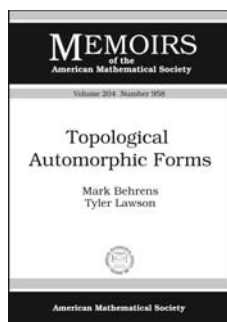


# New Publications Offered by the AMS

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## Algebra and Algebraic Geometry



### Topological Automorphic Forms

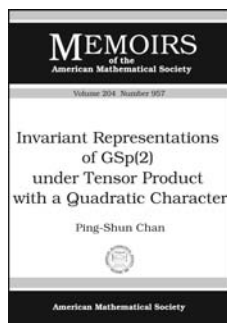
**Mark Behrens**, *Massachusetts Institute of Technology, Cambridge, MA*, and **Tyler Lawson**, *University of Minnesota, Minneapolis, MN*

**Contents:**  $p$ -divisible groups; The Honda-Tate classification; Tate modules and level structures; Polarizations;

Forms and involutions; Shimura varieties of type  $U(1, n-1)$ ; Deformation theory; Topological automorphic forms; Relationship to automorphic forms; Smooth  $G$ -spectra; Operation on TAF; Buildings; Hypercohomology of adèle groups;  $K(n)$ -local theory; Example: chromatic level 1; Bibliography; Index.

**Memoirs of the American Mathematical Society**, Volume 204, Number 958

March 2010, 136 pages, Softcover, ISBN: 978-0-8218-4539-4, LC 2009049931, 2000 *Mathematics Subject Classification*: 55N35; 55Q51, 55Q45, 11G15, **Individual member US\$44**, List US\$74, Institutional member US\$59, Order code MEMO/204/958



### Invariant Representations of $GSp(2)$ under Tensor Product with a Quadratic Character

**Ping-Shun Chan**, *Ohio State University, Columbus, OH*

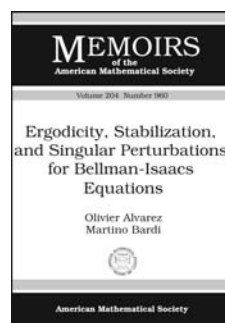
**Contents:** Introduction;  $\varepsilon$ -endoscopy for  $GSp(2)$ ; The trace formula; Global lifting;

The local picture; Appendix A. Summary of global lifting; Appendix B. Fundamental lemma; Bibliography; List of symbols; Index.

**Memoirs of the American Mathematical Society**, Volume 204, Number 957

March 2010, 172 pages, Softcover, ISBN: 978-0-8218-4822-7, LC 2009049914, 2000 *Mathematics Subject Classification*: 11F70, 11F72, 11F85, **Individual member US\$46**, List US\$77, Institutional member US\$62, Order code MEMO/204/957

## Analysis



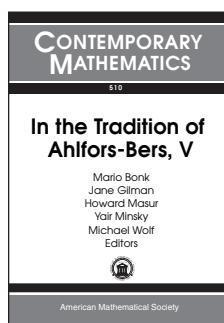
### Ergodicity, Stabilization, and Singular Perturbations for Bellman-Isaacs Equations

**Olivier Alvarez**, *Université de Rouen, Mont-Saint Aignan, France*, and **Martino Bardi**, *Università di Padova, Italy*

**Contents:** Introduction and statement of the problem; Abstract ergodicity, stabilization, and convergence; Uncontrolled fast variables and averaging; Uniformly nondegenerate fast diffusion; Hypocoelliptic diffusion of the fast variables; Controllable fast variables; Nonresonant fast variables; A counterexample to uniform convergence; Applications to homogenization; Bibliography.

