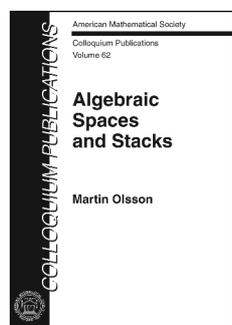


New Publications Offered by the AMS

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Algebra and Algebraic Geometry



Algebraic Spaces and Stacks

Martin Olsson, *University of California, Berkeley, CA*

This book is an introduction to the theory of algebraic spaces and stacks intended for graduate students and researchers familiar with algebraic geometry at the level of a first-year graduate course. The first several chapters are devoted to background

material including chapters on Grothendieck topologies, descent, and fibered categories. Following this, the theory of algebraic spaces and stacks is developed. The last three chapters discuss more advanced topics including the Keel-Mori theorem on the existence of coarse moduli spaces, gerbes and Brauer groups, and various moduli stacks of curves. Numerous exercises are included in each chapter ranging from routine verifications to more difficult problems, and a glossary of necessary category theory is included as an appendix.

It is splendid to have a self-contained treatment of stacks, written by a leading practitioner. Finally we have a reference where one can find careful statements and proofs of many of the foundational facts in this important subject. Researchers and students at all levels will be grateful to Olsson for writing this book.

—William Fulton, *University of Michigan*

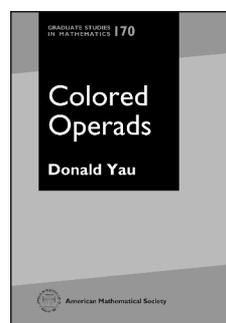
This is a carefully planned out book starting with foundations and ending with detailed proofs of key results in the theory of algebraic stacks.

—Johan de Jong, *Columbia University*

Contents: Introduction; Summary of background material; Grothendieck topologies and sites; Fibered categories; Descent and the stack condition; Algebraic spaces; Invariants and quotients; Quasi-coherent sheaves on algebraic spaces; Algebraic stacks: Definitions and basic properties; Quasi-coherent sheaves on algebraic stacks; Basic geometric properties and constructions for stacks; Coarse moduli spaces; Gerbes; Moduli of curves; Glossary of category theory; Bibliography; Index of notation; Index of terminology.

Colloquium Publications, Volume 62

April 2016, approximately 299 pages, Hardcover, ISBN: 978-1-4704-2798-6, LC 2015043394, 2010 *Mathematics Subject Classification:* 14A20; 14D23, 14D22, **AMS members US\$79.20**, List US\$99, Order code COLL/62



Colored Operads

Donald Yau, *The Ohio State University at Newark, OH*

The subject of this book is the theory of operads and colored operads, sometimes called symmetric multicategories. A (colored) operad is an abstract object which encodes operations with multiple inputs and one output and relations between such operations. The theory originated in the early 1970s in homotopy theory and quickly

became very important in algebraic topology, algebra, algebraic geometry, and even theoretical physics (string theory). Topics covered include basic graph theory, basic category theory, colored operads, and algebras over colored operads. Free colored operads are discussed in complete detail and in full generality.

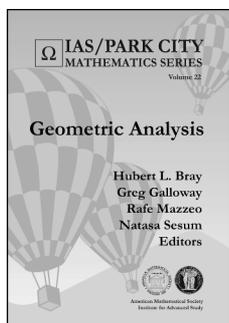
The intended audience of this book includes students and researchers in mathematics and other sciences where operads and colored operads are used. The prerequisite for this book is minimal. Every major concept is thoroughly motivated. There are many graphical illustrations and about 150 exercises. This book can be used in a graduate course and for independent study.

