

# CURRICULUM VITAE AND PUBLICATIONS

## PART 1

| 1a. Personal details         |   |                   |                       |                    |
|------------------------------|---|-------------------|-----------------------|--------------------|
| <b>Full name</b>             | <i>Title</i>  | <i>First name</i> | <i>Second name(s)</i> | <i>Family name</i> |
|                              | Prof.   | Sergej            |                       | Flach              |
| <b>Present position</b>      | Professor   |                   |                       |                    |
| <b>Organisation/Employer</b> | Massey University   |                   |                       |                    |
| <b>Contact Address</b>       | Private Bag 102904, North Shore   |                   |                       |                    |
|                              | North Shore City, Auckland  |                   |                       |                    |
|                              |   |                   | <b>Post code</b>      | 0745               |
| <b>Work telephone</b>        | 094140800 ext 41528   | <b>Mobile</b>     | 0211 936 456          |                    |
| <b>Email</b>                 | s.flach@massey.ac.nz  |                   |                       |                    |
| <b>Personal website</b>      | <a href="http://www.massey.ac.nz/~sflach">http://www.massey.ac.nz/~sflach</a> |                   |                       |                    |

## 1b. Academic qualifications

1998, Habilitation, Theoretical Physics, Technische Universität Dresden, Germany  
 1989, Promotion (similar to PhD), Theoretical Physics, Technische Universität Dresden  
 1986, Diplom (similar to Master), Physics, Technische Universität Dresden

## 1c. Professional positions held

2012 (since) Professor, Massey University  
 1997-2012, Head Visitors Program, Max-Planck-Institut für Physik Komplexer Systeme  
 1997-1997, Habilitand, Deutsche Forschungsgemeinschaft, MIPPKS Dresden  
 1994-1997, Research Associate, Max-Planck-Institut für Physik Komplexer Systeme  
 1992-1994, Postdoktorand, Deutsche Forschungsgemeinschaft, Boston University  
 1991-1991, Sonderstipendiat, Alexander von Humboldt Stiftung, Technische Universität München  
 1988-1992, Research Assistant, Technische Universität Dresden

## 1d. Present research/professional speciality

Nonlinear quantum and classical waves in complex systems  
 Nonlinear waves in localizing media – classical and quantum  
 Fano resonances in nanoscale structures  
 Flat bands with disorder, topological insulators  
 Exciton-polariton BEC dynamics  
 Transport properties of strongly driven classical and quantum systems far from equilibrium  
 Cryptography with nonlinear waves at criticality  
 Dynamics of supercooled liquids  
 Numerical methods for the analysis of dynamical correlated systems  
 Mode localization in classical and quantum finite systems  
 Applications to dynamics of Josephson junction networks  
 Applications to light propagation in structured media  
 Applications to dynamics of ultracold atomic gases in optical potentials

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|--|----------|
| <b>1e. Total years research experience</b> | 28 years |
|--|----------|

## 1f. Professional distinctions and memberships (including honours, prizes,

**scholarships, boards or governance roles, etc)**

- 2013, coordinator of workshop on Nonlinear Dynamics at the Nanoscae, Pohang  
 2013, coordinator of workshop on Nonequilibrium Bosons: From Driven Condensates to Nonlinear Optics, Trieste  
 2010, coordinator of workshop Anderson Localization, Nonlinearity and Turbulence, Trieste  
 2009, editor of book Nonlinearities in Periodic Structures and Metamaterials, Springer  
 2009, coordinator of workshop and symposium Anderson Localization in Nonlinear and Many Body Systems, Dresden  
 2009-2011, editorial board member of Physical Review E  
 2007, coordinator of workshop Nonlinear Physics in Periodic Structures and Metamaterials, Dresden  
 2006, coordinator of workshop Nonlinear Dynamics of Acoustic Modes in Finite Lattices: Localization, Equipartition, Transport, Dresden  
 2006, coordinator of symposium Intrinsic Localized Modes in Condensed Matter, Dresden  
 2005, member of advisory board of The Encyclopedia of Nonlinear Science  
 2004, coordinator of CECAM workshop Energy Localization: From Small Polyatomic Molecules to Large Biomolecules, Lyon  
 2003, editor of focus issue Nonlinear Localized Modes and Applications, Chaos 13  
 2002, Stefanos Pnevmatikos Award for Nonlinear Science, for contributions in the theory of discrete breathers with applications to localized modes in atomic and molecular crystals and to coupled arrays of Josephson junctions  
 2001, coordinator of workshop Nonlinear Lattice Structure and Dynamics, Dresden  
 1998, guest editor of focus issue Localization in Nonlinear Lattices, Physica D 119  
 1997, Habilitationsstipendium, Deutsche Forschungsgemeinschaft  
 1997, coordinator workshop Localization in Nonlinear Lattices, Dresden  
 1992, Postdoktorandenstipendium, Deutsche Forschungsgemeinschaft  
 1991, Sonderstipendium, Alexander von Humboldt Stiftung  
 1989, Prize of Joint Institute for Nuclear Research Dubna (Russia) for the work on anharmonic models of high-temperature superconductors, together with V.L. Aksenov, N.N. Bogoliubov, S.L. Drechsler and N.M. Plakida  
 1989 (since) member of the Deutsche Physikalische Gesellschaft

