## CV: Raphael (Rafi) Blumenfeld June 2024

- Nationality: UK, Israel
- Address: Gonville & Caius College, Cambridge University, Trinity St., Cambridge CB2 1TA, UK
- Email: rbb11@cam.ac.uk
- Homepage: http://rafi.blumenfeld.co.uk
- Google Scholar citations

#### Education

- 1989 Ph.D., Physics Tel Aviv University Random systems - Nonlinear conductivity and distributions Supervisors: Profs. Amnon Aharony and David J. Bergman, Summa cum Laude.
- 1986 M.Sc., Physics Tel Aviv University Nonlinear random resistor networks, topological problems and fluctuations Supervisor: Prof. Amnon Aharony, **Summa cum Laude**.
- 1984 B.Sc., Physics Tel Aviv University **Distinction** (equivalent to a UK high First).
- 1973 B.Tech. Diploma, Practical Mechanical Engineering Ort Technikum Givatayim, Israel.

## Languages

- English: Speaking excellent; Reading excellent; Writing excellent
- Hebrew: Speaking excellent; Reading excellent; Writing excellent
- Romanian: Speaking excellent; Reading excellent; Writing satisfactory
- Chinese: Sufficient for communication with waiters in restaurants

#### Appointments

- 2024 Senior Research Fellow, Imperial College London (52% FTE)
- 2020-2023 Senior Research Fellow, Imperial College London (52% FTE)
- 2019- Distinguished Visiting Professor, CSU, Hunan, China
- 2014-2017 Distinguished Visiting Professor, National University of Defense Technology, Changsha, Hunan, China
- 2013-present Editor, Granular Matter Journal, Springer
- 2010-12 Senior Visiting Fellow, Inst. of Shock Physics, Imperial College London, UK
- 2009-present College Lecturer, Gonville and Caius College, Cambridge, UK
- 2005-present Research Fellow, Earth Science and Engineering, Imperial College London, UK
- 1997-present Long-Term visitor, Cavendish Laboratory, Cambridge University, UK
- 2000-01 Research Associate, Physics Dept., University of Warwick, UK
- 1997-8 Project Leader, Mesoscale group, R & D, Molecular Simulations Inc., Cambridge, UK
- 1996-7 Research Scientist, Cambridge Hydrodynamics Inc (led by Prof S.A. Orszag), Princeton, NJ, USA

- 1993-6 Director's Fellow, Los Alamos National Laboratory, NM, USA
- 1992-3 Research Associate, Princeton University, NJ, USA
- 1989-92 Research Associate, Cavendish Laboratory, Cambridge University, UK
- 1987 Visiting Research Scientist, IBM (with Prof B. B. Mandelbrot), Yorktown Heights, USA

#### Honours / Awards / Grants

- 2024 6-month grant (CoI), Shell Brunei
- 2020-2023 3-year grant (CoI), Shell Brunei
- 2019- Awarded "High Level Foreign Talent", China government
- 2018 JSPS BRIDGE Fellowship BR180304
- 2016 4-year BP-ICAM grant
- 2015 Awardee of the "1000-Talent Plan", China government
- 2014- Distinguished Visiting Professor, NUDT, Hunan, China
- 2013-2016 Alan Howard PhD Student Scholarship
- 2012 Bye-Fellowship, Gonville and Caius College, Cambridge, UK
- 2011 Nuffield Undergraduate Research Bursary URB/39915
- 2010-2014 EPSRC Grant EP/H051716/1
- 2010 Visiting Grant, Tsukuba University, Japan
- 2008-11 Alan Howard phd Student Scholarship
- 2008-9 EOARD Grant 083046
- 2008 StatoilHydro Grant
- 2007-12 Member of the Room, Gonville and Caius College, Cambridge, UK
- 2005-8 EPSRC Grant GR/T28959/01
- 1993-6 Director's Fellowship, Los Alamos National Laboratory
- 1990-2 Leo Baeck Lodge Award
- 1989 Weiler Foundation Scholarship Award
- 1985, 1988-9 Distinction Award, Tel Aviv University
- 1982-8 Scholarship, Tel Aviv University

#### Organisation / Professional Activities

- 2024 Session Chair at the conference on Ergodicity in Physical Systems and Beyond, Lincoln, UK, July 8 10
- 2024 Organiser, International conference, 8th Edwards Symposium- Statistical Physics of Soft and Multicomponent Systems, Cambridge, UK Sept. 11-13
- 2023 Organiser, International conference, 7th Edwards Symposium- New Paradigms in Soft Matter and Statistical Physics, Cambridge, UK Sept. 13-15
- 2022 Organiser, International conference, 6th Edwards Symposium- Soft Matter in the 21st Century, Cambridge, UK Sept. 7-9

- 2021 Organiser, International conference, 5th Edwards Symposium- Emerging Trends in Soft Matter, Cambridge, UK Sept. 8-10
- 2021 Session Chair, Statistical Physics of Complex Systems, Warwick University, UK, June 23-24
- 2019 Organiser, International conference, 4th Edwards Symposium- Emerging Trends in Soft Matter, Cambridge, UK Sept. 4-6
- 2018 Session Chair at the 3rd Edwards Symposium New Horizons in Soft Matter, Cambridge, UK, Sept. 5 7
- 2018 Organiser, International conference, 3rd Edwards Symposium: Challenges and Opportunities in Soft Matter, Cambridge, UK, Sept. 5 7
- 2018 6 lectures in the Summer School on Soft Matter and Biophysics, Jiao Tong University, Shanghai, China, July 1 - 5
- 2018 Session Chair at the APS March Meeting, Los Angeles, USA, March 5 9
- 2018 Focus Session organiser at the APS March Meeting, Los Angeles, USA, March 5 9
- 2017 Session Chair, From Supercooled Liquids to Glasses: Current Challenges for Amorphous Materials, Kavli Inst., Beijing, China, August 7 - 18
- 2017 Organiser, International conference, 2nd Edwards Symposium Challenges and Opportunities in Soft Matter, Cambridge, UK, September 6 - 8
- 2017 Organiser, The 2nd International Granular Flow Workshop, Guiyang, China, August 21 24
- 2017 Session Chair, The 10th International Conference on Soft Matter and Biophysics, Xiamen, China, March 25 28
- 2016 Member, core team of The Edwards Centre for Soft Matter, Cambridge University
- 2016 Session Chair and Moderator, BP-ICAM Annual Conference 2016, Manchester, UK, October 31 November 2
- 2016 Session Chair, 3rd International Conference on Packing Problems, Jiao Tong University, Shanghai, China, August 29 September 1
- 2016 Member of the American Physical Society
- 2016 Organiser, International conference, Soft Matter Theoretical and Industrial Challenges, Celebrating the Pioneering Work of Sir Sam Edwards, Cambridge, UK, September 7 9
- 2015 Member of the Granular Materials Committee, Engineering Mechanics Institute
- 2015 Organiser, International Workshop on Soft and granular matter in ambient and extreme conditions 2015, Changsha, Hunan, China, 31 August - 4 September
- 2015 Session Chair, Beijing Soft Matter Workshop, Beijing, China, 17 April
- 2015 Sole organiser, Workshop on Computational methods in flow dynamics and granular science, Changsha, Hunan, China, 14 April
- 2014 Organiser, International Workshop on *Soft and granular matter in ambient and extreme conditions*, Changsha, Hunan, China, 15-18 September
- 2014 Conference Scientific Committee member, International Symposium on Energy Challenges and Mechanics, Aberdeen, UK, 10-14 July
- 2012 Session Chair, in 8th European Solid Mechanics Conference, Graz, Austria, 9-13 July
- 2011 Session Chair, in Workshop: Complexity in the Oil Industry, Natal, Brazil, 14-18 November
- 2008 Session Chair and Discussion Leader, Structure and Packing in Gordon Conference on Granular and Granular-Fluid Flow, Waterville, Maine, US, 22-26 July