Contents: *Graphs and trees:* Directed graphs; Extra structures on graphs; Rooted trees; Collapsing an internal edge; Grafting of rooted trees; Grafting and extra structure; *Category theory:* Basic category theory; Symmetric monoidal categories; Colored symmetric sequences and objects; *Operads and algebras:* Motivation for colored operads; Colored operads; Operads in arity 1; Algebras over colored operads; Examples of algebras; Motivation for partial compositions; Colored pseudo-operads; *Free colored operads:* Motivation for free colored operads; General operadic composition; Free colored non-symmetric operads; Free colored operads; Further reading; Bibliography; List of main facts; Index.

Graduate Studies in Mathematics, Volume 170

April 2016, 428 pages, Hardcover, ISBN: 978-1-4704-2723-8, LC 2015036707, 2010 *Mathematics Subject Classification:* 18D50, 18D10, 18D20, 18A40, 05-01, 06F05, **AMS members US\$71.20**, List US\$89, Order code GSM/170

Analysis



Geometric Analysis

Hubert L. Bray, *Duke University, Durham, NC*, **Greg Galloway**, *University of Miami, Coral Gables, FL*, **Rafe Mazzeo**, *Stanford University, CA*, and **Natasa Sesum**, *Rutgers University, Piscataway, NJ*, Editors

This volume includes expanded versions of the lectures delivered in the Graduate

Minicourse portion of the 2013 Park City Mathematics Institute session on Geometric Analysis. The papers give excellent high-level introductions, suitable for graduate students wishing to enter the field and experienced researchers alike, to a range of the most important areas of geometric analysis. These include: the general issue of geometric evolution, with more detailed lectures on Ricci flow and Kähler-Ricci flow, new progress on the analytic aspects of the Willmore equation as well as an introduction to the recent proof of the Willmore conjecture and new directions in min-max theory for geometric variational problems, the current state of the art regarding minimal surfaces in R^3 , the role of critical metrics in Riemannian geometry, and the modern perspective on the study of eigenfunctions and eigenvalues for Laplace-Beltrami operators.

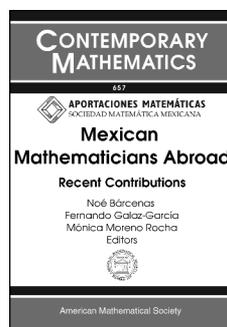
Titles in this series are co-published with the Institute for Advanced Study/Park City Mathematics Institute. Members of the Mathematical Association of America (MAA) and the National Council of Teachers of Mathematics (NCTM) receive a 20% discount from list price.

Contents: **G. Huisken**, Heat diffusion in geometry; **P. Topping**, Applications of Hamilton's compactness theorem for Ricci flow; **B. Weinkove**, The Kähler-Ricci flow on compact Kähler manifolds; **S. Zelditch**, Park City lectures on eigenfunctions; **J. A. Viaclovsky**, Critical metrics for Riemannian curvature functionals; **F. C. Marques** and **A. Neves**, Min-max theory and a proof of the Willmore conjecture; **T. Riviere**, Weak immersions of surfaces with L^2 -bounded second fundamental form; **B. White**, Introduction to minimal surface theory.

IAS/Park City Mathematics Series, Volume 22

April 2016, approximately 443 pages, Hardcover, ISBN: 978-1-4704-2313-1, LC 2015031562, 2010 *Mathematics Subject Classification*: 53-06, 35-06, 83-06, **AMS members US\$79.20**, List US\$99, Order code PCMS/22

General Interest



Mexican Mathematicians Abroad

Recent Contributions

Noé Bárcenas, *Centro de Ciencias Matemáticas, UNAM, Morelia, Mexico*, **Fernando Galaz-García**, *Karlsruher Institut Für Technologie, Germany*, and **Mónica Moreno Rocha**, *Centro de Investigación en Matemáticas, A.C., Guanajuato, Mexico*, Editors

This volume contains the proceedings of the First Workshop "Matemáticos Mexicanos Jóvenes en el Mundo", held from August 22-24, 2012, at Centro de Investigación en Matemáticas (CIMAT) in Guanajuato, Mexico.