| <b>1g. Total number of peer reviewed publications and patents</b> | Journal articles | Books, book chapters, books edited | Conference proceedings | Patents |
|---|------------------|------------------------------------|------------------------|---------|
|   | 148              | 7                                  |                        |         |

## PART 2

### 2a. Research publications and dissemination

#### Peer-reviewed journal articles

- [0] I. V. Barashenkov, G. S. Jackson, **S. Flach**, Blow-up regimes in the PT-symmetric coupler and the actively coupled dimer, *Phys. Rev. A* 88, 053817 (2013)
- [1] Charalampos Skokos, Ioannis Gkolas, **Sergej Flach** *Nonequilibrium chaos of disordered nonlinear waves*, *Phys. Rev. Lett.* 111, 064101 (2013)
- [2] Kristian Rayanov, Guenter Radons, **Sergej Flach** *Decohering localized waves*, *Phys. Rev. E* 88, 012901 (2013)
- [3] T. V. Lapyteva, J. D. Bodyfelt, **Sergej Flach**, *Do nonlinear waves in random media follow nonlinear diffusion equations?* *Physica D* 256-257, 1 (2013)
- [4] Goran Gligoric, Kristian Rayanov, **Sergej Flach** *Make Slow Fast – how to speed up interacting disordered matter* *EPL* 101, 10011 (2013)
- [5] Marco Larcher, Tetyana V. Lapyteva, Joshua D. Bodyfelt, Franco Dalfovo, Michele Modugno, **Sergej Flach** *Subdiffusion of nonlinear waves in quasiperiodic potentials* *New J Phys*, 14, 103036 (2012)
- [6] T. V. Lapyteva, J. D. Bodyfelt, **S. Flach** *Universal subdiffusion of nonlinear waves in two dimensions with disorder* *EPL* 98, 60002 (2012)
- [7] M. V. Ivanchenko, R. Khomeriki, **S. Flach** *Correlated metallic two particle bound states in quasiperiodic chains* *EPL* 98, 66002 (2012)
- [8] Jean-Pierre Nguenang, Ramaz Khomeriki, **Sergej Flach** *Resonant invisibility with finite range interacting fermions* *Phys. Lett. A* 376, 472 (2012)
- [9] G. Gligoric, J.D. Bodyfelt, **S. Flach** *Interactions destroy dynamical localization with strong and weak chaos* *EPL* 96, 30004 (2011)
- [10] M. V. Ivanchenko. T. V. Lapyteva and **S. Flach** *Anderson localization or nonlinear waves? A matter of probability* *Phys. Rev. Lett.* 107, 240602 (2011)
- [11] Antonio Poino, Helen Christodoulidi, Charalampos Skokos, **Sergej Flach** *The two-stage dynamics in the Fermi-Pasta-Ulam problem: from regular to diffusive behavior.* *Chaos* 21, 043127 (2011)
- [12] Dmitry O. Krimer, Ramaz Khomeriki, **Sergej Flach** *Two interacting particles in a random potential* . *JETP Letters* 94, 406 (2011)
- [13] J.D. Bodyfelt, T.V. Lapyteva, Ch. Skokos, D.O. Krimer, **S. Flach** *Nonlinear waves in disordered chains: probing the limits of chaos and spreading* . *Phys. Rev. E* 84, 016205 (2011)
- [14] J.D. Bodyfelt, T.V. Lapyteva, G. Gligoric, D.O. Krimer, Ch. Skokos, **S. Flach** *Wave interactions in localizing media - a coin with many faces* . *Int. J. Bif. Chaos* 21 , 2107 (2011)
- [15] **S. Flach**, M. V. Ivanchenko and N. Li *Thermal conductivity of nonlinear waves in disordered chains* . *PRAMANA J. Phys.* 77, 1007 (2011)
- [16] M. V. Ivanchenko and **S. Flach** *Disorder-induced mobility edges and heat flow control in anharmonic acoustic chains.* *EPL* 94, 46004 (2011)
- [17] **S. Flach** *Wave propagation in nonlinear disordered media* . *Phys. Part. Nucl.* 41, 1020 (2010)
- [18] D.O. Krimer, **S. Flach** *Statistics of wave interactions in nonlinear disordered systems* . *Phys. Rev. E* 82, 046221 (2010)
- [19] T.V. Lapyteva, J.D. Bodyfelt, D.O. Krimer, Ch. Skokos, **S. Flach** *The crossover from strong to weak chaos for nonlinear waves in disordered systems* . *EPL* 91, 30001 (2010)
- [20] Ramaz Khomeriki, Dmitry O. Krimer, Masudul Haque, **Sergej Flach** *Interaction induced fractional Bloch and tunneling oscillations* *Phys. Rev. A* 81, 065601 (2010)