- 2007 Session Chair, Reservoir Simulation in Universities Forum on Reservoir Description and Simulation (UFORDS), Scarborough, UK, 2-6 September
- 2007 Organiser and chairman, Workshop on Fractures, Complexity in the Oil Industry, Natal, Brasil, 5-9 August
- 2007 Discussion leader on *Slow dynamics of granular materials and modelling quasi-statics*, in Workshop on **Jamming**, Aspen Center for Physics, Aspen, CO, USA, 20 June 3 August
- 2007 Discussion leader on *Stress transmission and isostaticity theory*, in Workshop on **Jamming**, Aspen Center for Physics, Aspen, CO, USA, 20 June 3 August
- 2004-6 Organiser and Chairman, Working Group on Dimensional Reduction in many-variable systems, EU COST action P10 Physics of Risk
- 2004 Programme Committee, SPIE conference *Fluctuation and Noise, FaN2004*, Maspalomas, Gran Canaria, Spain, 25-28 May
- 2003 Chairman, *Statics and Dynamics of Systems of Rigid Particles*, Isaac Newton Institute, Cambridge, UK 10 December
- 2003 Organising Committee, SPIE conference Fluctuation and Noise, FaN2003, Santa Fe, NM, USA, 1-4 June
- 1999-2001 Specialist Subject Reviewer, Quality Assurance Agency (QAA) for Higher Education, UK
- 2000 Organising Committee Member, MESOMECHANICS2000, China
- 1995 Organiser and Chairman, Workshop on Fractal Analysis and Modelling of Materials, Los Alamos National Laboratory, USA
- 1994-6 Organiser and Chairman, Working Group on Protein Dynamics, CNLS, Los Alamos National Laboratory, USA

## Students

- 1990-92, 1999-present Supervision / tutorials: Parts IB (2nd year), II (3rd year), and III (MSci) Physics students, Cambridge University.
- 1995 Yi Jiang, Los Alamos National Laboratory, PhD (summer student) 1. Growth of planar Laplacian surfaces; 2. Parameter flow in coarse-graining of disordered systems.
- 1994-5 Rudolph Held, Los Alamos National Laboratory, MSc (summer student) Characterization of, and flow in, porous media.
- 2007 Arutchelvi Harichandran, Imperial College London, Part III (MSc) Distribution of heights on top of a granular pack.
- 2007 Ian Hewett, Cavendish Laboratory, Part II A Study of Gas Permeation Through Granular Beds.
- 2007 Michael Peyton-Jones, Cavendish Laboratory, Sixth Form summer student Quantitative analysis of contact forces in a two-dimensional poly-distributed particle bed using photoelastic methods.
- 2007 Golnaz Alipour, Stanford University, US, PhD Analysis and numerical simulations of stress propagation in granular materials (joint advisor with Prof. M. Gerritsen)
- 2008 Joe Jordan, Cavendish Laboratory, Part III (MSci) Statistics of force chain networks in granular systems.
- 2008 Anna Timoshina, Cavendish Laboratory, Part III (MSci) Statistics of force chain networks in granular systems skeletonisation.
- 2008 Hannah Davies, Cavendish Laboratory, Part III (MSci) Shaken not Stirred: conductivity of shaken graphite particles.
- 2008 Phil Tooke, Cavendish Laboratory, Part III (MSci) Structural analysis of deposited particles in two dimensions.

- 2009 Lauri Toikka, Cavendish Laboratory, Part III (MSci) The famous particle packing problem.
- 2009-13 Rebecca Hihinashvili, Imperial College London, PhD Morphological characterisation of porous materials for fuel cell technology.
- 2010 Zilvinas Rimas, Cavendish Laboratory, Part II (summer student) Characterisation of force chain networks.
- 2010 Christopher Revell, Cavendish Laboratory, Part II (summer student) Characterisation of packing of ellipses.
- 2010 Imbert Wang, Cavendish Laboratory, Part II (summer student) Coarse-graining the fabric tensor of the Isostaticity stress field equations.
- 2010-4 Joseph F.P. Jordan, Imperial College London, PhD Computing entropy and ordering of granular materials: From description to prediction.
- 2010 Finn Grimwood, Cavendish Laboratory, Part III (MSci) Gravitational Flow of a DaVinci Fluid.
- 2010 Harry R. Kennard, Cavendish Laboratory, Part III (MSci) The famous packing problem ellipses.
- 2010 Simon Nathan, Cavendish Laboratory, Part III (MSci) Couette Flow of a da Vinci Fluid.
- 2011 William Handley, Cavendish Laboratory, Part III (summer student) Stress equations in isostatic and granular systems: hyperbolic or elliptic?
- 2011 Yipei Guo, Cavendish Laboratory, Part III (MSc) Oscillatory shear flow of da Vinci fluids.
- 2011 Harrison Steggles, Cavendish Laboratory, Part III (MSci) Dynamics of planar fractures in disordered media.
- 2011 Julian Ma, Cavendish Laboratory, Part III (MSci) Stress transmission in disc-like granular systems.
- 2011 Christopher Revell, Cavendish Laboratory, Part III (MSci) Shear flow of da Vinci fluids.
- 2012-5 Christopher Revell, Cavendish Laboratory, PhD Stem cell sorting in mammalian embryos as a self-organising physical process.
- 2012 Giovanni Camisasca, Cavendish Laboratory, Part III (MSci) Loop forces and mechanical equilibrium of 2D granular structures.
- 2012 Andrew Gibbons, Cavendish Laboratory, Part III (MSci) Development of a systematic method to describe shapes of 3D objects.
- 2013 Alan Bowman, Cavendish Laboratory, Part III (MSci) Ribbon dynamics in 3D.
- 2013 Reuven Shirazi, Cavendish Laboratory, Part III (MSci) The Calderon problem in random resistor networks.
- 2013 Marise Westbroek, Cavendish Laboratory, Part III (MSci) Dynamics of director fields in 2D.
- 2013-6 Shahar Amitai, Imperial College London, PhD Predictive model for the design of porous media with application to fuel cells.
- 2014 Louis Bortolozzo, Cavendish Laboratory, Part III (MSci) Development of a continuous stress field theory for 3D isostatic systems.
- 2014 Ling Huang (Walter), Physics Dept., NUDT, Hunan, China (MSc) Dynamics and effects of penetrators into granular materials
- 2015 Zheng-Yu Yong, Physics Dept., NUDT, Hunan, China (MSc) Structural evolution of granular materials
- 2016 Nikoletta Prastiti, Imperial College London, Part II (summer student) Fractures in weakly consolidated media stress and the process zone
- 2016 David A. King, Cavendish Laboratory, (MSci) Toward an effective medium stress theory of stato-elastic media