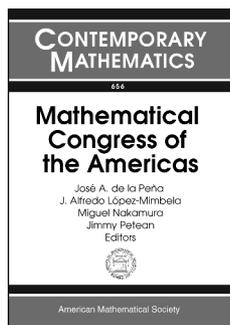
One of the main goals of this meeting was to present different research directions being pursued by young Mexican mathematicians based in other countries, such as Brazil, Canada, Colombia, Estonia, Germany, Spain and the United States, showcasing research lines currently underrepresented in Mexico.

Featured are survey and research articles in six areas: algebra, analysis, applied mathematics, geometry, probability and topology. Their topics range from current developments related to well-known open problems to novel interactions between pure mathematics and computer science. Most of the articles provide a panoramic view of the fields and problems the authors work on, making the book accessible to advanced graduate students and researchers in mathematics from different fields.

Contents: **M. Abel** and **R. M. Pérez-Tiscareño**, Locally pseudoconvex inductive limit of locally pseudoconvex Q -algebras; **O. Antolín Camarena**, A whirlwind tour of the world of $(\infty, 1)$ -categories; **O. Arizmendi** and **C. Vargas**, Norm convergence in non-commutative central limit theorems: Combinatorial approach; **P. Dávalos**, Dynamical models for some torus homeomorphisms; **E. A. Duéñez-Guzmán** and **M. A. Ramírez-Ortegón**, A review of no free lunch theorems for search; **D. Labardini-Fragoso**, On triangulations, quivers with potentials and mutations; **J. Malagón-López**, Riemann-Roch without denominators for oriented cohomology theories; **L. Núñez-Betancourt**, **E. E. Witt**, and **W. Zhang**, A survey on the Lyubeznik numbers; **S. Ortega Castillo**, Cluster value problem in infinite-dimensional spaces; **R. Perales**, A survey on the convergence of manifolds with boundary; **C. Ramos-Cuevas**, Convexity is a local property in $CAT(\kappa)$ spaces; **R. Ríos-Zertuche**, An introduction to the half-infinite wedge.

Contemporary Mathematics, Volume 657

February 2016, 237 pages, Softcover, ISBN: 978-1-4704-2192-2, LC 2015036424, 2010 *Mathematics Subject Classification*: 13D45, 13F60, 14C40, 18-01, 20C32, 37E45, 46G20, 46H05, 46L54, **AMS members US\$86.40**, List US\$108, Order code CONM/657



Mathematical Congress of the Americas

José A. de la Peña, J. Alfredo López-Mimbela, Miguel Nakamura, and Jimmy Petean, *CIMAT, Guanajuato, Mexico*, Editors

This volume contains the proceedings of the First Mathematical Congress of the Americas, held from August 5-9, 2013, in Guanajuato, México. With the participation of close to 1,000 researchers from more than 40 countries, the meeting set a benchmark for mathematics in the two continents.

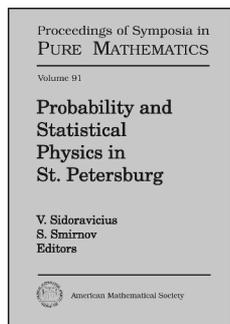
The papers, written by some of the plenary and invited speakers, as well as winners of MCA awards, cover new developments in classic topics such as Hopf fibrations, minimal surfaces, and Markov processes, and provide recent insights on combinatorics and geometry, isospectral spherical space forms, homogenization on manifolds, and Lagrangian cobordism, as well as applications to physics and biology.

