

# CURRICULUM VITAE

Klaus Schmidt

NAME: Klaus Schmidt  
ADDRESS: Mathematics Department, University of Vienna,  
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DATE OF BIRTH: 25th September 1943  
NATIONALITY: Austrian  
MARITAL STATUS: married  
EDUCATION: Wasagymnasium, Vienna, Austria, 1953 – 1961  
Mathematics Department, University of Vienna, Austria, 1962 – 1968  
QUALIFICATION: Dr. Phil. (Mathematics, University of Vienna) 1968  
RESEARCH AREAS: Ergodic Theory, Harmonic Analysis, Probability Theory, Operator  
Algebras  
POSITIONS HELD: Lecturer, Statistics Department, Technical University, Vienna, Austria,  
1967 – 1969  
Research Fellow, Department of Mathematics, University of Manchester,  
UK, 1969 – 1970  
Lecturer, Department of Mathematics, Bedford College, University of  
London, UK, 1970 – 1974  
Lecturer, Mathematics Institute, University of Warwick, UK, 1974 – 1979  
Reader, Mathematics Institute, University of Warwick, UK, 1979 – 1983  
Professor, Mathematics Institute, University of Warwick, UK, 1983 – 1994  
Professor, Mathematics Dept., University of Vienna, Austria, 1994 – 2009  
Professor Emeritus, Mathematics Dept., University of Vienna, Austria,  
since 2009

## PH.D. STUDENTS

G.A. Atkinson: *Non-compact extensions of transformations* (1976).

G.W. Riley: *The method of approximations and skew product transformations* (1978).

J.M. Hawkins: *On smooth type III diffeomorphisms of compact manifolds* (1981).

R.A.R. Butler: *A new information cocycle with some applications* (1982).

- A. Ocneanu: *Actions of discrete amenable groups on factors* (1982).
- A. Harding: *Properties of the  $\beta$ -function under finitary isomorphisms with finite expected code length between  $g$ -spaces* (1986).
- D. Pask: *Ergodicity of certain cylinder flows* (1989).
- T.B. Ward: *Topological entropy and periodic points for  $\mathbb{Z}^d$ -actions on compact abelian groups with the descending chain condition* (1989).
- Z.N. Coelho: *Entropy and ergodicity of skew products over subshifts of finite type and central limit asymptotics* (1990).
- M.A. Shereshevsky: *On the ergodic theory of cellular automata and two-dimensional Markov shifts generated by them* (1992).
- M. Einsiedler: *Problems in higher dimensional dynamics* (1999).
- G. Greschonig: *Problems in cohomology and recurrence* (2002).
- U. Haböck: *Cohomology and classification problems in dynamics* (2006).
- G. Strasser: *Adic and symbolic dynamical systems* (2017).

#### EDITORSHIPS

Founding and executive editor of *Ergodic Theory and Dynamical Systems*, Cambridge University Press, 1981 – 1985.

Editor of *Ergodic Theory and Dynamical Systems*, 1986 – 1997.

Editor of *Monatshefte für Mathematik*, Springer Verlag, 1994 – 2011.

Editor of *Aequationes Mathematicae*, Birkhäuser Verlag, since 1997.

Editor of *International Mathematics Research Notices*, Duke University, 1998 – 2001.

Editor of *Electronic Research Announcements of the AMS* (now *Electronic Research Announcements in Mathematical Sciences*), since 1998.

#### (CO)-ORGANIZATION OF MAJOR RESEARCH PROGRAMMES (WITH MORE THAN 100 PARTICIPANTS)

Symposium on *Operator Algebras and Ergodic Theory*, University of Warwick, 01/03/81 – 31/08/81.

Symposium on *The Dynamics of  $\mathbb{Z}^d$ -actions and their Connections with Number Theory, Commutative Algebra, and Statistical Mechanics*, University of Warwick, 20/09/93 – 31/07/94.

Research Programme on *Ergodic Theory and Dynamical Systems*, Erwin Schrödinger Institute, Vienna, Austria, 15/12/96 – 31/08/97.

Research Programme on *Random Walks*, Erwin Schrödinger Institute, Vienna, Austria, 15/02/01 – 31/07/01.

Research Programme on *Amenability*, Erwin Schrödinger Institute, Vienna, Austria, 01/03/07 – 31/07/07.

#### DISTINCTIONS

Winner of the 1993 Ferran Sunyer i Balaguer Prize (12000 ECU) for the monograph [4].

Member of the Austrian Academy of Sciences (corresponding member since 1995, full member since 1997).

Distinguished Chair in Mathematics, Pacific Institute for the Mathematical Sciences, November 2002.

#### OTHER RELEVANT INFORMATION

Mathematics Department, University of Warwick: Chairman, 1989 – 1992.

Erwin Schrödinger International Institute for Mathematical Physics, Vienna, Austria: Scientific Director 1995 – 2003; President, 2003 – 2011.

European Mathematical Society: Member of the Executive Committee, 2005 – 2010.

FWF (Austrian Science and Research Fund): Principal Assessor for Mathematics, 2005 – 2011.

#### A SELECTION OF ACADEMIC INVITATIONS AND INVITED LECTURES (TITLES OF LECTURES IN ITALICS)

Institute for Advanced Study, Princeton, USA (04/01/88 – 30/06/88). Dynamical Systems Seminar: *Automorphisms of compact groups*.

University of Maryland, College Park, USA (09/02/88 – 16/02/88 and 07/04/88 – 13/04/88).

Ergodic Theory Seminar: *Asymptotic invariance and hyperfiniteness*.

Colloquium lecture: *Automorphisms of compact groups*.

Special lecture series: *Automorphisms of compact groups* (4 lectures).

Graduate Center, CUNY, New York, USA (22/03/88). Dynamical Systems Seminar: *Expansive automorphisms of compact groups*.

McGill University, Montréal, Canada (29/03/88 – 04/04/88). Seminar lecture: *Dynamical systems of algebraic origin*.

University of North Carolina, Chapel Hill, USA (04/04/88 – 07/04/88). Seminar lecture: *Automorphisms of compact groups*.

University of Washington, Seattle, USA (13/04/88 – 27/04/88). Rainwater Seminar lecture series: *Automorphisms of compact groups* (3 lectures).

University of California, Berkeley, USA (27/04/88 – 01/05/88). Colloquium lecture: *Dynamical systems and commutative algebra*.

UCLA, Los Angeles, USA (01/05/88 – 04/05/88). Seminar lecture: *Automorphisms of compact groups and affine varieties*.

University of Colorado, Boulder, USA (04/05/88 – 10/05/88). Colloquium lecture: *Automorphisms of compact groups*.

Conference on Dynamical Systems, Northwestern University, Evanston, USA (10/05/88 – 15/05/88). Invited lecture: *Automorphisms of compact groups*.

Ohio State University, Columbus, USA (15/05/88 – 17/05/88). Seminar lecture: *Automorphisms of compact groups*.

IBM T.J. Watson Research Center, Yorktown Heights, New York, USA (01/07/88 – 29/07/88): Visiting researcher.

Conference in honour of René Thom, ICTP, Trieste, Italy (01/09/88 – 15/09/88). Invited lecture: *Dynamical systems of algebraic origin*.

University of Leipzig, GDR (09/12/88 – 23/12/88). Colloquium lecture: *Dynamische Systeme und kommutative Algebra*.

University of Halle-Wittenberg, Halle, GDR (23/12/88). Seminar lecture: *Über Markov-Shifts mit Gruppenstruktur*.

Institut Mittag-Leffler, Stockholm, Sweden (29/03/89 – 20/04/89). Mittag-Leffler Seminar: *Markov shifts and equivalence relations*.