- [21] Ch. Skokos and **S. Flach** *Spreading of wave packets in disordered systems with tunable nonlinearity*. Phys. Rev. E 82, 016208 (2010)
- [22] **S. Flach**, *Spreading of waves in nonlinear disordered media*. Chem. Phys. 375, 548 (2010)
- [23] A. E. Miroshnichenko, **S. Flach** and Yu. S. Kivshar, *Fano resonances in nanoscale structures*, Rev. Mod. Phys. 82, 2257 (2010)
- [24] J.-P. Nguenang and **S. Flach**, *Fermionic bound states on a one-dimensional lattice*, Phys. Rev. A 80, 015601 (2009)
- [25] D. O. Krimer, R. Khomeriki and **S. Flach**, *Delocalization and spreading in a nonlinear Stark ladder*, Phys. Rev. E 80, 036201 (2009)
- [26] R. A. Pinto, M. Haque and **S. Flach**, *Edge-localized states in quantum one-dimensional lattices*, Phys. Rev. A 79, 052118 (2009)
- [27] Ch. Skokos, D. O. Krimer, S. Komineas and **S. Flach**, *Delocalization of wave packets in disordered nonlinear chains*, Phys. Rev. E 79, 056211 (2009).
- [28] **S. Flach**, D. Krimer and Ch. Skokos, *Universal spreading of wavepackets in disordered nonlinear systems*, Phys. Rev. Lett. 102, 024101/209903 (2009)
- [29] R. A. Vicencio and **S. Flach**, *Control of wavepacket spreading in nonlinear finite disordered lattices*, Phys. Rev. E. 79, 016217 (2009)
- [30] R. A. Pinto, J. P. Nguenang and **S. Flach**, *Boundary effects on quantum q-breathers in a Bose-Hubbard chain*, Physica D 238, 581 (2009)
- [31] L. Morales-Molina, **S. Flach** and J. B. Gong, *Quantum ratchet control - harvesting on Landau-Zener transitions*, EPL 83, 40005 (2008)
- [32] M. I. Tribelsky, **S. Flach**, A. E. Miroshnichenko, A. Gorbach and Yu. Kivshar, *Fano resonances at light scattering by an obstacle*, Phys. Rev. Lett. 100, 043903 (2008)
- [33] G. Kopidakis, S. Komineas, **S. Flach** and S. Aubry, *Absence of Wavepacket Diffusion in Disordered Nonlinear Systems*, Phys. Rev. Lett. 100, 084103 (2008)
- [34] **S. Flach** and A. Gorbach, *Discrete Breathers: Advances in Theory and Applications*, Physics Reports 467, 1-116 (2008)
- [35] K. G. Mishagin, **S. Flach**, O. I. Kanakov and M. V. Ivanchenko, *q-breathers in Discrete Nonlinear Schroedinger lattices*, New J. Phys. 10, 073034 (2008)
- [36] R. Pinto and **S. Flach**, *Quantum breathers in capacitively coupled Josephson junctions: Correlations, number conservation, and entanglement*, Phys. Rev. B 77, 024308 (2008)
- [37] L. Morales-Molina and **S. Flach**, *Resonant ratcheting of a Bose- Einstein condensate*, New J. Phys. 10, 013008 (2008)
- [38] Joachim Brand, **Sergej Flach**, Victor Fleurov, L. S. Schulmann, and Denis Tolkunov, *Localization by entanglement*, EPL 83, 40002 (2008)
- [39] **S. Flach** and A. Ponomarev, *The Fermi-Pasta-Ulam problem: periodic orbits, normal forms and resonance overlap criteria*, Physica D 237, 908 (2008)
- [40] S. Denisov, L. Morales-Molina, **S. Flach** and P. Haenggi, *Periodically driven Quantum Ratchets: Symmetries and Resonances*, Phys. Rev. A 75, 063424 (2007)
- [41] R. A. Pinto and **S. Flach**, *Quantum localized modes in capacitively coupled Josephson-junction qubits*, Europhys. Lett. 79, 66002 (2007)
- [42] J. P. Nguenang, R. A. Pinto and **S. Flach**, *Quantum q-breathers in a finite Bose-Hubbard chain: the case of two interacting bosons*, Phys. Rev. B 75, 214303 (2007)
- [43] R. A. Vicencio, J. Brand and **S. Flach**, *Fano blockade by a Bose- Einstein condensate in an optical lattice*, Phys. Rev. Lett. 98, 184102 (2007)
- [44] S. Denisov, L. Morales-Molina, and **S. Flach**, *Quantum resonances and rectification of driven cold atoms in optical lattices*, Europhys. Lett. 79, 10007 (2007)
- [45] **S. Flach**, O. I. Kanakov, M. V. Ivanchenko and K. G. Mishagin, *q-breathers in FPU lattices - scaling and properties for large systems*, Int. J. Mod. Phys. B 21, 3925 (2007)