Contents: M. Clapp and A. Pistoia, Symmetries, Hopf fibrations and supercritical elliptic problems; F. C. Marques and A. Neves, Min-max theory of minimal surfaces and applications; G. Contreras, Homogenization on manifolds; O. Cornea, Lagrangian cobordism: Rigidity and flexibility aspects; A. Dickenstein, Biochemical reaction networks: An invitation for algebraic geometers; J. Denzler, H. Koch, and R. J. McCann, Long-time asymptotic expansions for nonlinear diffusions in Euclidean space; E. A. Lauret, R. J. Miatello, and J. P. Rossetti, Non-strongly isospectral spherical space forms; V. Rivero, Entrance laws for positive self-similar Markov processes; F. Rodríguez-Villegas, Combinatorics and geometry; M. Sambarino, A (short) survey on dominated splittings; E. V. Teixeira, Geometric regularity estimates for elliptic equations.

Contemporary Mathematics, Volume 656

February 2016, 201 pages, Softcover, ISBN: 978-1-4704-2310-0, 2010 *Mathematics Subject Classification*: 00-02, 00A05, 00A99, 00B20, 00B25, **AMS members US\$86.40**, List US\$108, Order code CONM/656

Probability and Statistics



Probability and Statistical Physics in St. Petersburg

V. Sidoravicius, *Courant Institute, New York, NY*, and *New York University-Shanghai, China*, and S. Smirnov, *University of Geneva, Switzerland*, and *St. Petersburg State University, Russia*, Editors

This book brings a reader to the cutting edge of several important directions of the contemporary probability theory, which in many cases are strongly motivated by problems in statistical physics. The

authors of these articles are leading experts in the field and the reader will get an exceptional panorama of the field from the point of view of scientists who played, and continue to play, a pivotal role in the development of the new methods and ideas, interlinking it with geometry, complex analysis, conformal field theory, etc., making modern probability one of the most vibrant areas in mathematics.

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

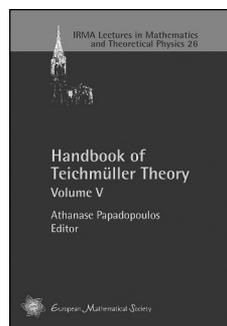
Contents: Y. Bakhtin, Ergodic theory of the Burgers equation; V. Beffara and H. Duminil-Copin, Critical point and duality in planar lattice models; G. Ben Arous and A. Fribergh, Biased random walks on random graphs; A. Borodin and V. Gorin, Lectures on integrable probability; Y. Chang and Y. Le Jan, Markov loops in discrete spaces; A. Guionnet, Random matrices and the Potts model on random graphs; J. Komjáthy and Y. Peres, Topics in Markov chains: Mixing and escape rate; G. F. Lawler, Random walk problems motivated by statistical physics; G. Olshanski, Markov dynamics on the dual object to the infinite-dimensional unitary group; M. Sodin, Lectures on random nodal portraits; A. Vershik, Smoothness and standardness in the theory of *AF*-algebras and in the problem on invariant measures; O. Zeitouni, Branching random walks and Gaussian fields.

Proceedings of Symposia in Pure Mathematics, Volume 91

April 2016, approximately 478 pages, Hardcover, ISBN: 978-1-4704-2248-6, LC 2015025728, 2010 *Mathematics Subject Classification*: 60K35, 82B43, 82C43, 60B20, 05C81, 82B41, 82C41, 60J25, **AMS members US\$96**, List US\$120, Order code PSPUM/91

New AMS-Distributed Publications

Analysis



Handbook of Teichmüller Theory: Volume V

Athanase Papadopoulos, *Université de Strasbourg, France*, Editor

This volume is the fifth in a series dedicated to Teichmüller theory in a broad sense, including the study of various deformation spaces and of mapping class group actions.

It is divided into four parts:

- Part A: The metric and the analytic theory
- Part B: The group theory
- Part C: Representation theory and generalized structures
- Part D: Sources

The topics that are covered include identities for the hyperbolic geodesic length spectrum, Thurston's metric, the cohomology

of moduli space and mapping class groups, the Johnson homomorphisms, Higgs bundles, dynamics on character varieties, and many others. Besides surveying important parts of the theory, several chapters contain conjectures and open problems. The last part contains two fundamental papers by Teichmüller, translated into English and accompanied by mathematical commentaries.