- 2017 Ping Liu, Physics Dept., NUDT, Hunan, China (PhD) Active objects in granular materials
- 2017 Do V. A. Nguyen, Cavendish Laboratory, (summer project) Understanding plastic deformation in particulate system
- 2017 David A. King, Cavendish Laboratory, (PhD) Statistical Mechanics for Dynamics of Slow and Dense Particulate Media
- 2018 Daniel L. Duffy, Cavendish Laboratory, Part III (MSci) Relating proximity to the jamming critical point and isostatic regions in particulate media
- 2018 Yuliang Wang, Cavendish Laboratory, Part III (MSci) Strain-driven hardening of fibrous networks
- 2018 Clara Wanjura, Cavendish Laboratory, (MSc) The structural evolution of granular matter
- 2019 Daniel Owens, Cavendish Laboratory, Part III (MSci) Statistics of stress distribution in loosely aggregated asteroids
- 2019 Jens Havgaard Nyhegn, Cavendish Laboratory, Part III (MSci) Stress spirals and focusing in isostatic granular discs
- 2020 Sulaimaan Lim, Cavendish Laboratory, Part III (MSci) A theoretical model for E.Coli survival strategy in the gut
- 2020 James M. Bird, Cavendish Laboratory, Part III (MSci) Statistical mechanics of social situations: optimising high table conversations
- 2022 Alex D. C. Myhill, Cavendish Laboratory, Part III (MSci) Structural dynamics of 2D superfluid granular systems
- 2023 Demosthenes Georgiou, Cavendish Laboratory, Part III (MSci) A search for the densest random packing of the bi-disperse disks in d=2: a numerical investigation

#### Courses taught

- 2019, 2020 Graduate course: "Complex Analysis and Calculus of Variations", Physics Dept., Imperial College London, UK
- 2014, 2015, 2016 Graduate course: "Statistical Mechanics of Granular Media", Physics Dept., NUDT, China

## Publications

## Summary

- Over 110 papers in primary peer reviewed journals
- 28 contributions to Symposia and compiled volumes (Google Scholar: Raphael Blumenfeld: Google Scholar citations)

## I. Peer-reviewed papers

- 119. Clara C. Wanjura, Amelie Mayländer, Othmar Marti, Raphael Blumenfeld, Detailed balance in non-equilibrium dynamics of granular matter: derivation and implications (2024) https://arxiv.org/abs/2404.05059
- 118. Chenyang Huang, Yang Yu, Peter R. King, Bin Cheng, Raphael Blumenfeld, Structure-dependent fragmentation risk of rubble-pile asteroids on low-impacts, Phys. Rev. Lett. xx, submitted (2024) https://arxiv.org/abs/2306.10581
- 117. Raphael Blumenfeld, Granular solids transmit stress as two-phase composites, Phys. Rev. E 109, 014901 (2024) https://arxiv.org/abs/2306.10581
- 116. Paula A. Gago, Marcos A. Madrid, Stefan Boettcher, Raphael Blumenfeld, Peter King, <u>Effect of bevelled silo outlet in the flow rate during discharge</u>, to appear in Powder Technology 428, 118842 (2023); https://doi.org/10.1016/j.powtec.2023.118842
- 115. Alex D. C. Myhill, Raphael Blumenfeld, Steady states of two-dimensional granular systems are unique, stable, and sometimes satisfy detailed balance, Journal of Physics A: Mathematical and Theoretical 56, 345001 (2023) https://iopscience.iop.org/article/10.1088/1751-8121/ace56d, https://arxiv.org/abs/2306.10526
- 114. Xiaoyu Jiang, Raphael Blumenfeld, Takashi Matsushima, Coordinated Stress-Structure Self-Organization in Granular Packing, submitted xxx, xxx (2022); http://arxiv.org/abs/2208.06582
- 113. XiaolingWang, Raphael Blumenfeld, Xi-QiaoFeng, David A.Weitz, Phase transitions in bacteria – From structural transitions in free living bacteria to phenotypic transitions in bacteria within biofilms, Physics of Life Reviews 43, 98-138 (2022); DOI: 10.1016/j.plrev.2022.09.004
- 112. R. Blumenfeld,

Comment on "Explicit analytical solution for random close packing in d=2 and d=3", PRL 128, 028002 (2022), http://arxiv.org/abs/2201.10550 (2022)

- 111. R. Blumenfeld, Sub-anomalous diffusion and unusual velocity distribution evolution in cooling granular gases: theory, http://arxiv.org/abs/2111.06260
- 110. X. Sun, Yinqiao Wang, Yujie Wang, R. Blumenfeld, J. Zhang, *Experimental evidence of detailed balance in granular systems*, submitted **xxx**, xxx (2021); https://arxiv.org/abs/2105.01355
- 109. R. Blumenfeld,

Erratum: Disorder Criterion and Explicit Solution for the Disc Random Packing Problem, Phys. Rev. Lett. **127**, 259901 (2021)

- 108. R. Blumenfeld,
  - Disorder Criterion and Explicit Solution for the Disc Random Packing Problem, Phys. Rev. Lett. **127**, 118002 (2021); http://arxiv.org/abs/2106.11774
- 107. T. Matsushima, R. Blumenfeld, Statistical properties of cell stresses in 2D granular solids, EPJ Web Conf., 249, 02006 (2021).
- 106. X. Jiang, T. Matsushima, R. Blumenfeld, Structural characteristics of ordered clusters in packs of ellipses, EPJ Web Conf., 249, 06004 (2021).
- 105. P. Liu, X. Ran, Q. Cheng, W. Tang, J. Zhou, R. Blumenfeld, Locomotion of Self-Excited Vibrating and Rotating Objects in Granular Environments, Appl. Sci. 11, 2054 (2021)
- 104. J. He, R. Blumenfeld, H. Zhu, Mechanical Behaviors of Sandy Sediments Bearing Pore-Filling Methane Hydrate under Different Intermediate Principal Stress, Int. J. Geomech., 21(5), 04021043 (2021)
- 103. X. Sun, W. Kob, R. Blumenfeld, H. Tong, Y. Wang, J. Zhang, *Friction-controlled entropy-stability competition in granular systems*, Phys. Rev. Lett. **125**, 268005 (2020); http://arxiv.org/abs/2007.14145
- 102. P. Liu, X. Ran, R. Blumenfeld, Sink-rise dynamics of horizontally oscillating active matter in granular media: Theory, Phys. Rev. Lett., submitted (2020); https://arxiv.org/abs/2006.04160
- 101. C.C. Wanjura, P.A. Gago, T. Matsushima, R. Blumenfeld, Structural Evolution of Granular Systems: Theory, Granular Matter 22, 91 (2020); http://arxiv.org/abs/1904.06549
- 100. R. Blumenfeld, The unusual problem of upscaling isostaticity theory for granular matter, Granular Matter 22, 38 (2020).
- 99. Y-J. Feng, R. Blumenfeld and C. Liu, Support of Modified Archimedes' Law Theory in Granular Media, Soft Matter 15, 3008 (2019)
- 98. C. Revell, R. Blumenfeld and K. J. Chalut, Force-based three-dimensional model predicts mechanical drivers of cell sorting, Proc. Roy. Soc. B 286, 20182495 (2019); (http://royalsocietypublishing.org/doi/10.1098/rspb.2018.2495).
- 97. M. Schwartz and R. Blumenfeld, Stress Tensor for Dense Granular Flow in Plug-Free Regions, Phys. Rev. E 98, 042905 (2018); http://arxiv.org/abs/1608.01708
- 96. C. M. Verstreken, K. J. Chalut and R. Blumenfeld, Equally probable positive and negative Poisson's ratios in disordered planar systems, Soft Matter 14, 6554 - 6560 (2018)
- 95. W. Kang, Y. Feng, C. Liu and R. Blumenfeld, Archimedes' law explains penetration of solids into granular media, Nature Comm. 9,1101 (2018)
- 94. Cheng Qi, Ran Xian-Wen, Liu Ping, Tang Wen-Hui and R. Blumenfeld, Numerical simulation of a spinning sphere moving in granular matter, Acta Physica Sinica 67, 014702 (2018). 10.7498/aps.66.014702
- 93. S. Amitai, A. Bertei and R. Blumenfeld, *Theory-based design of sintered granular composites triples three-phase boundary in fuel cells*, Phys. Rev. E 96, 052903 (2017); http://lanl.arxiv.org/abs/1706.05974