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| <p>[46] O. I. Kanakov, <b>S. Flach</b>, M. V. Ivanchenko and K. G. Mishagin, <i>Scaling properties of q-breathers in nonlinear acoustic lattices</i>, Phys. Lett. A 365, 416 (2007)</p> <p>[47] M.V.Ivanchenko, O.I.Kanakov, K.G.Mishagin and <b>S. Flach</b>. <i>Qbreathers in finite two- and three-dimensional nonlinear acoustic lattices</i>, Phys. Rev. Lett. 97, 025505 (2006)</p> <p>[48] <b>S. Flach</b>, M.V.Ivanchenko and O.I.Kanakov, <i>q-Breathers in Fermi-Pasta-Ulam chains: existence, localization and stability</i>, Phys. Rev. E 73, 036618 (2006)</p> <p>[49] R. A. Pinto and <b>S. Flach</b>, <i>Quantum dynamics of localized excitations in a symmetric trimer molecule</i>, Phys. Rev. A 73 (2006) 022717</p> <p>[50] <b>S. Flach</b>, M. V. Ivanchenko and O. I. Kanakov, <i>q-Breathers and the Fermi-Pasta-Ulam Problem</i>, Phys. Rev. Lett. 95, 064102 (2005).</p> <p>[51] <b>S. Flach</b>, V. Fleurov and A. Gorbach. <i>Classical and quantum radiation of perturbed discrete breathers</i>. Phys. Rev. B 71 (2005) 064302</p> <p>[52] D. K. Campbell, <b>S. Flach</b> and Yu. S. Kivshar. <i>Localizing Energy Through Nonlinearity and Discreteness</i>. Physics Today, January Issue, 43-49 (2004)</p> <p>[53] M. E. Torio, K. Hallberg, <b>S. Flach</b>, A. E. Miroshnichenko and M. Titov. <i>Spin filters with Fano dots</i>. Eur. J. Phys. B 37, 399 (2004)</p> <p>[54] <b>S. Flach</b> and S. Denisov. <i>Symmetries and transport with quasiperiodic driving</i>. Acta Phys. Pol. B 35, 1437 (2004)</p> |
| Peer reviewed books, book chapters, books edited  |
| <p>[1] Ricardo A. Pinto, <b>Sergej Flach</b>, <i>Quantum discrete breathers</i>. in: Dynamical Tunneling Theory and Experiment, pp. 339- 382, ed. by S. Keshavamurthy and P. Schlagheck, Taylor and Francis, New York, <b>2011</b></p> <p>[2] C. Denz, <b>S. Flach</b> and Yu. S. Kivshar (Eds), <i>Nonlinearities in periodic structures and metamaterials</i>, Springer Series in Optical Sciences 150, Springer, Berlin (<b>2009</b>)</p> <p>[3] S. Denisov, <b>S. Flach</b> and P. Haenggi, <i>Transporting cold atoms in optical lattices with ratchets: symmetries and mechanisms</i>, in: Nonlinearities in periodic structures and metamaterials, C. Denz et al (Eds), pp. 181-194, Springer Series in Optical Sciences 150, Springer Berlin (<b>2009</b>)</p>  |
| Refereed conference proceedings   |
|   |
| Patents   |
|   |
| Other forms of dissemination (reports for clients, technical reports, popular press, etc)   |
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