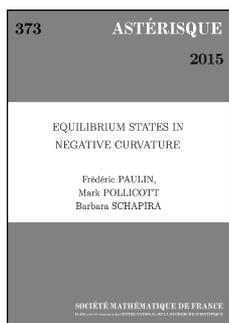
The papers, like those of the other volumes in this collection, are written by experts who have a broad view on the subject. Although the papers have an expository character (which fits with the purpose of the handbook), some of them also contain original and new material.

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

Contents: **A. Papadopoulos**, Introduction to Teichmüller theory, old and new; **V. Part A. The metric and the analytic theory:** **M. Bridgeman** and **S. P. Tan**, Identities on hyperbolic manifolds; **W. Su**, Problems on the Thurston metric; **Part B. The group theory:** **Y. Kuno**, Meyer functions and the signature of fibered 4-manifolds; **N. Kawazumi** and **Y. Kuno**, The Goldman–Turaev Lie bialgebra and the Johnson homomorphisms; **T. Satoh**, A survey of the Johnson homomorphisms of the automorphism groups of free groups and related topics; **Part C. Representation theory and generalized structures:** **I. Kim**, Geometry and dynamics on character varieties; **L. Ji**, Compactifications and reduction theory of geometrically finite locally symmetric spaces; **L. Jeffrey**, Representations of fundamental groups of 2-manifolds; **Part D. Sources:** **O. Teichmüller**, Extremal quasiconformal mappings and quadratic differentials; **V. Alberge, A. Papadopoulos, and W. Su**, A commentary on Teichmüller's paper "Extremale quasikonforme Abbildungen und quadratische Differentiale"; **O. Teichmüller**, Determination of extremal quasiconformal mappings of closed oriented Riemann surfaces; **A. A'Campo-Neuen, N. A'Campo, and V. Alberge**, A commentary on Teichmüller's paper "Bestimmung der extremalen quasikonformen Abbildungen bei geschlossenen orientierten Riemannschen Flächen"; List of contributors; Index.

IRMA Lectures in Mathematics and Theoretical Physics, Volume 26

January 2016, 596 pages, Hardcover, ISBN: 978-3-03719-160-6, 2010 *Mathematics Subject Classification*: 30-00, 32-00, 57-00, 32G13, 32G15, 30F60; 11F06, 11F75, 14D20, 14H15, 14H60, 14H55, 14J60, 20F14, 20F28, 20F38, 20F65, 20F67, 20H10, 22E46, 30-03, 30C62, 30F20, 30F25, 30F10, 30F15, 30F30, 30F35, 30F40, 30F45, 32-03, 32S30, 53A35, 53B35, 53C35, 53C50, 53C80, 53D55, 53Z05, 57M07, 57M20, 57M27, 57M50, 57M60, 57N16, **AMS members US\$86.40**, List US\$108, Order code EMSILMTP/26



Equilibrium States in Negative Curvature

Frédéric Paulin, *Université Paris-Sud, France*, **Mark Pollicott**, *University of Warwick, Coventry, United Kingdom*, and **Barbara Schapira**, *Université Picardie Jules Verne, Amiens, France*

With their origin in thermodynamics and symbolic dynamics, Gibbs measures are crucial tools for studying the ergodic theory of the geodesic flow on negatively curved manifolds. The authors develop a framework (through Patterson–Sullivan densities) that allows them to get rid of compactness assumptions on the manifold, and prove many existence, uniqueness and finiteness

results of Gibbs measures. They give many applications, to the variational principle, the counting and equidistribution of orbit points and periods, the unique ergodicity of the strong unstable foliation and the classification of Gibbs densities on some Riemannian covers.

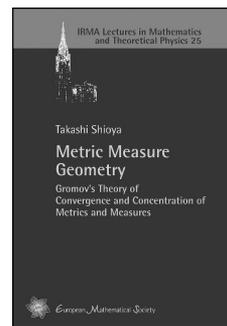
This item will also be of interest to those working in geometry and topology.