Conference on Harmonic Analysis and Ergodic Theory, Université Paris-Nord, Paris, France (12/06/89 – 14/06/89). Invited lecture: *Dirichlet measures and ranges of cocycles*.

University of Washington, Seattle, USA (03/08/89 – 25/08/89). CBMS lecture series: *Algebraic Ideas in Ergodic Theory* (10 lectures).

Conference on Ergodic Theory and Hyperbolic Geometry, University of Göttingen, Germany (11/07/90 – 17/07/90). Invited lecture: *Expansive  $\mathbb{Z}^d$ -actions*.

Conference on Operator Algebras and Ergodic Theory, Université de Montreal, Canada (18/02/91 – 22/02/91). Invited lecture: *Groups of Markov type*.

Summer School, Université de Provence, Marseille, France (Vars, 08/07/91 – 13/07/91). Invited lecture series: *Ergodic Theory* (6 lectures).

Conference on Symbolic Dynamics and its applications, Yale University, New Haven, USA (29/07/91 – 02/08/91). Invited lecture: *Invariants for higher dimensional Markov shifts*.

Pennsylvania State University, State College, USA (01/12/91 – 06/12/91). Seminar lecture:  *$\mathbb{Z}^d$ -actions by automorphisms of compact groups*.

Conference on Arithmetic and Symbolic Dynamics, CIRM, Luminy, Marseille, France (09/09/91 – 13/09/91). Invited lecture: *Mahler, Masser, and Mixing*.

Program on the Ergodic Theory of Lie group actions, MSRI, Berkeley, USA (05/04/92 – 17/04/92). Two lectures: *Mixing of all orders for  $\mathbb{Z}^d$ -actions by automorphisms of compact groups*, and *Cohomology of  $\mathbb{Z}^d$ -actions by automorphisms of compact groups*.

Conference on Dynamical Systems, University of Porto, Portugal (03/08/92 – 08/08/92). Invited lecture: *The dynamics of  $\mathbb{Z}^d$ -actions*.

Symbolic Dynamics Program, MSRI, Berkeley, USA (14/09/92 – 15/12/92). Three lectures: *Cocycle rigidity for higher-dimensional shifts of finite type* (2 lectures). *Problems for  $\mathbb{Z}^d$ -actions by automorphisms of compact groups*.

UCLA, Los Angeles, USA (15/10/92 – 16/10/92). Colloquium lecture: *Schlickewei's S-unit theorem and dynamics*.

University of Prague, CSFR (31/05/93 – 02/06/93). Academy of Science Colloquium lecture: *Mahler measure and entropy*.

Workshop on Dynamical Systems, IMPA, Rio de Janeiro, Brazil (02/08/93 – 14/08/93). Invited lecture: *Mixing toral automorphisms and arithmetic*.

CRM, Institut d'Estudis Catalans, Barcelona, Spain (20/04/94 – 24/04/94). Special colloquium lecture in connection with the award of the Ferran Sunyer i Balaguer Prize: *Dynamical systems of algebraic origin*.

Workshop on Ergodic Theory and Dynamical Systems, Invariant Measures and Applications to Number Theory, Technical University of Delft, Holland (22/08/94 – 26/08/94). Invited lecture series: *Ergodic Theory of  $\mathbb{Z}^d$ -actions* (4 lectures).

Symposium on Ergodic Theory and Dynamical Systems, Banach Center, Warsaw, Poland (05/06/95 – 16/06/95). Two invited lectures: *Cohomology of algebraic and symbolic  $\mathbb{Z}^d$ -actions*, and *De Finetti's theorem for shifts of finite type*.

Conference on Systèmes Dynamiques et Théorie des Nombres, CIRM, Luminy, Marseille, France (03/07/95 – 07/07/95). Invited lecture: *De Finetti's theorem revisited*.

International Colloquium on Lie Groups and Ergodic Theory, TIFR, Bombay, India (04/01/96 – 12/01/96). Invited lecture: *On the cohomology of algebraic  $\mathbb{Z}^d$ -actions with values in compact Lie groups*.

Workshop on Ergodic Theory, Churanov, Chechia (03/02/96 – 10/02/96). Invited lecture: *On the cohomology of expansive  $\mathbb{Z}^d$ -actions*.

Hungarian Academy of Sciences, Budapest, Hungary (25/04/96 – 27/04/96). Seminar lecture: *The intrinsic algebraic structure of higher-dimensional shifts of finite type*.

University of Washington, Seattle, USA (01/06/96 – 31/07/96). Participant of NSF Research Project on Dynamical Systems. Seminar lecture: *Fundamental cocycles and fundamental groups of shifts of finite type*.

University of California, Berkeley, USA (24/07/96 – 27/07/96). Seminar lecture: *Invariant cocycles, de Finetti's theorem and exchangeability*.

Bernoulli World Congress, Vienna, Austria (26/08/96 – 31/08/96). Invited lecture: *How much can you reveal about a random walk without giving anything away?*

Conference on Modern Ergodic Theorems, Technion, Haifa, Israel (16/03/97 – 23/03/97). Invited lecture: *Tails and fine tails*.

Mathematics Institute, University of Warwick, UK (05/09/97 – 30/09/97). Seminar lecture: *Markov partitions and homoclinic points of toral automorphisms*.

Mathematics Department, University of East Anglia, UK (22/09/97). Seminar lecture: *The intrinsic algebraic structure of higher-dimensional shifts of finite type*.

Mathematics Department, University of Manchester, UK (01/10/97 – 13/10/97). Seminar lecture: *Markov partitions and homoclinic points*.

Mathematics Department, QMW, London, UK (14/10/97). Seminar lecture: *Markov partitions and homoclinic points*.

Conference on Analysis and Geometry, Napier, New Zealand (04/01/98 – 10/01/98). Invited lecture series: *Rigidity of higher rank abelian actions* (3 lectures).

Mathematics Department, University of California, Berkeley, USA (17/01/98 – 05/02/98). Two seminar lectures: *Shifts of finite type*, *Wang tilings and cohomology*, and *Markov partitions, homoclinic points and beta-expansions*.

Center for Dynamical Systems, Pennsylvania State University, State College, USA (09/02/98 – 19/03/98). Special lecture series: *Commuting automorphisms of compact groups* (3 lectures). Seminar lecture: *Rigidity properties of higher-dimensional shifts of finite type*.

Workshop on Dynamical Systems and Related Topics, University of Maryland, USA (19/03/98 – 29/03/98). Invited lecture: *Wang tiles, cohomology and shifts of finite type*.

University of Washington, Seattle, USA (05/04/98 – 29/06/98). Two seminar lectures: *On the equation  $f = bT/b$  and related questions*, and *Markov partitions and homoclinic points of hyperbolic toral automorphisms*.

Ohio State University, Columbus, USA (26/05/98 – 31/05/98). Colloquium lecture: *Wang tiles, fundamental cocycles and fundamental groups of symbolic  $\mathbb{Z}^2$ -actions*.

University of British Columbia, Vancouver, Canada (17/06/98 – 16/06/98). Seminar lecture: *Wang tiles, symbolic dynamics and cohomology*.

Conference on Dynamical Systems — From Crystal to Chaos, Marseille, France (06/07/98 – 10/07/98). Invited lecture: *Markov partitions and homoclinic points of expansive group automorphisms*.

Eurandom Workshop on Ergodic Theory, Eindhoven, Holland (12/11/98 – 15/11/98). Invited lecture: *Recurrence of stationary random walks*.

Mathematics Department, Chalmers University, Göteborg, Sweden (15/05/99 – 19/05/99). Colloquium lecture: *Wang tiles and fundamental groups of Markov shifts*. Seminar lecture: *De Finetti's Theorem revisited*.

Mathematics Department, University of Manchester, UK (27/06/99 – 08/07/99). Seminar lecture: *Isomorphism rigidity of algebraic  $\mathbb{Z}^d$ -actions*.