92. S. Amitai and R. Blumenfeld,

Affine and topological structural entropies in granular statistical mechanics: explicit calculations and equation of state, Phys. Rev. E 95, 052905 (2017); http://arxiv.org/pdf/1701.05860.pdf

- 91. R. Blumenfeld, S. Amitai, J.F. Jordan and R. Hihinashvili, Reply to comment on "On the failure of the volume function in granular statistical mechanics and an alternative formulation", Phys. Rev. Lett., 119, 039802 (2017)
- 90. R. Blumenfeld,

Statistical mechanics of dense granular fluids - contacts as quasi-particles, Phys. Rev. Lett., submitted (2016); http://arxiv.org/abs/1603.02015

- 89. T. Matsushima and R. Blumenfeld, Fundamental structural characteristics of planar granular assemblies: self-organisation and scaling away friction and initial state, Phys. Rev.E 95, 032905 (2017); http://arxiv.org/pdf/1207.2988.pdf
- 88. R. Blumenfeld and J. Ma, Bending back stress chains and unique behaviour of granular matter in cylindrical geometries, Gran. Matt. 19:29 (2017); http://arxiv.org/abs/1606.06484
- R. Blumenfeld, M.E.Cates and M. Warner, Report on International workshop: Soft Matter - Theoretical and Industrial Challenges, celebrating the pioneering work of Sir Sam Edwards, Applied Rheology, 27, 46 (2017)
- 86. S. Amitai and R. Blumenfeld, Modifying continuous-time random walks to model finite-size particle diffusion in granular porous media, J. Gran. Matt.19, 1-9 (2017); http://arxiv.org/pdf/1501.03998v2.pdf
- 85. L. Huang, X. Ran and R. Blumenfeld, Vertical dynamics of a horizontally-oscillating active object in a 2D granular medium, Phys. Rev. E 94, 062906 (2016); http://arxiv.org/abs/1609.01457
- 84. R. Blumenfeld, S. Amitai, J.F. Jordan and R. Hihinashvili, On the failure of the volume function in granular statistical mechanics and an alternative formulation, Phys. Rev. Lett., 116, 148001 (2016); http://arxiv.org/pdf/1507.03779v2.pdf
- 83. R. Blumenfeld, Structural evolution of granular systems: Theory, (2014) http://arxiv.org/pdf/1412.6933v1.pdf
- 82. R. Blumenfeld and S. F. Edwards, Granular statistical mechanics - a personal perspective, Euro. Phys. J. **223**, 2189-2204 (2014)
- 81. T. Matsushima and R. Blumenfeld, On universal structural characteristics of granular packs, Phys. Rev. Lett. 112, 098003 (2014); http://arxiv.org/pdf/1305.6093.pdf
- 80. R. Blumenfeld, J. F. Jordan and Sam F. Edwards, Inter-dependence of the volume and stress ensembles and equipartition in statistical mechanics of granular systems, Phys. Rev. Lett. 109, 238001 (2012); http://arxiv.org/pdf/1204.2977.pdf
- 79. R. Hihinashvili and R. Blumenfeld, Structural-entropic characteristics of dense planar granular systems, Granular Matter 14, 277-282 (2012)
- 78. R. Blumenfeld and Sam F. Edwards, *Theory of strains in auxetic materials*, J. Superconductivity and Novel Magnetism 25, 565-571 (2012); http://arxiv.org/abs/1111.6684)

- 77. M. Schwartz and R. Blumenfeld, Plug flow formation and growth in da Vinci Fluids, Granular Matter 13, 241-245 (2011)
- 76. R. Blumenfeld, M. Schwartz and S. F. Edwards, The flow equations and catch-up dynamics of da Vinci Fluids, Eur. Phys. J. E 32, 333-338 (2010)
- 75. G. Frenkel, R. Blumenfeld, P. King and M. Blunt, *Topological Analysis of Foams and Tetrahedral Structures*, Adv. Eng. Mat. **11**, 169-176 (2009)
- 74. R. Blumenfeld and S. F. Edwards, On granular stress statistics: compactivity, angoricity and some open issues, J. Phys. Chem. B 113, 3981 (2009)
- 73. M. Gerritsen, G. Kreiss, R. Blumenfeld, Analysis of stresses in two-dimensional isostatic granular systems, Physica A 387, 6263 (2008)
- 72. M. Gerritsen, G. Kreiss, R. Blumenfeld, Stress chain solutions in two-dimensional isostatic granular systems: fabric-dependent paths, leakage and branching, Phys. Rev. Lett. 101, 098001 (2008)
- 71. G. Frenkel, R. Blumenfeld, Z. Grof, P. R. King, *The structure and statistics of 2D granular systems*, Phys.Rev. E 77, 041304 (2008)
- 70. R. Blumenfeld and S. F. Edwards, Blumenfeld and Edwards Reply to Comment on "Granular Entropy: Explicit Calculations for Planar Assemblies", Phys. Rev. Lett., 99, 089402 (2007)
- R. Blumenfeld, Stresses in two-dimensional isostatic granular systems: Exact solutions, New Journal of Physics 9, 160 (2007)
- R. Blumenfeld, *Isostaticity and action at a distance in the cytoskeleton - A model awaiting experimental evidence*, Biophysical Journal, **91**, 1970 (2006)
- 67. R. Blumenfeld and S. F. Edwards, *Geometric partition functions of cellular systems: Explicit calculation of the entropy in two and three dimensions*, EuroPhys. J. E 19, 23 (2006)
- R. Blumenfeld, *Auxetic strains - insight from iso-auxetic materials*, Molecular Simulations **31**, 867 (2005)
- 65. R. Blumenfeld, S. F. Edwards and R. C. Ball, Granular matter and the marginal rigidity state, J. Phys.: Cond. Mat. 17, S2481 (2005); http://arxiv.org/abs/cond-mat/0105348
- 64. R. Blumenfeld, Stresses in isostatic granular systems and emergence of force chains, Phys. Rev. Lett., 93, 118301 (2004); http://arxiv.org/abs/cond-mat/0402556
- R. Blumenfeld, Stress in planar cellular solids: Coarse-graining the constitutive equation, Physica A 336, 361 (2004)
- R. C. Ball and R. Blumenfeld, *From Plasticity to a renormalisation group*, Phil. Trans. R. Soc. Lond. **361**, 731 (2003); http://arxiv.org/abs/cond-mat/0301562
- 61. T. J. Sluckin, A. J. Bray, T. McLeish, R. Blumenfeld, E. J. Hinch, R. Magerle, R. C. Ball, *Coarsening dynamics of phase-separating systems - discussion*, Phil. Trans. R. Soc. Lond. A. Mathematical, Physical and Engineering Sciences **361**, 791 (2003)
- 60. R. Blumenfeld and S. F. Edwards, Granular entropy: Explicit calculations for planar assemblies, Phys. Rev. Lett. 90, 114303 (2003); http://arxiv.org/abs/cond-mat/0303418

59. R. Blumenfeld,

Stress transmission in planar disordered solid foams, J. Phys. A: Math. Gen. **36**, 2399-2411 (2003); http://arxiv.org/abs/cond-mat/0210336