A publication of the Société Mathématique de France, Marseilles (SMF), distributed by the AMS in the U.S., Canada, and Mexico. Orders from other countries should be sent to the SMF. Members of the SMF receive a 30% discount from list.

Contents: Introduction; Background on negatively curved manifolds; A Patterson–Sullivan theory for Gibbs states; Critical exponent and Gurevich pressure; A Hopf–Tsuji–Sullivan–Roblin theorem for Gibbs states; Thermodynamic formalism and equilibrium states; The Liouville measure as a Gibbs measure; Finiteness and mixing of Gibbs states; Growth and equidistribution of orbits and periods; The ergodic theory of the strong unstable foliation; Gibbs states on Galois covers; List of symbols; Index; Bibliography.

Astérisque, Number 373

October 2015, 289 pages, Softcover, ISBN: 978-2-85629-818-3, 2010 *Mathematics Subject Classification*: 37D35, 53D25, 37D40, 37A25, 37C35, 53C12, **AMS members US\$65.60**, List US\$82, Order code AST/373



Metric Measure Geometry

Gromov's Theory of Convergence and Concentration of Metrics and Measures

Takashi Shioya, *Tohoku University, Mathematical Institute, Sendai, Japan*

This book studies a new theory of metric geometry on metric measure spaces. The theory was originally developed by M. Gromov in his book *Metric Structures for Riemannian and Non-Riemannian Spaces* and based on the idea of the concentration of measure phenomenon by Lévy and Milman. A central theme in this book is the study of the observable distance between metric measure spaces, defined by the difference between 1-Lipschitz functions on one space and those on the other. The topology on the set of metric measure spaces induced by the observable distance function is weaker than the measured Gromov–Hausdorff topology and allows the author to investigate a sequence of Riemannian manifolds with unbounded dimensions.

One of the main parts of this presentation is the discussion of a natural compactification of the completion of the space of metric measure spaces. The stability of the curvature-dimension condition is also discussed.

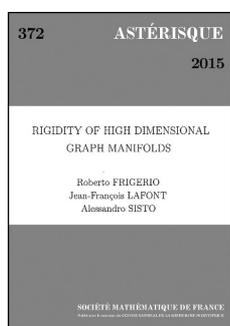
A publication of the European Mathematical Society. Distributed within the Americas by the American Mathematical Society.

Contents: Preliminaries from measure theory; The Lévy–Milman concentration phenomenon; Gromov–Hausdorff distance and distance matrix; Box distance; Observable distance and measurement; The space of pyramids; Asymptotic concentration; Dissipation; Curvature and concentration; Bibliography; Index.

IRMA Lectures in Mathematics and Theoretical Physics, Volume 25

January 2016, 194 pages, Hardcover, ISBN: 978-3-03719-158-3, 2010 *Mathematics Subject Classification*: 53C23; 28A33, 30Lxx, 35P15, 53C20, 54Exx, 58C40, 58J50, 60B10, AMS members US\$38.40, List US\$48, Order code EMSILMTP/25

Geometry and Topology



Rigidity of High Dimensional Graph Manifolds

Roberto Frigerio, *University of Pisa, Italy*, **Jean-François Lafont**, *Ohio State University, Columbus*, and **Alessandro Sisto**, *ETH Zurich, Switzerland*

This book is devoted to the definition and systematic study of graphed manifolds in large dimension. These are compact smooth manifolds supporting a decomposition into finitely many pieces, each of which is diffeomorphic to the product of a torus with a finite volume hyperbolic manifold with toric cusps. The pieces are glued by affine mappings of the boundary tori. The authors prove, in dimension larger or equal to 6, the Borel conjecture for the graphed manifolds and they establish the smooth rigidity. They analyze the structure of the groups which are quasi-isometric to the fundamental group of an irreducible graphed manifold.