Mathematics Institute, University of Warwick, UK (02/07/99 – 04/07/99). Special colloquium on the occasion of William Parry's 65th birthday: *Recurrence of random walks*.

AMS Summer Research Institute on Smooth Ergodic Theory and Applications, Seattle, USA (25/07/99 – 08/08/99). Plenary lecture: *Isomorphism rigidity of  $\mathbb{Z}^d$ -actions*.

Program on Codes, Systems and Graphical Models, IMA, Minneapolis, USA (08/08/99 – 15/08/99): *Multi-dimensional symbolic dynamical systems*.

Workshop on Probability and Physics of Disordered Systems, Paul Erdős Summer Research Center in Mathematics, Budapest, Hungary (23/08/99 – 27/08/99): *Recurrence of stationary random walks*.

Théorie Ergodique, Rencontres Mathématiques de Rouen, Université de Rouen, France (05/09/99 – 08/09/99). Invited lecture: *Automatic ergodicity of cocycles*.

Conference on Arithmetics, Automata and Dynamical Systems, CIRM, Luminy, France (02/11/99 – 06/11/99).

Mathematics Department, Ajou University, Suwon, Korea (02/01/00 – 09/01/00). Two colloquium lectures: *Wang tilings, fundamental cocycles and fundamental groups of multi-dimensional shifts of finite type*, and *Invariant cocycles*.

Conference on Ergodic Theory, Keio University, Tokyo, Japan (10/01/00 – 13/01/00). Invited lecture: *Isomorphism rigidity of commuting toral automorphisms and other algebraic  $\mathbb{Z}^d$ -actions*.

Mathematics Department, Osaka City University, Osaka, Japan (14/01/00 – 17/01/00). Colloquium lecture: *Invariant cocycles*.

Mathematics Department, Hiroshima University, Saijo, Japan (18/01/00 – 20/01/00). Colloquium lecture: *Wang tilings, fundamental cocycles and fundamental groups of multi-dimensional shifts of finite type*.

Mathematics Department, Kyushu University, Fukuoka, Japan (21/01/00 – 24/01/00). Seminar lecture: *Invariant cocycles*.

Mathematics Department, Keio University, Yokohama, Japan (24/01/00 – 29/01/00).

Senior Visiting Research Fellow of the Programme on Ergodic Theory, Geometric Rigidity and Number Theory, Newton Institute, Cambridge, UK (14/02/00 – 29/02/00, 19/03/00 – 08/04/00 and 18/06/00 – 02/07/00), and organizer of the Newton Institute Satellite Conference on Ergodic Theory of  $\mathbb{Z}^d$ -actions, Mathematics Institute, University of Warwick, UK (03/04/00 – 07/04/00). Seminar lecture: *Hyperbolic toral automorphisms and  $\beta$ -expansions*.  
Warwick Conference lecture: *Rigidity of algebraic  $\mathbb{Z}^d$ -actions*.

Mathematics Department, University of East Anglia, Norwich, UK (21/02/00). Seminar lecture: *Rigidity of algebraic  $\mathbb{Z}^d$ -actions*.

Conference on Diophantine Approximations, Mathematisches Forschungsinstitut Oberwolfach, Germany (09/04/00 – 15/04/00). Invited lecture: *Mahler, Masser,  $S$ -units and mixing*.

Third European Congress in Mathematics, Barcelona, Spain (10/07/00 – 15/07/00). Invited lecture: *The dynamics of algebraic  $\mathbb{Z}^d$ -actions*.

Workshop on Dynamics and Randomness, Santiago, Chile (11/12/00 – 16/12/00). Invited lecture: *Rigidity of group automorphisms*.

University of Washington, Seattle, USA (04/01/01 – 08/01/01). Seminar lecture: *Homoclinic points of toral automorphisms and Renyi's beta-expansion*.

Program on Operator Algebras, MSRI, Berkeley, USA (08/01/01 – 20/01/01). Invited lecture: *Isomorphism rigidity of  $\mathbb{Z}^d$ -actions*.

L'Odyssee Dynamique, CIRM, Luminy, France (28/01/01 – 10/02/01). Invited lecture series: *Expansive automorphisms of compact abelian groups and homoclinic points* (5 lectures).

Conference on Ergodic Theory, Probability and Analysis, Center for Dynamical Systems, Pennsylvania State University, State College, USA (20/04/01 – 22/04/01). Invited lecture: *Invariant subrelations*.

Research visit, Institute for Advanced Study, Princeton, USA (22/04/01 – 26/04/01).

Dynamical Systems and Related Fields, Paul Erdős Summer Research Center of Mathematics, Budapest, Hungary (22/08/01 – 25/08/01). Invited lecture: *Homoclinic points and adjoint actions of algebraic  $\mathbb{Z}^d$ -actions*.

Workshop on Ergodic Theory and Topological Dynamics, Nicholas Copernicus University, Toruń, Poland (17/01/02 – 22/01/02). Invited lecture: *Growth and recurrence of stationary random walks*.

Chaines de Markov topologiques dénombrables, CIRM, Luminy, France (22/07/02 – 27/07/02). Invited lecture: *Reducing factor maps of subshifts to entropy-preserving ones*.

Aperiodic order, dynamical systems, operator algebras and topology, Victoria, Canada (04/08/02 – 10/08/02). Invited lecture: *Shifts of finite type, Wang tilings and fundamental cocycles*.

Distinguished Chair in Mathematics, Pacific Institute for the Mathematical Sciences, University of Victoria, Canada, and University of Washington, Seattle, USA (27/10/02 – 26/11/02). PIMS Distinguished Chair in Mathematics Lecture Series: *The dynamics of  $\mathbb{Z}^d$ -actions* (5 lectures in Victoria) and *Recurrence of stationary random walks* (Rainwater Seminar at the University of Washington).

Journée Spéciale: Algèbres d'Opérateurs – Théorie Ergodique, Institut de Mathématiques, Luminy, France (09/12/02). Invited lecture: *Dynamical properties of  $\mathbb{Z}^d$ -actions*.

University of Washington, Seattle, USA (02/01/03 – 30/05/03 and 26/07/03 – 28/08/03). Rainwater Seminar: *Dispersion of cocycles and mixing flows*.

University of British Columbia, Vancouver, Canada (07/05/03 – 10/05/03). PIMS Distinguished Chair in Mathematics Lecture: *Mahler measure, factors of Markov shifts and symbolic representations of group automorphisms*.

Conference on Recent Advances in Operator Algebras, UCLA, Los Angeles, USA (13/05/03 – 17/05/03). Invited lecture: *On some of the differences between  $\mathbb{Z}$  and  $\mathbb{Z}^2$* .

Stanford University, USA (20/05/03 – 22/05/03). Analysis seminar lecture: *The mixing behaviour of algebraic  $\mathbb{Z}^d$ -actions and additive relations in fields*.

Furstenberg Conference, Jerusalem, Israel (16/06/03 – 22/06/03). Invited lecture: *Isomorphism rigidity of algebraic  $\mathbb{Z}^d$ -actions*.

BIRS Workshop on Joint Dynamics, Banff, Canada (29/06/03 – 03/07/03). Invited lecture: *Higher order mixing in algebraic actions*.

Warwick symbolic dynamics workshop, in honour of P. Walters and K. Schmidt (07/07/03 – 18/07/03).

Conference on ergodic theory with connections to number theory, Corvallis, Oregon, USA (21/07/03 – 26/07/03). Two invited lectures: *On some of the differences between  $\mathbb{Z}$  and  $\mathbb{Z}^2$* , and *Automorphisms of compact groups and their homoclinic points*.