**Memoirs of the American Mathematical Society**, Volume 204, Number 960

March 2010, 77 pages, Softcover, ISBN: 978-0-8218-4715-2, LC 2009049941, 2000 *Mathematics Subject Classification*: 35Bxx, 35Kxx, 93C70, 49N70; 49L25, 60J60, 91A23, 93E20, **Individual member US\$38**, List US\$64, Institutional member US\$51, Order code MEMO/204/960



## In the Tradition of Ahlfors-Bers, V

**Mario Bonk**, *University of Michigan, Ann Arbor, MI*, **Jane Gilman**, *Rutgers University, Newark, NJ*, **Howard Masur**, *University of Chicago, IL*, **Yair Minsky**, *Yale University, New Haven, CT*, and **Michael Wolf**, *Rice University, Houston, TX*, Editors

The Ahlfors-Bers Colloquia commemorate the mathematical legacy of Lars Ahlfors and Lipman Bers. The core of this legacy lies in the fields of geometric function theory, Teichmüller theory, hyperbolic geometry, and partial differential equations. However, the work of Ahlfors and Bers has impacted and created interactions with many other fields of mathematics such as algebraic geometry, dynamical systems, topology, geometric group theory, mathematical physics, and number theory. Recent years have seen a flowering of this legacy with an increased interest in their work.

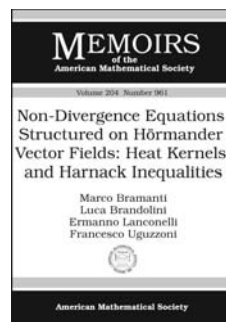
This current volume contains articles on a wide variety of subjects that are central to this legacy. These include papers in Kleinian groups, classical Riemann surface theory, translation surfaces, algebraic geometry and dynamics. The majority of the papers present new research, but there are survey articles as well.

**Contents:** **J. Belk** and **S. Koch**, Iterated monodromy for a two-dimensional map; **J. Bowman**, Orientation-reversing involutions of the genus 3 Arnoux-Yoccoz surface and related surfaces; **E. Bujalance** and **F.-J. Cirre**, A family of Riemann surfaces with orientation reversing automorphisms; **L. Arenas-Carmona** and **A. M. Rojas**, Unramified prime covers of hyperelliptic curves and pairs of  $p$ -gonal curves; **A. Carocca**, **H. Lange**, **R. E. Rodriguez**, and **A. M. Rojas**, Prym and Prym-Tyurin varieties: A group-theoretical construction; **V. Charette**, **T. A. Drumm**, and **W. Goldman**, Stretching three-holed spheres and the Margulis invariant; **B. Farb** and **H. Masur**, Teichmüller geometry of moduli space, II:  $\mathcal{M}(S)$  seen from far away; **D. Gabai**, **R. Meyerhoff**, and **P. Milley**, Mom technology and hyperbolic 3-manifolds; **U. Hamenstädt**, Dynamical properties of the Weil-Petersson metric; **J. H. Hubbard** and **R. L. Miller**, Equidistribution of horocyclic flows on complete hyperbolic surfaces of finite area; **L. Ji** and **S. A. Wolpert**, A cofinite universal space for proper actions for mapping class groups; **M. Kapovich**, On sequences of finitely generated discrete groups; **R. P. Kent IV** and **C. J. Leininger**, A fake Schottky group in  $\text{mod}(S)$ ; **D. D. Long** and **A. W. Reid**, Eigenvalues of hyperbolic elements in Kleinian groups; **V. Malik**, Primitive words and self-intersections of curves on surfaces generated by the Gilman-Maskit discreteness algorithm; **K. Matsuzaki**, Symmetric groups that are not the symmetric conjugates of Fuchsian groups; **K. Ohshika** and **H. Miyachi**, Uniform models for the closure of the Riley slice; **G. Mondello**, Poisson structures on the Teichmüller space of hyperbolic surfaces with conical points.

**Contemporary Mathematics**, Volume 510

April 2010, 329 pages, Softcover, ISBN: 978-0-8218-4732-9, LC 2009045524, 2000 *Mathematics Subject Classification*: 14H15, 20H10, 28A75, 30F40, 30C62, 32G15, 54E40, 57M50, **AMS members US\$79**, List US\$99, Order code CONM/510

## Differential Equations



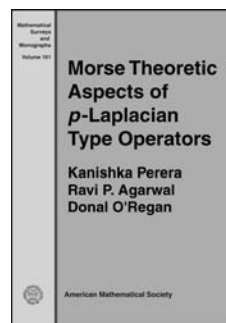
## Non-Divergence Equations Structured on Hörmander Vector Fields: Heat Kernels and Harnack Inequalities

**Marco Bramanti**, *Politecnico di Milano, Italy*, **Luca Brandolini**, *Università di Bergamo, Bologna, Italy*, and **Ermanno Lanconelli** and **Francesco Uguzzoni**, *Università di Bologna, Italy*