- 58. R. C. Ball and R. Blumenfeld, The stress field in granular systems: Loop forces and potential formulation, Phys. Rev. Lett. 88, 115505 (2002); http://arxiv.org/abs/cond-mat/0008127
- 57. R. Blumenfeld, Dynamics of twists on antiferromagnetic spin chains: Theory, Eur. Phys. J. B 29, 261 (2002)
- 56. R. Blumenfeld

Strange dynamics of domain walls and periodic stripes on antiferromagnetic chains, http://arxiv.org/abs/condmat/0108470 (2001)

- R. Blumenfeld and R. Balakrishnan Exact multi-twist solutions for the Belavin-Polyakov equation and application to magnetic systems, J. Phys. A 33, 2459 (2000)
- 54. R. Blumenfeld, Pulling a chain's leg: The pullout dynamics of entangled chain, Macromolecules, **32**, 1082 (2000)
- 53. R. Blumenfeld *Hierarchical structure of domain walls in magnetic layers*, Phase Transitions, **69**, 237 (1999)
- R. Blumenfeld
   Dynamics of fracture prpagation in the mesoscale: Theory, Theor. And Appl. Frac. Mech. 30, 209 (1998)
- 51. R. Balakrishnan and R. Blumenfeld, On the twist excitations in a classical anisotropic antiferromagnetic chain, Phys. Lett. A 237, 69 (1997)
- 50. A.E. Garcia, R. Blumenfeld, G. Hummer and J. A. Krumhansl, *Multi-Basin Dynamics of a Protein in a Crystal Environment*, Physica **D 107**, 225, (1997)
- R. Balakrishnan and R. Blumenfeld, *Transformation of general curve evolution to a modified Belavin-Polyakov equation*, J. Math. Phys. 38, 5878 (1997)
- R. Blumenfeld and Benoit B. Mandelbrot, <u>Mass fractal lacunarity, Lévy dusts, Mittag-Leffler statistics, and perceived dimension</u>, Phys. Rev. E 56, 112 (1997)
- 47. R. Blumenfeld, *Planar curve representation of many-body systems and dynamics*, Phys. Rev. Lett. **78**, 1203 (1997)
- 46. B. L. Holian, R. Blumenfeld and P. Gumbsch, An Einstein model of brittle crack propagation, Phys. Rev. Lett. **78**, 78 (1997)
- 45. R. Blumenfeld and D. J. Bergman,
   Strongly nonlinear composite dielectrics: a method for exact solution for the potential field and effective bulk properties - Addition, Phys. Rev. B 54, 9555 (1996)

# 44. R. Blumenfeld,

Nonequilibrium brittle fracture propagation: Steady state, oscillations and intermittency, Phys. Rev. Lett. 76, 3703 (1996)

- 43. R. Blumenfeld, Pattern formation in Laplacian growth: Theory, Center for Nonlinear Studies Newsletter 112, April (1995); http://arxiv.org/abs/cond-mat/9505116
- 42. R. Blumenfeld and R. C. Ball.

Two dimensional Laplacian growth as a system of creating and annihilating particles, Phys. Rev. E 51, 3434 (1995);

http://arxiv.org/abs/cond-mat/9401068

41. R. Blumenfeld,

Formulating a first-principles statistical theory of growing surfaces in two-dimensional Laplacian fields, Phys. Rev. E 50, 2952 (1994);

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#### II. Refereed contributions to symposia and compiled volumes

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- 25. T. Matsushima and R. Blumenfeld, Microstructural characteristics of planar granular solids, 7th International Conference on Micromechanics of Granular Media (Powders and Grains 2013), AMER INST PHYSICS, pp. 325-328 (2013)
- 24. R. Blumenfeld, J. F. Jordan and S. F. Edwards, Granular statistical mechanics: volume-stress phase space, equipartition and equations of state, 7th International Conference on Micromechanics of Granular Media (Powders and Grains 2013), AMER INST PHYSICS, pp. 1186-1189 (2013)
- R. Hihinashvili and R. Blumenfeld, Structural characterisation of porous and granular materials, in Proceedings of 16th European Symposium on Improved Oil Recovery 2011, Cambridge, UK.
- R. Hihinashvili and R. Blumenfeld, Structural characterisation of porous and granular materials, in XVIII International conference on water re-sources, CMWR 2010, J. Carrera (Ed), CIMNE, Barcelona (2010).
- 21. R. Blumenfeld,

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20. R. Blumenfeld,

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 G. Frenkel, R. Blumenfeld, P. R. King and M. Blunt, *Topological Analysis of Foams and Tetrahedral Structures*, in Proceedings of MetFoam 2007 - Conference on Porous Metals and Metallic Foams, Montreal, Canada 18. R. Blumenfeld and P. King,

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17. S. F. Edwards and R. Blumenfeld,

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16. R. Blumenfeld,

Stress transmission and isostatic states of non-rigid particulate systems, IMA Volumes in Mathematics and its Applications, Vol. 141:

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15. R. Blumenfeld,

Dynamics of twists on antiferromagnetic spin chains: Theory, International conference on geometry, nonlinearity, and integrability in condensed matter and soft condensed matter physics, Bansko, Bulgaria

14. R. Blumenfeld,

Dynamics of fracture propagation in the mesoscale: Theory MESOMECHANICS98, Tel Aviv, Israel

- A. E. Garcia, R. Blumenfeld, G. Hummer and J. Sobehart, Diffusion of a protein in configuration space in Proceedings of the 9th Conversation in Biomolecular Stereodynamics, Eds. R.H. Sarma and M.H. Sarma (Adenine Press, Schenectady, NY 1996)
- S. Zhou, R. Blumenfeld, B. Holian and P. S. Lomdahl, Study of fiber composite failure criterion in 1996 MRS Proceedings V409 Fracture-instability dynamics, scaling, and ductile/brittle behavior, Eds. R. L. Blumberg Selinger et al.
- R. Blumenfeld and Robin C. Ball, Characterization of fractal and hierarchical morphologies beyond the fractal dimension in 1995 MRS General Meeting, Boston, MA, USA
- 10. R. Blumenfeld,

A theory for growing interfaces in Laplacian fields: a many-body formulation and statistical analysis in 1994 MRS General Meeting, Boston, MA, USA

9. R. Blumenfeld,

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A morphological theory for Laplacian nonlinear growth processes via statistics of equivalent many-body systems in Nonlinear Evolution Equations and Dynamical Systems (NEEDS94), Eds. V.G. Makhankov, A.R. Bishop, and D.D. Holm (World Scientific, 1995)

7. R. Blumenfeld,

Towards a theory of growing surfaces: Mapping Laplacian growth onto Hamiltonian dynamics and statistics in Fluctuations and Order: The New Synthesis, Ed. M. M. Millonas (Springer-Verlag, 1995); cond-mat/9401069

6. R. Blumenfeld,

Novel flux solutions in nonlinear conducting continuum systems with negative dynamic resistance in Proceedings of the EPS-8 meeting "Trends in Physics", Ed. F. Pleiter (1990)

- R. Blumenfeld, N. Jan, G. Corsten and C. Liem, Evidence for vortex/antivortex mediated pairing of holes in doped La<sub>2-x</sub>Sr<sub>x</sub>CuO<sub>4</sub> and a possible mechanism for the holes movement in Proceedings of the EPS-8 meeting "Trends in Physics", Ed. F. Pleiter (1990)
- 4. R. C. Ball and R. Blumenfeld,

Universal scaling of the stress field generated by a two dimensional wedge crack and periodic self-similar corrections to scaling in Proceedings of the EPS-8 meeting "Trends in Physics", Ed. F. Pleiter (1990)