IRMA, Strasbourg, France (19/11/03 – 26/11/03). Research visit as part of an AMADEUS joint research programme with P. Foulon and A. Papadopoulos.

University of Basle, Switzerland (26/11/03 – 30/11/03). Colloquium lecture: *Pisot numbers, Salem numbers and dynamics*.

Workshop on von Neumann Algebras, CIRM, Luminy, France (02/02/04 – 06/02/04). Invited lecture: *Invariant measures for toral automorphisms and  $\beta$ -shifts*.

Conference on Representation Theory, Dynamical Systems and Asymptotic Combinatorics, St. Petersburg, Russia (08/06/04 – 13/06/04). Invited lecture: *Symbolic representations of nonhyperbolic toral automorphisms*.

Program on Algebraic and Topological Dynamics and ESF Workshop on Dynamical Systems, MPIM Bonn, Germany (joint organizer, 27/06/04 – 17/07/04). Invited lecture: *Symbolic representations of toral automorphisms, Mahler measure and equivalence relations on sequence spaces*.

University of Washington, Seattle, USA (26/08/04 – 24/09/04). Seminar lecture: *Invariant measures for nonhyperbolic toral automorphisms*.

University of Vancouver, Vancouver, Canada (09/09/04 – 11/09/04). Colloquium lecture: *Recurrence of stationary random walks*.

Clay Mathematics Institute and MSRI Conference on Recent Progress in Dynamics, MSRI, Berkeley, USA (joint organizer, 25/09/04 – 02/10/04). Invited lecture: *Isomorphism rigidity for algebraic  $\mathbb{Z}^d$ -actions on zero-dimensional groups*.

Department of Mathematics, Technical University of Budapest, Hungary (06/12/04 – 11/12/04). Colloquium lecture: *Invariant sets and measures of nonhyperbolic toral automorphisms*.

Workshop on Dynamical Systems, Probability Theory and Statistical Mechanics, EURANDOM, Eindhoven, Holland (02/01/05 – 07/01/05). Invited lecture: *Distributional properties of cocycles and random walks*.

Department of Mathematics, University of Paderborn, Germany (17/01/05–18/01/05). Colloquium lecture: *Algebraic dynamical systems*.

Department of Mathematics, University of New South Wales, Sydney, Australia (07/02/05 – 23/02/05), MASCOS Workshop on Algebraic Dynamics (14/02/05 – 18/02/05). Two lectures: *Introduction to commutative algebraic dynamics I and II*.

Université Pierre et Marie Curie, Paris 6, France (21/03/05 – 23/03/05 and 25/03/05 – 26/03/05). Invited lecture: *Invariant sets and measures for nonhyperbolic toral automorphisms*.

Annual Meeting of the Israel Mathematical Union, Neve Ilan, and University of Tel Aviv, Israel, (19/05/05 – 23/05/05). Invited lecture: *Isomorphism of  $\mathbb{Z}^d$ -actions*.

University of Prague, Czech Republic (25/05/05 – 29/05/05). Colloquium lecture: *Dynamical systems arising from algebra*.

Northwest Dynamics Symposium, University of Victoria, BC, Canada (14/08/05 – 20/08/05). Invited lecture: *Toral automorphisms revisited*.

McGill University, Montréal, Canada (29/08/05 – 04/09/05). Colloquium Lecture: *Invariant sets and invariant measures of toral automorphisms*.

Princeton University and Institute for Advanced Study, Princeton, USA (04/09/05 – 13/09/05). Seminar lecture at Princeton University: *Algebraic actions of nilpotent groups*.

Mathematics Department, University of Torún, Poland (29/11/05 – 02/12/05). Seminar lecture: *Invariant sets and measures of nonhyperbolic toral automorphisms*.

UK-Japan Winter School on Dynamics and Arithmetic, Bury St. Edmunds, UK (08/01/06 – 13/01/06). Invited series of 4 lectures: *Dynamics and Arithmetic of Toral Automorphisms*.

IRMA, Strasbourg, France (23/04/06 – 30/04/06). Research visit as part of an AMADEUS joint research programme with P. Foulon and A. Papadopoulos.

Workshop on Ergodic Theory and Dynamical Systems, Sklarska Poreba, Poland (18/06/06 – 24/06/06). Invited lecture: *Algebraic Actions of Discrete Amenable Groups and Entropy*.

Workshop on Probabilistic Methods in Combinatorics, Graz, Austria (19/07/06 – 22/07/06). Invited lecture: *Exchangeability and random tilings*.

Conference on Randomness and Hyperbolicity in Dynamical Systems, Budapest, Hungary (21/08/06 – 25/08/06). Invited lecture: *Exchangeability and related problems*.

Jahrestagung der DMV, Bonn, Germany (18/09/06 – 22/09/06). Plenary lecture: *Algebraic dynamical systems*.

Princeton University, Princeton, USA (01/10/06 – 11/11/06). Colloquium lecture: *Mahler measure and entropy*. Seminar lecture: *Distributional properties of cocycles*.

University of Maryland, College Park, USA (26/10/06 – 28/10/06). Colloquium lecture: *Mahler measure and Fuglede-Kadison determinants*. Seminar lecture: *Invariant sets and measures of nonhyperbolic toral automorphisms*.



Ohio State University, Columbus, USA (12/11/06 – 09/12/06). Colloquium lecture: *Mahler measure and entropy*. Seminar lecture: *Nonhyperbolic toral automorphisms*.

University of Washington, Seattle, USA (09/12/06 – 20/01/07). PIMS 10th Anniversary Distinguished Lecture: *On some of the differences between  $\mathbb{Z}$  and  $\mathbb{Z}^2$  in dynamics*. Seminar lecture: *Mahler measure, Fuglede-Kadison determinants and entropy*.

Conference in honour of William Parry, University of Warwick, UK (16/05/07 – 19/05/07). Invited lecture: *Beta-shifts and toral automorphisms*.

Colloquium on Number Theory: Diophantine Approximation, Technical University Graz, Austria, 26/07/07 – 27/07/07). Invited lecture: *Mixing properties of dynamical systems and additive relations in fields*.

Workshop on Sandpile Models and Related Fields, Eurandom, Eindhoven, The Netherlands (10/09/07 – 13/09/07). Invited lecture: *Abelian sandpiles and the harmonic model*.

Colloquium on Number Theory, Technical University Graz, Austria (18/10/07 – 19/10/07). Invited lecture: *Mahler measure and entropy*.

Conference on ‘Measures and dynamics on groups and homogeneous spaces’ in honour of S.G. Dani, TIFR, Mumbai, India (15/12/07 – 29/12/07). Two invited lectures: *Mahler measure and entropy* and *Infinitely divisible probability measures and the embedding problem*.

Rencontre entre physiciens théoriciens et mathématiciens: Conference on random walks and Brownian motion, Institut de Recherche Mathématique Avancée, Université Louis Pasteur, Strasbourg, France (28/05/08 – 31/05/08). Invited lecture: *Symbolic covers of group automorphisms and of algebraic  $\mathbb{Z}^d$ -actions*.

Conference on Dynamical Systems, Mathematical Research and Conference Center, Bedlewo, Poland (29/06/08 – 05/07/08). Invited lecture: *Sandpiles and Markov partitions*.

Northwest Dynamics Symposium 2008, PIMS, University of Victoria, Canada (03/08/08 – 09/08/08). Invited lecture: *Sandpiles and Markov partitions*.

Research visit, University of Washington, Seattle, USA (10/08/08 – 17/08/08).

Research visit, Programme on ‘Ergodic Theory and Additive Combinatorics’, MSRI, Berkeley, USA (18/08/08 – 18/09/08).

Hebrew University, Jerusalem, Israel (29/11/08 – 05/12/08). Colloquium lecture: *Sandpiles and the harmonic model*.