**Contents:** Introduction; *Part I: Operators with constant coefficients:* Overview of Part I; Global extension of Hörmander's vector fields and geometric properties of the CC-distance; Global extension of the operator  $H_A$  and existence of a fundamental solution; Uniform Gevrey estimates and upper bounds of fundamental solutions for large  $d(x, y)$ ; Fractional integrals and uniform  $L^2$  bounds of fundamental solutions for large  $d(x, y)$ ; Uniform global upper bounds for fundamental solutions; Uniform lower bounds for fundamental solutions; Uniform upper bounds for the derivatives of the fundamental solutions; Uniform upper bounds on the difference of the fundamental solutions of two operators; *Part II: Fundamental solution for operators with Hölder continuous coefficients:* Assumptions, main results and overview of Part II; Fundamental solution for  $H$ : the Levi method; The Cauchy problem; Lower bounds for fundamental solutions; Regularity results; *Part III: Harnack inequality for operators with Hölder continuous coefficients:* Overview of Part III; Green function for operators with smooth coefficients on regular domains; Harnack inequality for operators with smooth coefficients; Harnack inequality in the non-smooth case; Epilogue; References.

**Memoirs of the American Mathematical Society**, Volume 204, Number 961

March 2010, 123 pages, Softcover, ISBN: 978-0-8218-4903-3, LC 2009050034, 2000 *Mathematics Subject Classification*: 35H20, 35A08, 35K65; 35H10, 35A17, **Individual member US\$41**, List US\$69, Institutional member US\$55, Order code MEMO/204/961



## Morse Theoretic Aspects of $p$ -Laplacian Type Operators

**Kanishka Perera** and **Ravi P. Agarwal**, *Florida Institute of Technology, Melbourne, FL*, and **Donal O'Regan**, *National University of Ireland, Galway, Ireland*

The purpose of this book is to present a Morse theoretic study of a very general class of homogeneous operators that includes the  $p$ -Laplacian as a special case. The  $p$ -Laplacian operator is a

quasilinear differential operator that arises in many applications such as non-Newtonian fluid flows and turbulent filtration in porous media. Infinite dimensional Morse theory has been used extensively to study semilinear problems, but only rarely to study the  $p$ -Laplacian.

The standard tools of Morse theory for computing critical groups, such as the Morse lemma, the shifting theorem, and various linking and local linking theorems based on eigenspaces, do not apply to quasilinear problems where the Euler functional is not defined on a Hilbert space or is not  $C^2$  or where there are no eigenspaces to work with. Moreover, a complete description of the spectrum of a quasilinear operator is generally not available, and the standard sequence of eigenvalues based on the genus is not useful for obtaining nontrivial critical groups or for constructing linking sets and local linkings. However, one of the main points of this book is that the lack of a complete list of eigenvalues is not an insurmountable obstacle to applying critical point theory.

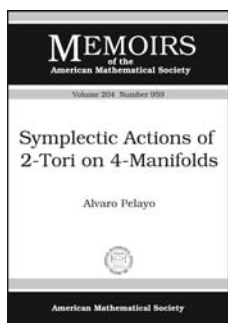
Working with a new sequence of eigenvalues that uses the cohomological index, the authors systematically develop alternative tools such as nonlinear linking and local splitting theories in order to effectively apply Morse theory to quasilinear problems. They obtain nontrivial critical groups in nonlinear eigenvalue problems and use the stability and piercing properties of the cohomological index to construct new linking sets and local splittings that are readily applicable here.

**Contents:** Morse theory and variational problems; Abstract formulation and examples; Background material; Critical point theory;  $p$ -Linear eigenvalue problems; Existence theory; Monotonicity and uniqueness; Nontrivial solutions and multiplicity; Jumping nonlinearities and the Dancer-Fučík spectrum; Indefinite eigenvalue problems; Anisotropic systems; Bibliography.