- 3. G. Corsten, C. Liem, R. Blumenfeld, N. Jan and C. Bowen, Vortex-antivortex pairing of holes in frustrated XY spin systems in Correlations and connectivity, Eds. H. E. Stanley and N. Ostrowsky (Kluwer Academic Publishers, Dordrecht, 1990) pp. 121-130
- R. Blumenfeld and R. C. Ball, Universally correlated scale-invariant side-branching in propagation of a two-dimensional cracking growth in Correlations and connectivity, Eds. H. E. Stanley and N. Ostrowsky (Kluwer Academic Publishers, Dordrecht, 1990) pp. 313-316
- R. Blumenfeld and A. Aharony, *Nolinear resistor fractal networks* in Scaling phenomena in disordered systems, Eds. R. Pynn and A Skjeltorp (Plenum, 1985)

## Invited presentations in conferences

- 2024 Conference on "Ergodicity in Physical Systems and Beyond", Lincoln, UK, July 8-10: Selforganisation and detailed balance in non-ergodic out-of-equilibrium dense granular matter
- 2023 2nd Conference on "Mechanical Systems Dynamics", Peking University, Beijing, China, September 1-5: Exact solution of the random close packing problem in d=2
- 2021 Conference on "Statistical Physics of Complex Systems", Warwick University, UK, June 23-24: Self-organisation of dense granular matter: non-equilibrium entropy and detailed balance
- 2020 Workshop on "Bridging Micro-Meso-Macroscopic Scales in Particulate and Biological Systems", Duke Kunshan University, Kunshan, China, December 17-20 (Keynote talk): Structural evolution of dense granular systems: Theory and non-equilibrium detailed balance
- 2020 Soft Matter Symposium on "Emerging Scales in Granular Media", Hong Kong University of Science and Technology, Hong Kong, January 14-16 (Keynote talk): Surprising detailed balance in far-fromequilibrium structural dynamics of dense granular fluids
- 2020 Edwards Centre Mini-conference, Cambridge, UK, January 10 (Keynote talk): Structural selforganisation of granular matter during slow flow
- 2019 4th International Granular Flow Workshop, Yangtze-River-Delta Physics Research Ctr., Liyang, Jiangsu, China, Sept. 15 17: Theory of structural evolution during quasi-static flow of dense granular matter
- 2019 4th International Conference on Packings, Yale University, CN, USA, June 3 7: Structural evolution of granular packs: Theory
- 2018 KITS / IoP / CECAM Workshop: "Entropy without the Hot Air", Beijing, China, August 5 7: Entropy-based contact statistical mechanics for particulates dynamics
- 2018 The 4th Asia-Pacific Regional Workshop for Complex Non-Equilibrium Systems, Shanghai, China, June 28 - 30: Contact statistical mechanics for particulates dynamics: Bridging between statics and dynamics
- 2018 APS March Meeting, Los Angeles, USA, March 5 9: Granular statistical mechanics: Bridging between statics and dynamics
- 2017 Outlook of Soft Matter Physics and Its Applications, Beijing, China, December 16-17: Granular statistical mechanics: Bridging between statics and dynamics
- 2017 The 2nd International Granular Flow Workshop, Guiyang, China, August 21 24: Granular statistical mechanics: different structural entropy sources, exact calculations, and the origin of N!
- 2017 From supercooled liquids to glasses: Current challenges for amorphous materials, Kavli Inst. of Theoretical Science, Beijing, August 7 18: *Entropy in disordered particulate systems*
- 2017 The 10th International Conference on Soft Matter and Biophysics, Xiamen, China, March 25 - 28: Self-organisation of structural characteristics in packing of granular materials in 2D and implications (opening talk)

- 2016 The 3rd International conference on Packing: across length scales, Shanghai, China, August 29 - September 1: Self-organisation of structural characteristics in packing of granular materials in 2D
- 2016 The 3rd International workshop on Soft and Granular Matter in Ambient and Extreme Conditions, Changsha, Hunan, China, August 22 25
- 2016 The American Physical Society March Meeting, Baltimore, MD, USA, March 14 18: Granular statistical mechanics Building on the legacy of Sir Sam Edwards
- 2016 Dynamic Days, Durham, NC, USA, January 7 10: Granular statistical mechanics
- 2015 The 2nd International Workshop on Soft and granular matter in ambient and extreme conditions 2015, Changsha, Hunan, China, 31 August 4 September: 1. Statistical mechanics of Granular matter I; 2. Statistical mechanics of Granular matter II
- 2015 The Annual Meeting of Thermodynamic and Statistical Mechanics Education and Research Association of China 2015, Changsha, Hunan, China, 12-15 July A three-lecture series: 1. Statistical mechanics of athermal systems; 2. Statistical mechanics of granular, porous and cellular materials; 3. Discussion: Necessary curriculum for physics undergraduates
- 2015 EMI 2015, Stanford, USA, 16-19 June: Two talks: 1. Structural evolution of 2D granular solid under shear deformation; 2. From local structural characterisation of porous materials to structure-property relations: a systematic approach
- 2015 Beijing Soft Matter Workshop, Beijing, China, 17 April A local morphological descriptor of granular materials and its uses
- 2014 Avalanches in Functional Materials and Geophysics, Cambridge, UK, 4-8 December Local structural characterisation and statistical mechanics of porous and cellular media
- 2014 International Workshop on Soft and granular matter in ambient and extreme conditions, Changsha, Hunan, China, 15-18 September 1. Stress transmission in dense granular materials; 2. Granular statistical mechanics
- 2014 International Symposium on Geomechanics from Micro to Macro, Cambridge, UK, 1-3 September Structural characterisation and understanding stress transmission in dense granular materials
- 2014 Dynamic Systems: From Statistical Mechanics to Engineering Applications, Zurich, Switzerland, 9-10 January Flow of dense granular fluids - a first-principle approach
- 2014 International Winter School and Symposium on Statistical Mechanics and Simulation of Nonlinear Dynamics, Changsha, China, 3-7 Jan A six-lecture series: 1. Stress transmission in granular packs: why do conventional theories fail; 2. Isostaticity theory as a baseline model for stress transmission in granular assemblies; 3. Extension of isostaticity theory for real granular matter: stato-elasticity theory; 4. Statistical mechanics of granular media: the Edwards formalism; 5. Statistical mechanics of granular media: (ii) the volume-stress ensemble; 6. Fracture propagation in heterogenous media: process zone statistics and rich dynamics
- 2013 Powders and Grains 2013 Conference, Sydney, Australia, 7-13 July Statistical Mechanical Characteristics of Dense Planar Granular Matter
- 2012 8th European Solid Mechanics Conference, Graz, Austria, 9-13 July Statistical Mechanical Characteristics of Dense Planar Granular Matter
- 2012 8th European Solid Mechanics Conference, Graz, Austria, 9-13 July Elementary Volumes Distribution and Cell Structural Stability in 2D Granular Assemblies
- 2012 Petroleum Engineering and Rock Mechanics (PERM) Affiliates Meeting, London, UK, 11 June A systematic programme for predicting fracture network characteristics
- 2011 Workshop: Complexity in the Oil Industry, Inst. of Physics, Natal, Brazil, 14-18 November From characterization of porous media to macroscale structure-property relations A systematic approach