University of Tel Aviv, Israel (06/12/08 – 08/12/08). Horowitz Seminar Lecture: *On some of the differences between  $\mathbb{Z}$  and  $\mathbb{Z}^2$  in dynamics*.

Ben Gurion University, Beer Sheva, Israel (09/12/08 – 11/12/08). Colloquium lecture: *Mahler measure, Fuglede-Kadison determinants and entropy*.

Department of Mathematics, Technical University of Budapest, Hungary (26/02/09 – 28/02/09). Seminar lecture: *Sandpiles and the harmonic model*.

Department of Mathematics, ETH Zürich (05/03/09 – 07/03/09). Seminar lecture: *Salem numbers, beta-shifts and quasihyperbolic toral automorphisms*

Conference on ‘Dynamical Systems and Randomness’, Institut Henri Poincaré, Paris (11/05/09 – 15/05/09). Invited lecture: *Sandpiles and the harmonic model*.

Programme on ‘Dynamical Numbers, Max-Planck-Institute for Mathematics, Bonn, Germany (03/06/09 – 24/06/09 and 06/07/09 – 31/07/09). Invited lecture: *Mahler measure: a dynamical number*.

Workshop on ‘Boundaries’, University of Technology, Graz, Austria (29/06/09 – 04/07/09). Invited lecture: *Sandpiles and the Harmonic Model*.

Workshop on ‘Non-Archimedean Analysis, Lie Groups and Dynamical Systems’, University of Paderborn, Germany (08/02/10 – 12/02/10). Invited lecture: *Algebraic Dynamics*.

Workshop on ‘Ergodic Theory and Smooth Dynamics’, Mittag-Leffler Institute, Djursholm, Sweden (14/02/10 – 19/02/10). Invited lecture: *Entropy and periodic orbits*.

University of Maryland, College Park, USA (06/04/10 – 14/04/10). Colloquium lecture: *Sandpiles and the harmonic model*. Workshop on ‘Dynamical Systems and Related Topics in honor of Dan Rudolph’. Invited lecture: *Principal algebraic group actions*.

Workshop on ‘Dynamical Systems and Symbolic Dynamics’, Bielefeld University, Germany (17/05/10 – 19/05/10). Invited lecture: *Sandpiles and the harmonic model*.

‘Dynamical Systems Meeting’, Trzebieiszowice, Poland (24/05/10 – 28/05/10). Invited lecture: *Entropy and periodic points of algebraic actions*.

Workshop on ‘Numeration’, Lorentz Center, Leiden, Holland (14/06/10 – 18/06/10). Invited lecture: *Symbolic representation of toral automorphisms*.

Conference on ‘Ergodic Theory and Dynamical Systems: 30th Anniversary of the Journal’. University of Warwick, UK (02/09/10 – 17/09/10). Invited lecture: *Entropy and periodic points of principal group actions*.

Department of Mathematics, ETH Zürich (07/02/11 – 11/02/11).

Conference on Ergodic Theorems, Group Actions and Applications, Eilat, Israel (15/05/11 – 19/05/11). Invited lecture: *Entropy and growth-rate of periodic points for algebraic actions of  $\mathbb{Z}^d$  and more general groups*.

Workshop on Positivity, Fields Institute, Toronto, Canada (02/08/11 – 04/08/11). Invited lecture: *Entropy and periodic points of algebraic group actions*.

Research visit, University of Washington, Seattle, USA (05/08/11 – 01/09/11).

Microsoft Research, Redmond, Washington, USA (17/08/11). Seminar lecture: *Sandpiles and the harmonic model*.

University of California, Berkeley, USA (01/09/11 – 08/09/11). Seminar lecture: *Principal algebraic group actions*.

Department of Mathematics, Technical University of Budapest, Hungary (10/11/11 – 11/11/11). Two invited lectures: *On some of the differences between  $\mathbb{Z}$  and  $\mathbb{Z}^2$  in dynamics*, and *Ergodic Theory and Number Theory – On the work of Elon Lindenstrauss*.

Department of Mathematics, ETH Zürich, Switzerland. (29/11/11 – 01/12/11). Seminar lecture: *Mahler measure, Fuglede-Kadison determinants and entropy of algebraic actions*.

Workshop entitled “Avoided? Crossing of Eigenvalue Curves”, Kyushu University, Fukuoka, Japan (04/03/2012 – 10/03/2012). Invited lecture: *Mahler measure and entropy of algebraic group actions*.

University of Leiden, Holland (09/04/12 – 14/04/12). ‘Most Informal Probability Seminar Lecture’: *On Normal Numbers*.

Conference on ‘Ergodic Theory and Dynamical Systems: Perspectives and Prospects’, University of Warwick, UK (14/04/12 – 21/04/12). Invited lecture: *Dynamical properties of principal algebraic group actions*.

Conference on Interactions Between Ergodic Theory, Number Theory and Noncommutative Geometry, Ohio State University, Columbus, Ohio, USA (12/05/12 – 19/05/12). Invited lecture: *Entropy and the growth rate of periodic points for principal algebraic  $\mathbb{Z}^d$ -actions*.

Von Neumann Konferenz, SFB 878 ‘Groups, Geometry, and Actions’, University of Münster, Germany (29/05/12 – 01/06/12). Invited lecture: *Some facets of multi-parameter ergodic theory*.

Research visit, Department of Mathematics, University of Washington, Seattle, USA (21/08/12 – 26/08/12 and 01/09/12 – 05/09/2012).

Department of Mathematics, University of British Columbia, Vancouver, Canada (26/08/12 – 01/09/12). Invited lecture: *Sandpiles and the Harmonic Model*.

Visiting Professorship, Department of Mathematics, Penn State University, State College, USA (05/09/12 – 02/10/12). Seminar lecture: *Sandpiles and the Harmonic Model*. A series of 4 two-hour lectures on Algebraic  $\mathbb{Z}^d$ -actions with positive entropy.

University at Buffalo, New York, USA (19/09/12 – 22/09/12). Colloquium lecture: *Sandpiles and the Harmonic Model*.

Research visit, Department of Mathematics, ETH Zürich (19/01/13 – 22/01/13).

Workshop ‘Probability and Numbers’, Delft University, Holland (31/03/13 – 04/04/13). Invited lecture: *Principal algebraic group actions*.

Research visit, Department of Mathematics, University of Leiden, Holland (04/04/13 – 07/04/13).

Rencontre entre physiciens théoriciens et mathématiciens: Dynamical systems and statistical physics, Université de Strasbourg, France (30/05/13 – 01/06/13). Invited lecture: *Algebraic  $\mathbb{Z}^d$ -actions and their homoclinic points*.

PIMS Workshop on Automata Theory and Symbolic Dynamics, University of British Columbia, Vancouver, Canada (03/06/13 – 08/06/13). Invited lecture: *Symbolic covers of toral automorphisms*.

University of Washington, Seattle, Washington, USA (21/07/13 – 02/08/13). Workshop on ‘Dynamical Systems of Algebraic Origin’ (30/07/13 – 02/08/13). Invited lecture: *Algebraic  $\mathbb{Z}^d$ -actions*.

Workshop on Dynamical Systems and Related Topics, Pennsylvania State University, State College, USA (16/10/13 – 21/10/13). Invited lecture: *Expansiveness of higher rank algebraic actions*.

Fundação para a Ciência e Tecnologia, Lisbon, Portugal (19/11/13 – 23/11/13): Panel meeting.

Research visit, Department of Mathematics, University of Leiden, Holland (15/12/13 – 18/12/13).