**Mathematical Surveys and Monographs**, Volume 161

April 2010, approximately 202 pages, Hardcover, ISBN: 978-0-8218-4968-2, 2000 *Mathematics Subject Classification*: 58E05, 47J05, 47J10, 35J60, **AMS members US\$55**, List US\$69, Order code SURV/161

## Geometry and Topology



### Symplectic Actions of 2-Tori on 4-Manifolds

**Alvaro Pelayo**, *University of California at Berkeley, CA*

**Contents:** Introduction; The orbit space; Global model; Global model up to equivariant diffeomorphisms; Classification: Free case; Orbifold homology and geometric mappings; Classification; The four-dimensional

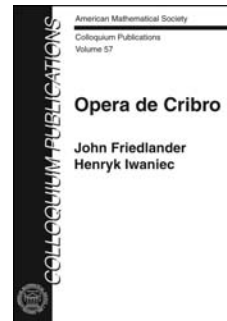
classification; Appendix: (sometimes symplectic) orbifolds; Bibliography.

**Memoirs of the American Mathematical Society**, Volume 204, Number 959

March 2010, 81 pages, Softcover, ISBN: 978-0-8218-4713-8, LC 2009049943, 2000 *Mathematics Subject Classification*: 53D35;

57M60, 53C12, 55R10, **Individual member US\$38**, List US\$64, Institutional member US\$51, Order code MEMO/204/959

## Number Theory



### Opera de Cribro

**John Friedlander**, *University of Toronto, ON, Canada*, and **Henryk Iwaniec**, *Rutgers University, Piscataway, NJ*

*This monograph represents the state of the art both in respect of coverage of the general methods and in respect of the actual applications to interesting problems.*

*A unique feature of this monograph is how the authors take great pains to explain the fundamental ideas behind the proofs and to show how to approach a question in a correct fashion. So, this book is not just another monograph useful for consultation; rather, it is a teaching instrument of great value both for the specialist and the beginner in the field.*

*The authors must be congratulated for this exceptional monograph, the first of its kind for depth of content as well as for the effort made to explain the 'why' and not limiting themselves to the 'how to'. This is a true masterpiece that will prove to be indispensable to the serious researcher for many years to come.*

—**Enrico Bombieri**, *Institute for Advanced Study*

*This is a truly comprehensive account of sieves and their applications, by two of the world's greatest authorities. Beginners will find a thorough introduction to the subject, with plenty of helpful motivation. The more practised reader will appreciate the authors' insights into some of the more mysterious parts of the theory, as well as the wealth of new examples. No analytic number theorist should be without this volume, but it will not have a place on my bookshelves—it will be permanently on my desk!*

—**Roger Heath-Brown**, *University of Oxford, Fellow of Royal Society*

This is a comprehensive and up-to-date treatment of sieve methods. The theory of the sieve is developed thoroughly with complete and accessible proofs of the basic theorems. Included is a wide range of applications, both to traditional questions such as those concerning primes, and to areas previously unexplored by sieve methods, such as elliptic curves, points on cubic surfaces and quantum ergodicity. New proofs are given also of some of the central theorems of analytic number theory; these proofs emphasize and take advantage of the applicability of sieve ideas.

The book contains numerous comments which provide the reader with insight into the workings of the subject, both as to what the sieve can do and what it cannot do. The authors reveal recent developments by which the parity barrier can be breached, exposing golden nuggets of the subject, previously inaccessible. The variety in the topics covered and in the levels of difficulty encountered makes this a work of value to novices and experts alike, both as an educational tool and a basic reference.

**Contents:** Sieve questions; Elementary considerations on arithmetic functions; Bombieri's sieve; Sieve of Eratosthenes-Legendre; Sieve principles and terminology; Brun's sieve—The big bang; Selberg's



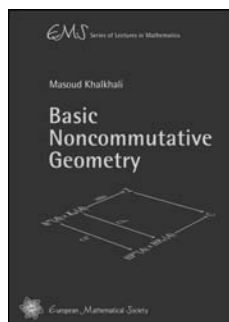
sieve—Kvadrater er positiv; Sieving by many residue classes; The large sieve; Molecular structure of sieve weights; The beta-sieve; The linear sieve; Applications to linear sequences; The semi-linear sieve; Applications—Choice but not prime; Asymptotic sieve and the parity principle; Combinatorial identities; Asymptotic sieve for primes; Equidistribution of quadratic roots; Capturing Gaussian primes; Primes represented by polynomials; Level of distribution of arithmetic sequences; Primes in short intervals; The least prime in an arithmetic progression; Almost-prime sieve; Mean-values of arithmetic functions; Differential-difference equations; Bibliography; Index.