- 2011 Workshop: Fluctuations and Response in Active Materials: From Driven Granular Systems to Swarming Bacteria, Lorentz Center, Leiden, The Netherlands, 20-24 June Driven dense granular matter as a da Vinci fluid
- 2011 Pore-Scale Modelling Consortium meeting, Imperial College London, London, UK, 11 January Failure and flow of granular matter: from yield rheology to da Vinci fluid
- 2010 Gordon Conference on Flow and Transport in Permeable Media, Lewiston, ME, USA 11-16 July: Systematic derivation of structure-property relations in porous and cellular materials
- 2010 Gordon Conference on Granular and Granular Flow , Waterville, ME, USA 20-25 June: Da Vinci fluid as a possible model for dense granular flow
- 2010 Mini-symposium on fractured reservoirs, Delft, Nethrelands 10 June: A model for dynamic fractures in inhomogeneous media
- 2010 **PERM Affiliates meeting**, Imperial College London, UK 7 June: Stress theory and fragility of granular matter
- 2010 Workshop Particulate Matter: Does Dimensionality Matter?, Dresden, Germany 30 May 4 June: Effects of dimensionality on statistical mechanics of granular matter
- 2010 Workshop on granular materials, Tsukuba, Japan 4 March: Continuum stress theory for large statically determinant structures and implications for granular materials
- 2009 IUTAM-ISIMM Symposium on Mathematical Modeling and Physical Instances of Granular Flows, Reggio Calabria, Italy, 14-18 Sept.: Stress transmission and yield flow of dense Granular materials
- 2009 Workshop on Statistical mechanics of static granular media, Lorentz centre, Leiden, 6-10 July: Plenary talk, Compactivity, Angoricity, and Open Issues in Granular Statistics
- 2009 Meeting of the PERM consortium, London, 22 June: Systematic characterization and analysis of pore space
- 2008 Workshop on Flow in Porous Media, Brasilia, Brazil, 18-24 Oct: Structural characteristics of porous media and systematic predictions of transport properties
- 2008 Conference on Granular Gases: Beyond the Dilute Limit, Thurnau, Germany, 7-12 Sept: Stress transmission in granular systems and incipient yield flow
- 2008 The BPI-Cavendish workshop, BPI Inst, Cambridge University, UK, Stresses in granular systems and yield flow
- 2008 Petroleum Engineering and Rock Mechanics (PERM) Affiliates Meeting on **Pore-scale modelling**, London, UK, 16 June: Microstructural characterization of porous media and systematic derivation of transport properties
- 2008 IOP Meeting on Condensed Matter and Materials Physics 2008, London, UK, 26-28 March: Granular matter as two-phase composites: Critical behaviour, stato-elasticity and new stress solutions
- 2008 Air Force Office for Scientific Research and Air Force Research Lab Meeting on **Particulate Mechanics** in Extreme Environments, Eglin Florida, USA, 29-31 January: *Effects of formation dynamics on structural characteristics of grain assemblies*
- 2007 Meeting of the Society for Natural Philosophy on **The Interface Between Atomistic and Continuum Theories**, Houston Texas, US, 26-28 October: Stress equations in statically determinate systems - a unique coarse-graining problem and solutions
- 2007 Universities Forum on Reservoir Description and Simulation (UFORDS), Scarborough, UK, 2-6 September: Process zone driven fracture propagation - a first-principles equation and rich dynamics
- 2007 Universities Forum on Reservoir Description and Simulation (UFORDS), Scarborough, UK, 2-6 September: Structural-entropic characterization of porous media and derivation of local permeability

- 2007 Conference on **Complexity in the Oil Industry**, Natal, Brasil, 5-9 August Process zone limited fracture propagation: a first-principles equation and rich dynamics
- 2007 Conference on **Complexity in the Oil Industry**, Natal, Brasil, 5-9 August Force chains in granular porous media: emergent self-organized networks and criticality
- 2007 StatPhys Satellite meeting on **Statics and Dynamics of Granular Media and Colloidal Suspensions**, Naples, Italy: *Entropic description of granular and cellular structures*
- 2007 Petroleum Engineering and Rock mechanics (PERM) Affiliates Meeting, Imperial College London: Structural - entropic characterization of porous media and systematic derivation of transport properties
- 2007 USAF Workshop on Particulate Mechanics in Extreme Environments, University of Florida, Florida, US 23-25 January: Isostaticity theory and modelling propagation of stresses in granular materials
- 2006 20th Canberra International Physics Summer School on Granular Matter, The Australian National University, Canberra, Australia: Structural-entropic characterization of porous media and systematic derivation of transport properties
- 2005 Summer School on **Econophysics and complexity**, Academy of Economics Studies, Bucharest, Romania: Rational modelling of multi-agent systems
- 2004 Summer School on Bridging between economists and physicists, Academy of Economics Studies, Bucharest, Romania: Dimensional reduction in economic systems
- 2004 IMA Workshop on Modeling of Soft Matter, Institute for Mathematics and its Applications (IMA), Minneapolis, US: Stress field equations in granular solids: A shift of paradigm
- 2004 IChemE meeting on the Behaviour of Structured Granular Materials Across Length Scales, Leeds, UK: Stresses and yield in granular materials
- 2004 Physics of Risk, Nyborg, Denmark: Econo-string theory: Representation of many-agent systems as planar strings,
- 2003 Flow Regimes, Transitions and Segregation in Granular and Particle-laden Flows, Cambridge, UK: (i) Granular piles and marginal rigidity; (ii) Stress transmission in granular systems.
- 2001 International conference on geometry, nonlinearity, and integrability in condensed matter and soft condensed matter physics, Bansko, Bulgaria: Domain wall dynamics on antiferromagnetic chains: Interactions, conservation laws and stable lattice solutions.
- 1998 The Polymer Consortium Annual Meeting, Cambridge, UK: Mesoscale polymer modeling: The fracture case study.
- 1997 77th Statistical Mechanics Conference, Rutgers Univ., USA: Why fractal patterns: A first-principles approach.
- 1997 Workshop on Nonlinear Phenomena in Transforming Solids, Penn State Univ., USA: *Hierarchical structure of domains in magnetic layers*.
- 1996 Workshop on Fracture, Friction and Deformation, Los Alamos, USA: Nonequilibrium fracture propagation: Steady-state, periodicity and intermittency.
- 1996 Workshop on Nonequilibrium Phase Transformations, Santa Fe, USA: Domain Wall Textures in 2D Ferromagnets.
- 1995 FRACTALS 95, Marseilles, France: A theory for the morphology of Laplacian growth via statistics of equivalent many-body systems.
- 1995 MRS Fall Meeting, Boston, USA: Review of analyses of fracture roughness.
- 1994 Gordon conference on Fractals, San Miniato, Italy: Formulaing a First-principles theory for stochastic Laplacian growth.

- 1994 Nonlinear Evolution Equations and Dynamical Systems (NEEDS94), Los Alamos, NM, USA: A morphological theory for Laplacian nonlinear growth processes via statistics of equivalent many-body systems.
- 1994 MRS General Meeting, Boston, USA: On a first-principles theory for growing interfaces in Laplacian fields: A many-body formulation and statistical analysis.
- 1993 Fractals in Natural Sciences, Budapest, Hungary: Quantifying morphology of scale-invariant structures beyond the fractal dimension.
- 1992 Forum in Compaction Forming Operations, Aston University, Birmingham, UK: Percolation as a model for disordered systems.
- 1990 NATO ASI Summer school on Propagation of Correlations in Constrained Systems, Institute d'Etudes Scientifiques de Cargese, Corsica, France: 1) Universally correlated scale-invariant side-branching in propagation of a two-dimensinal cracking growth; 2) Vortex-antivortex pairing of holes in frustrated XY spin system.