Research Programme ‘Random Walks and Asymptotic Geometry of Groups’, Institut Henri Poincaré, Paris, France (26/01/14 – 22/02/14). Conference ‘Random Walks on Groups’, IHP (27/01/14 – 31/01/14). Invited lecture: *Homoclinic points of algebraic group actions and their connection with random walks*.  
Université Paris 6, Seminar lecture: *Entropy and periodic points of algebraic  $\mathbb{Z}^d$ -actions*.

Department of Mathematics, Hebrew University of Jerusalem, Jerusalem, Israel (07/04/14 – 09/04/14). Conference on ‘Probability, Ergodic Theory, Dynamical Systems’, Department of Mathematics, Tel Aviv University, Tel Aviv, Israel (09/04/14 – 11/04/14). Invited lecture: *Entropy and growth rate of periodic points of algebraic  $\mathbb{Z}^d$ -actions*.

Conference on Ergodic Theory and Dynamical Systems, Toruń, Poland (12/05/14 – 16/05/14). Invited lecture: *Ergodicity of principal algebraic group actions*.

Conference on ‘Representations, Dynamics, Combinatorics’, Euler Institute, St. Petersburg, Russia (09/06/14 – 13/06/14). Invited lecture: *Algebraic actions of countable discrete groups and their entropies*.

Workshop on ‘Recent Progress in Dynamical Systems and Related Topics’, BIRS, Banff, Canada (10/08/14 – 15/08/14): Joint Organizer.

Workshop on ‘The Pisot Conjecture’, Lorentz Center, University of Leiden, Holland (01/09/14 – 05/09/14). Invited lectures: *Symbolic representations of toral automorphisms* (2 lectures).

Mathematics Department, University of Leiden, Holland (06/09/14 – 08/09/14).

Fakultät für Mathematik, Universität Jena, Germany (19/01/15). Colloquium lecture: *A glimpse of multi-parameter ergodic theory*.

Workshop on ‘Algebraic, Number Theoretic and Graph Theoretic Aspects of Dynamical Systems’, UNSW, Sydney, Australia (02/02/15 – 06/02/15). Invited lecture: *Sandpiles and Harmonic Systems*.

Department of Mathematics, University of Wollongong, NSW, Australia (09/02/15 – 12/02/15).

Conference on Ergodic theorems and applications in probability, Eilat, Israel (03/05/2015 – 08/08/2015). Invited lecture: *Permutations of the integers with bounded movement*.

Department of Mathematics, University of Leiden, Holland (29/06/15 – 01/07/15): Invited lecture: *Permutations of the integers with bounded movement*.

Department of Mathematics, Chongqing University, Chongqing, China (04/07/15 – 12/07/15). Invited lecture: *A glimpse of multiparameter ergodic theory*.

Conference on subfactor theory in mathematics and physics, Qinguangdao, China (13/07/15 – 17/07/15). Invited lecture: *Algebraic actions of discrete groups*.

Department of Mathematics, Fudan University, Shanghai, China (19/07/15 – 25/07/15). Invited lecture: *Sandpiles and harmonic systems*.

Euler Institute, St. Petersburg, Russia (30/08/15 – 04/09/15). Organizer of conference on ‘Dynamics, Combinatorics, Representations’.

Conference on ‘Ergodic Theory, Fractals and Groups’, IIAS, Jerusalem, and Mathematics Department, Hebrew University, Jerusalem, Israel (10/10/15 – 22/10/15). Invited Lecture: *Entropy, Lyapunov exponents and determinants for algebraic actions of the discrete Heisenberg group*.

Penn State October Workshop and Brin Prize Session, Penn State University, State College, USA (23/10/15 – 28/10/15). Invited lecture: *Entropy and Lyapunov exponents for algebraic actions of the discrete Heisenberg group*.

Conference on ‘Ergodic Theory of Dynamical Systems’, Bedlewo, Poland (23/11/15 – 28/11/15). Invited lecture: *Permutations of  $\mathbb{Z}^d$  with restricted movement*.

Programme on ‘Dynamical Systems’, Simons Semester in Banach Center, Warsaw, Poland (28/11/15 – 04/12/15). Invited lecture: *Algebraic Actions of the Discrete Heisenberg Group*.

Research visit to the Mathematics Department, Leiden University, Holland (16/04/16 – 23/04/16).

Conference on ‘Groups, Dynamics, and Operator Algebras’, Queen Mary University of London (18/07/16 – 22/07/16). Invited lecture: *Homoclinic points of algebraic group actions*.

Conference on ‘Ergodic Theory and its Connections with Arithmetic and Combinatorics’, CIRM, Marseille (12/12/16 – 16/12/16). Invited lecture: *Nonmixing sets of algebraic  $\mathbb{Z}^d$ -actions*.

Conference on ‘Groups, Probability, Dynamics’, S.B.A.I. Dept, La Sapienza, Roma (22/02/17 – 25/02/17). Invited lecture: *Periodic and homoclinic points of algebraic  $\mathbb{Z}^d$ -actions*.

Center for Dynamical Systems, Pennsylvania State University, State College, USA (25/03/17 – 28/03/17): Invited lecture: *Periodic and Homoclinic Points of Algebraic  $\mathbb{Z}^d$ -Actions*. Dynamics Colloquium Lecture: *Periodic and Homoclinic Points of Algebraic  $\mathbb{Z}^d$ -Actions*.

Yeshiva University, New York, USA (28/03/17 – 04/04/17). NYC Dynamics Seminar at Yeshiva University: *Algebraic Actions of the Discrete Heisenberg Group*.

Research visit to the Mathematics Department, University of Washington, Seattle, Washington, USA (05/08/17 – 19/08/17).

Geometry, dynamics and physics: 100th Encounter between Mathematicians and Theoretical Physicists, IRMA, Strasbourg, France (07/09/17 – 09/09/17). Invited lecture: *Entropy and periodic points for algebraic group actions*.

Colloquium on Diophantine Analysis, Technical University Graz, Austria (18/10/17 – 20/10/17). Invited lecture: *Entropy and periodic points for algebraic group actions*.

Conference on ‘Entropies and Soficity’, Université Lyon 1, France (15/01/18 – 19/01/18). Invited lecture: *Entropy and periodic points of algebraic actions of discrete groups*.

## PUBLICATIONS

### MONOGRAPHS AND LECTURE NOTES

- [1] *Positive definite kernels, continuous tensor products, and central limit theorems in probability theory* (with K. R. Parthasarathy). Lecture Notes in Mathematics, Vol. 272, Springer Verlag 1972.
- [2] *Cocycles of ergodic transformation groups*. Lecture Notes in Mathematics, Vol. 1, MacMillan (India) 1977. Available from <http://www.mat.univie.ac.at/~kschmidt/Publications/rigveda.pdf>
- [3] *Algebraic Ideas in Ergodic Theory*. CBMS Lecture Notes, Vol. 76, Amer. Math. Soc. 1990.
- [4] *Dynamical systems of algebraic origin*. Progress in Mathematics, Vol. 128, Birkhäuser Verlag 1995.
- [5] *Algebraic  $\mathbb{Z}^d$ -actions*. Pacific Institute for the Mathematical Sciences Distinguished Chair Lecture Notes, University of Victoria, BC, November 2002. 60 pp. Electronic publication: <http://www.pims.math.ca/publications/distchair/schmidtnotes.pdf>
- [6] *Dynamische Systeme – Ergodentheorie und Topologische Dynamik* (with M. Einsiedler). Mathematik Kompakt, Birkhäuser Verlag, Basel, 2014. viii+159 pp.