**Colloquium Publications**, Volume 57

May 2010, approximately 529 pages, Hardcover, ISBN: 978-0-8218-4970-5, LC 2009046518, 2000 *Mathematics Subject Classification*: 11N35, 11N36; 11N05, 11N13, 11N32, 11N37, 11J71, 11E25, **AMS members US\$82**, List US\$103, Order code COLL/57

## New AMS-Distributed Publications

### Analysis



### Basic Noncommutative Geometry

**Masoud Khalkhali**, *University of Western Ontario, London, Ontario, Canada*

This book provides an introduction to noncommutative geometry and some of its applications. It can be used either as a

textbook for a graduate course on the subject or for self-study. It will be useful for graduate students and researchers in mathematics and theoretical physics and all those who are interested in gaining an understanding of the subject. One feature of this book is the wealth of examples and exercises that help the reader to navigate through the subject. While background material is provided in the text and in several appendices, some familiarity with basic notions of functional analysis, algebraic topology, differential geometry, and homological algebra at a first-year graduate level is helpful.

Developed by Alain Connes since the late 1970s, noncommutative geometry has found many applications to long-standing conjectures in topology and geometry and has recently made headways in theoretical physics and number theory. The book starts with a detailed description of some of the most pertinent algebra-geometry correspondences by casting geometric notions in algebraic terms, then proceeds to the idea of a noncommutative space and how it is constructed. The last two chapters deal with homological tools: cyclic cohomology and Connes–Chern characters in  $K$ -theory and  $K$ -homology, culminating in one commutative diagram expressing the equality of topological and analytic index

in a noncommutative setting. Applications to integrality of noncommutative topological invariants are given as well.

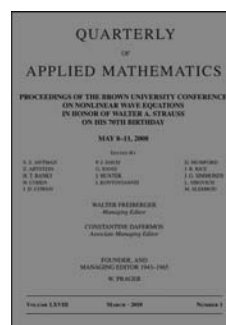
A publication of the European Mathematical Society (EMS). Distributed within the Americas by the American Mathematical Society.

**Contents:** Examples of algebra-geometry correspondences; Noncommutative quotients; Cyclic cohomology; Connes–Chern character; Appendices; Bibliography; Index.

**EMS Series of Lectures in Mathematics**, Volume 10

December 2009, 239 pages, Softcover, ISBN: 978-3-03719-061-6, 2000 *Mathematics Subject Classification*: 58-02, 58B34, **AMS members US\$38**, List US\$48, Order code EMSSERLEC/10

## Differential Equations



### Proceedings of the Brown University Conference on Nonlinear Wave Equations in Honor of Walter A. Strauss on his 70th Birthday, May 8-11, 2008

**Walter Freiberger**, *Brown University, Providence, RI*, Editor

This volume is a special issue of the *Quarterly of Applied Mathematics* journal. It represents the proceedings of the conference in honor of Walter Strauss's 70th birthday held at Brown University (Providence, RI) in May of 2008. The issue offers a collection of original and expository articles devoted to the study of nonlinear wave equations. The articles cover a wide range of topics, including scattering theory, dispersive waves, classical field theory, mathematical fluid mechanics, kinetic theory, and stability theory. The book offers a nice cross-section of current trends and research directions in the study of nonlinear wave equations.

Published by Brown University and distributed worldwide by the American Mathematical Society.

**Contents:** **Y. Guo**, Introduction to the Brown University Nonlinear Wave Equations Conference papers; **C. Morawetz**, Introduction. Dinner speech; **M. Grillakis**, The mathematics of W. A. Strauss and his contributions to analysis; **H. Andréasson**, **M. Kunze**, and **G. Rein**, Gravitational collapse and the formation of black holes for the spherically symmetric Einstein–Vlasov system; **C. Bardos** and **N. J. Mauser**, One particle equations for many particle quantum systems: The MCTHDF method; **N. Burq**, **P. Gérard**, and **N. Tzvetkov**, High frequency solutions of the nonlinear Schrödinger equation on surfaces; **G.-Q. Chen**, **M. Slemrod**, and **D. Wang**, A fluid dynamic formulation of the isometric embedding problem in differential geometry; **A. Constantin**, On the particle paths in solitary waves; **W. Craig** and **C. Sulem**, Asymptotics of surface waves over random bathymetry; **J. Ginibre** and **G. Velo**, Quadratic Morawetz inequalities and asymptotic completeness in the energy space for nonlinear Schrödinger and Hartree