This item will also be of interest to those working in algebra and algebraic geometry.

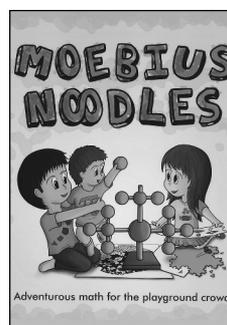
A publication of the Société Mathématique de France, Marseilles (SMF), distributed by the AMS in the U.S., Canada, and Mexico. Orders from other countries should be sent to the SMF. Members of the SMF receive a 30% discount from list.

Contents: *Part I. Graph manifolds: topological and algebraic properties:* Quasi-isometries and quasi-actions; Generalized graph manifolds; Topological rigidity; Isomorphisms preserve pieces; Smooth rigidity; Algebraic properties; *Part II. Irreducible graph manifolds: coarse geometric properties:* Irreducible graph manifolds; Pieces of irreducible graph manifolds are quasi-preserved; Quasi isometry rigidity, I; Quasi isometry rigidity, II; *Part III. Concluding remarks:* Examples not supporting locally CAT(O) metrics; Directions for future research; Bibliography.

Astérisque, Number 372

October 2015, 189 pages, Softcover, ISBN: 978-2-85629-809-1, 2010 *Mathematics Subject Classification*: 53C24, 20F65, 53C23, 20E08, 20F67, 20F69, 19D35, AMS members US\$60, List US\$75, Order code AST/372

Math Education



Moebius Noodles

Adventurous Math for the Playground Crowd

Yelena McManaman and **Maria Droujkova**

Illustrations by Ever Salazar

This book is designed for parents and teachers who want to enjoy playful math with young children. It offers advanced math activities to fit the individual child's

personality, interests, and needs and will open the door to a supportive online community that will answer questions and give ideas along the way.

Moebius Noodles will help readers take small, immediate steps toward the sense of mathematical power.

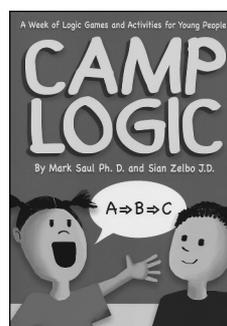
This item will also be of interest to those working in general interest.

A publication of Delta Stream Media, an imprint of Natural Math. Distributed in North America by the American Mathematical Society.

Contents: Why play this book; Questions and answers; *Symmetry:* Live mirror; Double doodle zoo; Mirror book; Special snowflake; Two-hand mirror drawing; *Number:* One-two-three and more; SuperAutoSimilarlyFractalicious; The big hunt for quantities; Real multiplication tables; *Function:* Function machine; Walk around in circles; New functions from old; Silly robot; *Grid:* Make your own grids; Grids and chimeras; The three bears and the middle way; Multiplication tower; Covariance monsters; Glossary.

Natural Math Series, Volume 3

April 2015, 88 pages, Softcover, ISBN: 978-0-9776939-5-5, AMS members US\$12, List US\$15, Order code NMATH/3



Camp Logic

A Week of Logic Games and Activities for Young People

Mark Saul and **Sian Zelbo**, *Courant Institute of Mathematical Sciences, New York University, New York*
Illustrations by Sian Zelbo

Most students encounter math through boring, rote memorization and drill and skill. Camp Logic reverses the trend by offering teachers fun, inquiry-based activities that get to the deeper elegance and joy of math with adaptations for different skill levels and learning environments. The work of Saul and Zelbo has redefined how math is taught in our programs.

—**Meghan Groome**, *Executive Director of Education and Public Programs at the New York Academy of Sciences*

Sian Zelbo and Mark Saul have created a user-friendly guide to help educators engage kids in finding patterns and using logic to solve puzzles. The program is a challenging yet fun approach to deepening math understanding.