### EDITED CONFERENCE PROCEEDINGS

- [7] *Ergodic Theory of  $\mathbb{Z}^d$ -actions: Proceedings of the Warwick Symposium 1993/94* (joint editor with M. Pollicott). London Mathematical Society Lecture Notes, Vol. 228, Cambridge University Press 1996.
- [8] *Random Walks and Geometry: Proceedings of a Workshop at the Erwin Schrödinger Institute, June 18 – July 13, 2001* (joint editor with Vadim Kaimanovich (Principal Editor) and Wolfgang Woess). De Gruyter, Berlin-New York, 2004.
- [9] *Diophantine Approximation: Festschrift for Wolfgang Schmidt* (joint editor with Hans Peter Schlickewei (Principal Editor) and Robert Tichy). Springer Verlag, Wien-New York, 2008.

### PUBLISHED PAPERS

- [10] Über einen Zusammenhang zwischen gleichverteilten Punkt- und Maßfolgen. *J. reine angew. Math.* **244** (1970), 94–96.
- [11] Über Quadraturformeln auf  $\mathbf{T}^\omega$  (with P. Zinterhof). *Computing* **6** (1970), 94–96.
- [12] Eine Diskrepanz für Maßfolgen auf kompakten Gruppen. *Z. Wahrscheinlichkeitstheorie verw. Geb.* **17** (1971), 48–52.
- [13] Über die  $C$ -Gleichverteilung von Maßen. *Z. Wahrscheinlichkeitstheorie verw. Geb.* **17** (1971), 327–332.
- [14] Limits of uniformly infinitesimal families of projective representations of locally compact groups. *Math. Ann.* **192** (1971), 107–118.
- [15] On a characterisation of certain infinitely divisible positive definite functions and measures. *J. London Math. Soc.* **4** (1972), 401–407.
- [16] Factorizable representations of current groups and the Araki-Woods embedding theorem (with K.R. Parthasarathy). *Acta Mathematica* **128** (1972), 53–71.
- [17] Algebras with quasi-local structure and factorizable representations. In: *Mathematics of Contemporary Physics*, ed. R.F. Streater, Academic Press 1972, pp. 237–251.
- [18] A class of infinitely divisible positive definite functions on topological groups. *Z. Wahrscheinlichkeitstheorie verw. Geb.* **25** (1973), 97–102.
- [19] Stable positive definite functions (with K.R. Parthasarathy). *Trans. Amer. Math. Soc.* **203** (1975), 161–174.
- [20] Stable probability measures on  $\mathbf{R}^\nu$ . *Z. Wahrscheinlichkeitstheorie verw. Geb.* **33** (1975), 19–31.
- [21] A note on cocycles of unitary representations (with W. Parry). *Proc. Amer. Math. Soc.* **55** (1976), 185–190.

- [22] A new method for constructing factorizable representations of current groups and current algebras (with K.R. Parthasarathy). *Comm. Math. Phys.* **50** (1976), 167–175.
- [23] Infinite invariant measures on the circle. *Symposia Mathematica* **XXI** (1977), 37–43.
- [24] On the cohomology of a hyperfinite action (with K.R. Parthasarathy). *Mh. Math.* **84** (1977), 37–48.
- [25] A probabilistic proof of ergodic decomposition. *Sankhya (A)* **40** (1978), 10–18.
- [26] A cylinder flow arising from irregularity of distribution. *Compositio math.* **36** (1978), 225–232.
- [27] A class of probability measures on groups arising from some problems in ergodic theory (with V. Losert). In: *Lecture Notes in Mathematics*, Vol. 706, Springer Verlag 1979, pp. 220–238.
- [28] Unique ergodicity for quasi-invariant measures. *Math. Z.* **167** (1979), 168–172.
- [29] Unique ergodicity and related problems. In: *Lecture Notes in Mathematics*, Vol. 729, Springer Verlag 1979, pp. 188–198.
- [30] Coboundaries and homomorphisms for nonsingular actions and a problem by H. Helson (with C.C. Moore). *Proc. London Math. Soc.* **40** (1980), 443–475.
- [31] On periodic expansions of Pisot numbers and Salem numbers. *Bull. London Math. Soc.* **12** (1980), 269–278.
- [32] Asymptotically invariant sequences and an action of  $SL(2, \mathbb{Z})$  on the 2-sphere. *Israel J. Math.* **37** (1980), 193–208.
- [33] On the existence and uniqueness of the maximum likelihood estimate of a vector valued parameter in fixed size samples (with T. Mäkeläinen and G.P.H. Styan). *Ann. Math. Stat.* **9** (1981), 758–767.
- [34] Amenability, Kazhdan’s property  $T$ , strong ergodicity and invariant means for ergodic group actions. *Ergod. Th. & Dynam. Sys.* **1** (1981), 223–236.
- [35] Spectra of ergodic group actions. *Israel J. Math.* **41** (1982), 151–153.
- [36] Two applications of a theorem by Glimm and Effros in Ergodic Theory. In: *Ergodic Theory and Related Topics*, ed. H. Michel, Akademie Verlag 1982, pp. 173–180.
- [37] On  $C^\infty$ -diffeomorphisms of the circle which are of type  $III_1$  (with J. Hawkins). *Inventiones math.* **66** (1982), 511–518.
- [38] Mildly mixing actions of locally compact groups (with P. Walters). *Proc. London Math. Soc.* **45** (1983), 506–518.
- [39] Invariants of finitary isomorphisms with finite expected code lengths (with W. Parry). In: *Conference in Modern Analysis and Probability*, *Contemp. Math.* **26** (1984), 301–308.
- [40] Asymptotic properties of unitary representations and mixing. *Proc. London Math. Soc.* **48** (1984), 445–460.
- [41] Natural coefficients and invariants for Markov shifts (with W. Parry). *Inventiones math.* **76** (1984), 15–32.
- [42] Invariants for isomorphisms with finite expected code lengths. *Inventiones math.* **76** (1984), 33–40.
- [43] On recurrence. *Z. Wahrscheinlichkeitstheorie verw. Geb.* **68** (1984), 75–95.
- [44] Coding of Markov shifts. In: *Lecture Notes in Mathematics*, Vol. 1132, Springer Verlag 1985, pp. 497–508.
- [45] Cohomology and the absence of strong ergodicity for ergodic group actions. In: *Lecture Notes in Mathematics*, Vol 1132, Springer Verlag 1985, pp. 486–496.
- [46] An information cocycle for groups of nonsingular transformations (with R. Butler). *Z. Wahrscheinlichkeitstheorie verw. Geb.* **69** (1985), 347–360.
- [47]  $C^*$ -algebras associated with Denjoy homeomorphisms of the circle (with I. Putnam and C. Skau). *J. Operator Theory* **16** (1986), 99–126.
- [48] Hyperbolic structure preserving isomorphisms of Markov shifts. *Israel J. Math.* **55** (1986) 213–228.
- [49] Asymptotically invariant sequences and approximate finiteness (with V.F.R. Jones). *Amer. J. Math.* **109** (1987), 91–114.