equations; **R. Glassey, J. Schaeffer, and S. Pankavich**, Time decay for solutions to one-dimensional two component plasma equations; **Y. Guo**, Bounded solutions for the Boltzmann equation; **Y. Guo and Y. Han**, Critical Rayleigh number in Rayleigh–Bénard convection; **J. Shatah**, Space-time resonances; **T. C. Sideris**, Energy splitting for solutions of multi-dimensional isotropic symmetric hyperbolic equations.

March 2010, 178 pages, Softcover, 2000 *Mathematics Subject Classification*: 35-06, 35Lxx, 35Qxx, List US\$49, Order code QAMSP2

## Discrete Mathematics and Combinatorics

### Discrete Mathematics in Statistical Physics

#### Introductory Lectures

**Martin Loebl**, Charles University, Prague, Czech Republic

This book first describes connections between some basic problems and technics of combinatorics and statistical physics. The discrete mathematics and physics terminology are related to each other. Using the established connections, some exciting activities in one field are shown from a perspective of the other field. The purpose of the book is to emphasize these interactions as a strong and successful tool. In fact, this attitude has been a strong trend in both research communities recently.

It also naturally leads to many open problems, some of which seem to be basic. This book aims to help make these exciting problems attractive to advanced students and researchers.

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

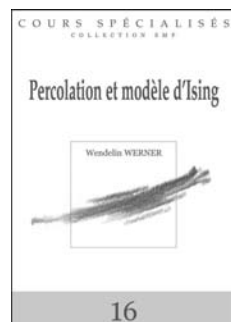
A publication of Vieweg Verlag. The AMS is exclusive distributor in North America. Vieweg Verlag Publications are available worldwide from the AMS outside of Germany, Switzerland, Austria, and Japan.

**Contents:** Basic concepts; Introduction to graph theory; Trees and electrical networks; Matroids; Geometric representations of graphs; Game of dualities; The zeta function and graph polynomials; Knots; 2D Ising and dimer models; Bibliography; List of figures; Index.

#### Vieweg Advanced Lectures in Mathematics

October 2009, 187 pages, Softcover, ISBN: 978-3-528-03219-7, 2000 *Mathematics Subject Classification*: 05-01, 82-01, 05A15, 05C30, 82B20, **AMS members US\$48**, List US\$53, Order code VWALM/11

## Probability



### Percolation et Modèle d'Ising

**Wendelin Werner**, Université Paris Sud, Orsay, France

These lecture notes provide a mathematical introduction to the study of random lattice-based models from statistical physics. Through the study of percolation and of the Ising model, the author introduces the notion of phase

transitions and describes some classical techniques. One of the main goals of these notes is also to present recent results of Stanislav Smirnov concerning the conformal invariance of these models in two-dimensional space.

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

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; *Partie I. Percolation:* Unicité de la composante connexe infinie; Inégalités de corrélation; Décroissance exponentielle; *Partie II. Percolation critique sur le réseau triangulaire:* La théorie de Russo–Seymour–Welsh; La formule de Cardy–Smirnov; Quelques exercices sur la percolation; *Partie III. FK-percolation et modèle d'Ising:* FK-percolation sur des graphes finis; FK-percolation en volume infini; Bref retour sur Ising et Potts; *Partie IV. FX-percolation et modèle d'Ising sur le réseau carré:* FK-percolation sur le réseau carré; Invariance conforme du modèle d'Ising; Quelques exercices sur la FK-percolation; Commentaires bibliographiques; Bibliographie.

#### Cours Spécialisés—Collection SMF, Number 16

November 2009, 161 pages, Hardcover, ISBN: 978-2-85629-276-1, 2000 *Mathematics Subject Classification*: 60-01, 82-01, 82B05, 82B20, 82B26, 82B27, 82B43, **Individual member US\$54**, List US\$60, Order code COSP/16