C45, 57M40, 57M60, **AMS members US\$64.80**, List US\$81, Order code CMIM/5

## Probability and Statistics



### Modern Aspects of Random Matrix Theory

Van H. Vu, *Yale University, New Haven, CT*, Editor

The theory of random matrices is an amazingly rich topic in mathematics. Random matrices play a fundamental role in various areas such as statistics, mathematical physics, combinatorics, theoretical computer science, number

theory and numerical analysis.

This volume is based on lectures delivered at the 2013 AMS Short Course on Random Matrices, held January 6–7, 2013 in San Diego, California.

Included are surveys by leading researchers in the field, written in introductory style, aiming to provide the reader a quick and intuitive overview of this fascinating and rapidly developing topic. These surveys contain many major recent developments, such as progress on universality conjectures, connections between random matrices and free probability, numerical algebra, combinatorics and high-dimensional geometry, together with several novel methods and a variety of open questions.

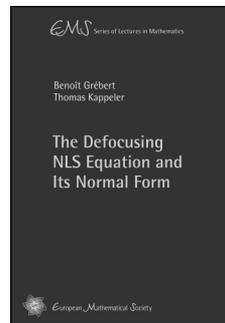
**Contents:** C. Bordenave and D. Chafaï, Lecture notes on the circular law; A. Guionnet, Free probability and random matrices; A. Edelman, B. D. Sutton, and Y. Wang, Random matrix theory, numerical computation and applications; M. Rudelson, Recent developments in non-asymptotic theory of random matrices; T. Tao and V. Vu, Random matrices: The universality phenomenon for Wigner ensembles; Index.

Proceedings of Symposia in Applied Mathematics, Volume 72

June 2014, 176 pages, Hardcover, ISBN: 978-0-8218-9471-2, LC 2013051063, 2010 *Mathematics Subject Classification*: 11C20, 60B20, 15B52, 05D40, 60H25, 62-07, **AMS members US\$44.80**, List US\$56, Order code PSAPM/72

## New AMS-Distributed Publications

### Differential Equations



### The Defocusing NLS Equation and Its Normal Form

Benoît Grébert, *University of Nantes, France*, and Thomas Kappeler, *University of Zurich, Switzerland*

The theme of this monograph is the nonlinear Schrödinger equation. This equation models slowly varying wave envelopes in dispersive media and arises in various physical systems such as water waves, plasma physics, solid state physics and nonlinear optics. More specifically, this book treats the defocusing nonlinear Schrödinger (dNLS) equation on the circle with a dynamical systems viewpoint. By developing the normal form theory, it is shown that this equation is an integrable partial differential equation in the strongest possible sense. In particular, all solutions of the dNLS equation on the circle are periodic, quasi-periodic or almost-periodic in time and Hamiltonian perturbations of this equation can be studied near solutions far away from the equilibrium.

The book is intended not only for specialists working at the intersection of integrable PDEs and dynamical systems but also for researchers farther away from these fields as well as for graduate students. It is written in a modular fashion; each of its chapters and appendices can be read independently of each other.

*This item will also be of interest to those working in analysis.*

A publication of the European Mathematical Society (EMS). Distributed within the Americas by the American Mathematical Society.

**Contents:** Zakharov-Shabat operators; Spectra; Liouville coordinates; Birkhoff coordinates; Appendices; References; Index; Notations.

EMS Series of Lectures in Mathematics, Volume 18

March 2014, 176 pages, Softcover, ISBN: 978-3-03719-131-6, 2010 *Mathematics Subject Classification*: 35Q55, 37K15, 37K10, 34L40, 34L20, **AMS members US\$30.40**, List US\$38, Order code EMSSERLEC/18