- 2022 Engineering Dept., Tsukuba University, Japan Exact solution of the random close packing problem in d=2 - ramifications and extensions
- 2022 Dept. of Physics, Tel Aviv University, Israel Exact solution of the random close packing problem in two dimensions
- 2022 Engineering Dept., Tsukuba University, Japan Stress theory for ideal and real granular materials
- 2021 J. Granular Matter monthly Webinar Granular matter self-organises by entropy-stability competition into non-equilibrium detailed balance states
- 2021 Inst. of Natural Sciences & Dept. of Physics and Astronomy, Jiao Tong University, Shanghai, China Self-organisation of dense granular systems: theory, entropy, and non-equilibrium detailed balance
- 2021 Engineering Dept., Tsukuba University, Japan Introduction to statistical mechanics of granular media
- 2016 Yukawa Inst., Kyoto University, Japan Progress in statistical mechanics of a-thermal particulate systems
- 2016 Engineering, Tsukuba University, Japan Bending back and rich behaviour of stress chains in isostatic annuli
- 2016 Aerospace Engineering, Peking University, Beijing, China Towards a stress theory for real granular materials
- 2016 Aerospace Engineering, Peking University, Beijing, China Statistical mechanics of granular materials
- 2016 Phyiscs, Beihang University, Beijing, China Theory of stress in granular materials
- 2015 Physics, Jiao Tong University, Shanghai, China Towards a stress theory for real granular materials
- 2015 Engineering, Tsukuba University, Tsukuba, Japan Towards a fundamental stress theory for real granular materials
- 2015 Engineering, Tsukuba University, Tsukuba, Japan A local morphological descriptor of granular materials and its uses
- 2014 College of Civil Engineering, Tongji University, Shanghai, China Fracture propagation in geo-materials: The single fracture dynamics
- 2014 Inst. of Theoretical Physics, Chinese Academy of Science, Beijing, China Structural characterisation and statistical mechanics of granular and porous systems: A systematic method to derive structure-property relation and equations of state
- 2014 Center of soft matter physics and its applications, Beihang University, Beijing, China Towards a fundamental stress theory for real granular materials
- 2013 Dept. of physics, University of Cambridge, UK Recent perspectives in the science of granular matter
- 2013 Graduate Lecture, Dept. of physics, University of Cambridge, UK The science of granular matter
- 2013 Dept. of chemical and environmental engineering, University of Nottingham, UK Structural Characterization and Statistical Mechanics of Granular Matter
- 2012 Physics Dept., University of Kent, Canterbury, UK From statistical mechanics of granular, cellular and porous materials to structure-property relations: a systematic approach
- 2012 Dept. of Mathematics, Open University, Norwich, UK Statistical mechanics of granular, cellular and porous media and structure-property relations a systematic approach
- 2011 Institut fur Experimentelle Physik, Universitat Ulm, Ulm, Germany, Controlled force mediation in the cytoskeleton: A dream model awaiting experimental verification
- 2010 School of Physics and Astronomy, Tel Aviv University, Tel Aviv, Israel, Colloquium: Da Vinci Fluid a minimal model for flow of dense granular materials

- 2010 School of Physics and Astronomy, Tel Aviv University, Tel Aviv, Israel, From pore-scale structural char-
- 2010 Department of Environmental Sciences, ETH, Zurich, Switzerland, Da Vinci Fluid model for flow of dense granular materials
- 2010 Engineering Dept, Tokyo University, Japan, Understanding stress transmission in dense granular materials
- 2010 Lecture course: Engineering Dept, Kyoto University, Japan, 1. Stress transmission in granular packs: why do conventional theories struggle? 2. Stress transmission in granular packs: isostaticity theory and beyond; 3. Entropic formalism for the statistics of granular packs; 4. Stresses and force chains in granular materials: misconceptions and new directions
- 2009 Civil Engineering Dept, Sydney University, Australia, Systematic derivation of structure-property relations in porous and cellular materials
- 2009 Civil Engineering Dept, Sydney University, Australia, Stress transmission and incipient yield flow in dense granular materials
- 2008 Mathematics Dept, Brunel University, UK, A Stresses in Granular Systems: A paradigm of Complexity
- 2008 ICP, Stuttgart University, Germany, Stresses in granular systems

acterization to macro-scale structure-property predictions

- 2008 Earth Sciences and Engineering, PERM Seminar, Imperial College London, UK, The Rich Dynamics of Process Zone Limited Fracture Propagation in Heterogeneous Materials
- 2008 DAMTP, Cambridge University, UK, Stresses in granular systems and yield flow
- 2008 Applied Modelling and Computation Group (AMCG), Earth Sciences and Engineering, Imperial College London, *Microstructural characterization of porous media and systematic derivation of transport properties*
- 2008 Earth Sciences and Energy Research, Weizmann Inst., Rehovot, Israel, Structural-entropic characterization of porous media and flow properties
- 2008 Physics Department, Tel Aviv University, Israel, Stresses in isostatic systems and applications to granular materials
- 2007 Physics Department, North Carolina State University, NC, USA, Exact solutions to the isostaticity stresses equations in disordered 2d granular materials
- 2007 Physics Department, Duke University, NC, USA, Exact solutions to the isostaticity stresses equations in disordered 2d granular materials
- 2006 Physics Department, Bar Ilan University, Tel Aviv, Israel, Propagation of stresses in granular porous materials: between elasticity and isostaticity
- 2006 Biology Department, Bar Ilan University, Tel Aviv, Israel, Controlled force mediation in the cytoskeleton: A dream model awaiting experimental verification
- 2006 Physics Department, University of Manchester, Manchester, UK, Stresses in granular materials: between elasticity and isostaticity
- 2006 Laboratoire de Physique Th©orique, Ecole Normale Sup©rieure, Paris, Frances, Propagation of stresses in granular porous materials: between elasticity and isostaticity
- 2004 Applied Mathematics, Bristol University, UK, Stress field equations in granular solids: A shift of paradigm
- 2004 Institute of Physics of Geological Processes, Oslo, Norway, Stress transmission in granular materials: Between elasticity and isostaticity
- 2004 Cavendish Laboratory, Cambridge, Stress transmission in granular materials: Between elasticity and isostaticity
- 2003 Cavendish Laboratory, Cambridge, Stress transmission in cellular solids: beyond elasticity.
- 2003 Isaac Newton Institute, Granular piles and marginal rigidity.

- 2002 Kings College London, Mechanics of cellular systems.
- 2001 Leeds University, UK, Pulling single chains and implications to rheology of dense polymers near the glass transition.
- 2000 Max Planck Institute, Golm, Chilling out polymer dynamics: Fluctuating disentanglement forces and rheological implications.
- 1997 Max Planck Institute, Stuttgart, Nonequilibrium mesoscale fracture propagation: Noise-free and noisedriven steady states, oscillations and intermittency.
- 1996 Wake Forest University, North Carolina, A new theoretical approach to surface growth: The Laplacian growth paradigm.
- 1996 University of New Mexico, Albuquerque, Growth of complex interfaces: Theory.
- 1995 Santa Fe Institute, Santa Fe, Theorizing on patterns of evolving interfaces: The Laplacian growth paradigm.
- 1995 University of Texas, El Paso, Statistics of interfaces in Laplacian growth.
- 1995 New Mexico State University, Las Cruces, A first-principles theory for Laplacian growth.
- 1994 Emory University, Atlanta, Georgia, Formulation of a first-principles theory for growing surfaces.
- 1994 Arizona State University, Characterization and analysis of morphologies of scale-invariant patterns and hierarchical structures beyond simple scaling.
- 1993 Clarkson University, Onset of scale-invariant side-branching in cracking patterns and comparison with diffusion-limited-aggregation.