- [50] Some solved and unsolved problems concerning orbit equivalence of countable group actions. In: Ergodic Theory and Related Topics II, ed. H. Michel, Teubner Verlag 1987, pp. 171–184.
- [51] Hyperbolic structure preserving isomorphisms of Markov shifts. II. *Israel J. Math.* **58** (1987), 225–242.
- [52] Strong ergodicity and quotients of equivalence relations. *Proc. Centre Math. Anal., A.N.U., Canberra*, **16** (1988), 300–311.
- [53] Periodic points, decidability and Markov subgroups (with B. Kitchens). In: Lecture Notes in Mathematics, Vol. 1342, Springer Verlag 1988, pp. 440–454.
- [54] Mixing automorphisms of compact groups and a theorem by Kurt Mahler. *Pacific J. Math.* **137** (1989), 371–385.
- [55] Automorphisms of compact groups (with B. Kitchens). *Ergod. Th. & Dynam. Sys.* **9** (1990), 691–735.
- [56] Automorphisms of compact abelian groups and affine varieties. *Proc. London Math. Soc.* **61** (1990), 480–496.
- [57] Mahler measure and entropy for automorphisms of compact groups (with D.A. Lind and T. Ward). *Inventiones math.* **101** (1990), 593–629.
- [58] Markov subgroups of  $\mathbb{Z}_{/2}^{\mathbb{Z}^2}$  (with B. Kitchens). *Contemp. Math.* **135** (1992), 265–283.
- [59] Mixing automorphisms of compact groups and a theorem of Schlickewei (with T. Ward). *Inventiones math.* **111** (1993), 69–76.
- [60] Mixing sets and relative entropies for higher dimensional Markov shifts (with B. Kitchens). *Ergod. Th. & Dynam. Sys.* **13** (1993), 705–735.
- [61] Bernoullicity of solenoidal automorphisms and global fields (with D. Lind). *Israel J. Math.* **87** (1994), 33–35.
- [62] The cohomology of expansive  $\mathbb{Z}^d$ -actions by automorphisms of compact abelian groups (with A. Katok). *Pacific J. Math.* **170** (1995), 105–142.
- [63] The cohomology of higher-dimensional shifts of finite type. *Pacific J. Math.* **170** (1995), 237–270.
- [64] Invariant measures for certain expansive  $\mathbb{Z}^2$ -actions. *Israel J. Math.* **90** (1995), 295–300.
- [65] Associated actions and uniqueness of cocycles (with J. Aaronson and T. Hamachi). In: Algorithms, Fractals and Dynamics, ed. Y. Takahashi, Plenum Publishing Company, New York 1996, 1–25.
- [66] Cohomological rigidity of algebraic  $\mathbb{Z}^d$ -actions. *Ergod. Th. & Dynam. Sys.* **15** (1995), 759–805.
- [67] Almost block independence and Bernoullicity of  $\mathbb{Z}^d$ -actions by automorphisms of compact groups (with D. Rudolph). *Inventiones math.* **120** (1995), 455–488.
- [68] From infinitely divisible representations to cohomological rigidity. In: Analysis, Geometry and Probability, ed. R. Bhatia and A.G. Bhatt, Hindustan Book House, Delhi 1996, pp. 173–197.
- [69] Extensions of cocycles for hyperfinite actions and applications (with P. Gabriel and M. Lemańczyk). *Mh. Math.* **123** (1997), 209–228.
- [70] Symmetric Gibbs measures (with K. Petersen). *Trans. Amer. Math. Soc.* **349** (1997), 2775–2811.
- [71] Invariant cocycles, random tilings and the super- $K$  and strong Markov properties. *Trans. Amer. Math. Soc.* **349** (1997), 2812–2825.
- [72] Markov partitions and homoclinic points of algebraic  $\mathbb{Z}^d$ -actions (with M. Einsiedler). *Proc. Steklov Inst. Math.* **216** (1997), 259–279.
- [73] On the cohomology of algebraic  $\mathbb{Z}^d$ -actions with values in compact Lie groups. In: Lie Groups and Ergodic Theory (Proceed. of Internat. Colloq. at the Tata Institute, Mumbai 1996), ed. S.G. Dani, Narosa Publishing House, New Delhi, 1998, 203–228.
- [74] Tilings, fundamental cocycles and fundamental groups of symbolic  $\mathbb{Z}^d$ -actions. *Ergod. Th. & Dynam. Sys.* **18** (1998), 1473–1525.
- [75] On joint recurrence, *C. R. Acad. Sci. Paris Sér. I Math.* **327** (1998), 837–842.

- [76] Remarks on Livšic' theory for nonabelian cocycles. *Ergod. Th. & Dynam. Sys.* **19** (1999), 703–721.
- [77] Homoclinic points of algebraic  $\mathbb{Z}^d$ -actions (with D. Lind). *J. Amer. Math. Soc.* **12** (1999), 953–980.
- [78] Tail-fields of products of random variables and ergodic equivalence relations. *Ergod. Th. & Dynam. Sys.* **19** (1999), 1325–1341.
- [79] Common homoclinic points of commuting toral automorphisms (with A. Manning), *Israel J. Math.* **114** (1999), 289–299.
- [80] Algebraic coding of expansive group automorphisms and two-sided beta-shifts. *Mh. Math.* **129** (2000), 37–61.
- [81] Ergodic decomposition of quasi-invariant probability measures (with G. Greschonig). *Coll. Math.* **84/85** (2000), 495–514.
- [82] Isomorphism rigidity of irreducible algebraic  $\mathbb{Z}^d$ -actions (with B. Kitchens). *Inventiones math.* **142** (2000), 559–577.
- [83] Multi-dimensional symbolic dynamical systems. In: Codes, Systems and Graphical Models, ed. B. Marcus and J. Rosenthal, IMA Volumes in Mathematics and its Applications, vol. 123, 2001, 67–82.
- [84] The dynamics of algebraic  $\mathbb{Z}^d$ -actions. In: European Congress of Mathematics (Barcelona 2000), Vol. I, ed. C. Casacuberta, R.M. Miró-Roig, J. Verdera and S. Xambó-Descamps, Progress in Mathematics, vol. 201, Birkhäuser Verlag, Basel-Berlin-Boston, 2001, 543–553.
- [85] Measurable rigidity of algebraic  $\mathbb{Z}^d$ -actions. In: Smooth Ergodic Theory and its Applications, Proceedings of Symposia in Pure Mathematics, vol. 69, American Mathematical Society, Providence, R.I., 2001, 661–676.
- [86] Symbolic and algebraic dynamical systems (with D. Lind). In: Handbook of Dynamical Systems, ed. B. Hasselblatt and A. Katok, vol. 1A, North Holland, Amsterdam, 2002, 765–812.
- [87] Invariant cocycles have abelian ranges (with G. Greschonig). *Mh. Math.* **134** (2002), 207–216.
- [88] The adjoint action of an expansive algebraic  $\mathbb{Z}^d$ -action (with M. Einsiedler). *Mh. Math.* **135** (2002), 203–220.
- [89] Irreducibility, homoclinic points and adjoint actions of algebraic  $\mathbb{Z}^d$ -actions of rank one (with M. Einsiedler). In: Nonlinear Phenomena and Complex Systems, ed. A. Maass, S. Martinez and J. San Martin, Kluwer Academic Publishers, Dordrecht, 2002, 95–124.
- [90] Dispersing cocycles and mixing flows under functions. *Fund. Math.* **173** (2002), 191–199.
- [91] Rigidity of measurable structure for algebraic actions of higher-rank abelian groups (with A. Katok and S. Katok). *Comment. Math. Helv.* **77** (2002), 718–745.
- [92] Affinely infinitely divisible distributions and the embedding problem (with S.G. Dani). *Math. Res. Lett.* **9** (2002), 607–620; Correction, **12** (2005), 817–820.
- [93] Growth and recurrence of stationary random walks (with G. Greschonig). *Probab. Theor. Relat. Fields* **125** (2003), 266–270.
- [94] Homoclinic points and isomorphism rigidity of algebraic  $\mathbb{Z}^d$ -actions on zero-dimensional compact abelian groups (with S. Bhattacharya). *Israel J. Math.* **137** (2003), 189–209.
- [95] Algebraic  $\mathbb{Z}^d$ -actions on zero-dimensional compact abelian groups. In: Modern Dynamical Systems and Applications, ed. M. Brin, B. Hasselblatt and Ya. Pesin, Cambridge University Press, Cambridge, 2004, 185–209.
- [96] Invariant measures of nonexpansive group automorphisms (with E. Lindenstrauss). *Israel J. Math.* **144** (2004), 29–60.
- [97] Algebra, arithmetic and multi-parameter ergodic theory. *Internat. Math. Nachr.* **200** (2005), 1–21.
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