—**Lisa Mielke**, *STEM Programs Manager for TASC, New York*

Mark and Sian have put together a delightful set of activities that are sure to captivate young minds (and old). Kids will enjoy games like Giotto for hours, all the while improving their math skills for years to come.

—**Ethan Berman, Founder, i2 Learning**

This book offers a deeper insight into what mathematics is, tapping every child's intuitive ideas of logic and natural enjoyment of games. Simple-looking games and puzzles quickly lead to deeper insights, which will eventually connect with significant formal mathematical ideas as the child grows.

This book is addressed to leaders of math circles or enrichment programs, but its activities can fit into regular math classes, homeschooling venues, or situations in which students are learning mathematics on their own. The mathematics contained in the activities can be enjoyed on many levels.

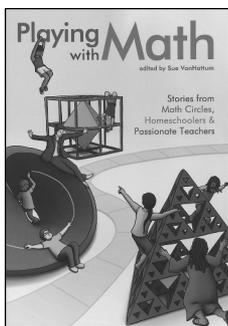
This item will also be of interest to those working in general interest.

A publication of Delta Stream Media, an imprint of Natural Math. Distributed in North America by the American Mathematical Society.

Contents: *Day One:* Animal puzzles (An introduction to logical reasoning with cryptarithms); The game of Giotto (Practice with pure logical reasoning); Lewis Carroll puzzles (Proof by contradiction); Cryptogram puzzle (More proof by contradiction); *Day Two:* Giotto puzzles (Analyzing the logical structure of Giotto); Watermelon language (Logic applied to number systems); Jittery soldiers (An introduction to invariants); The black and red problem (An introduction to parity); *Day Three:* Parity problem set; Discussion of black and red problem (A surprising connection to parity); Ginger's pigeons (Proofs with the pigeonhole principle); The mouse-and-cheese problem (Using the idea of an isomorphism to solve a problem); *Day Four:* Nim (An introduction to mathematical induction); Two-row nim and one-piece chess (Another example of an isomorphism); Leap frog activity (An activity for exploring invariants); *Day Five:* The boys and girls problem (Another example of the use of invariants); Hidden cards puzzle (Practice with logical deductions); Magic squares and 15 game (More practice with invariants and isomorphism).

Natural Math Series, Volume 2

December 2015, 134 pages, Softcover, ISBN: 978-0-9776939-6-2, **AMS members US\$12**, List US\$15, Order code NMATH/2



Playing with Math

Stories from Math Circles, Homeschoolers & Passionate Teachers

Sue VanHattum, Editor

Mathematics is a creative activity, like music. It requires some technique, and the technique has to be taught, but the main point is elsewhere—it is all about creativity, a sense of enjoyment, and higher purpose. This book goes a long way in that direction.

—**Ivar Ekeland, author of *The Cat in Numberland***

...a marvelously useful and inspiring book. It is filled with stories by people who don't just love math, they share that love with others through innovative math activities. ...is perfect for anyone eager to make math absorbing, entertaining, and fun.

—**Laura Grace Weldon, author of *Free Range Learning***

The Internet is presently bursting with vibrant writing about mathematics learning; yet it can be difficult to navigate this wealth of resources. Sue VanHattum has carefully collected and arranged some of the best of this writing. Imagine having a cheerful, knowledgeable, caring, and patient native interpreter accompany you on a tour of a foreign land. That's Sue in the land of math. She and the authors collected here care deeply about welcoming everyone to the world of mathematics. Whether you play with math every day or are struggling to believe that one can play with math, this book will provide inspiration, ideas, and joy.

—**Christopher Danielson (talkingmathwithkids.com), author of *Talking Math with Your Kids***

This book brings together the stories of over thirty authors who share their math enthusiasm with their communities, families, and students. After every chapter is a puzzle, game, or activity to encourage adults and children to play with math too. Thoughtful stories, puzzles, games, and activities will provide new insights.

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

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