

**CV: Raphael (Rafi) Blumenfeld**

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- Nationality: UK, Israel
- Address: Gonville & Caius College, Cambridge University, Trinity St., Cambridge CB2 1TA, UK
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- 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

- 2019- Distinguished Visiting Professor, CSU, Hunan, China
- 2014-2017 Distinguished 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

- 2020- 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

- 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
- 2021 Alex D. C. Myhill, Cavendish Laboratory, Part III (MSci) - Structural dynamics of 2D superfluid granular systems

#### 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 100 papers in primary peer reviewed journals
- 28 contributions to Symposia and compiled volumes  
(Google Scholar: [Raphael Blumenfeld: Google Scholar citations](#))

### I. Peer-reviewed papers

117. Raphael Blumenfeld,  
*Granular solids transmit stress as two-phase composites*, Submitted **xx**, xxx (2023)  
<https://arxiv.org/abs/2306.10581>
116. Paula A. Gago, Marcos A. Madrid, Stefan Boettcher, Raphael Blumenfeld, Peter King,  
*Effect of bevelled silo outlet in the flow rate during discharge*, to appear in Powder Technology **428**, 118842 (2023)
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);  
<http://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](http://arxiv.org/abs/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>
87. 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)
69. R. Blumenfeld,  
*Stresses in two-dimensional isostatic granular systems: Exact solutions*, New Journal of Physics **9**, 160 (2007)
68. 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)
66. 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>
63. R. Blumenfeld,  
*Stress in planar cellular solids: Coarse-graining the constitutive equation*, Physica **A 336**, 361 (2004)
62. 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/cond-mat/0108470> (2001)

55. 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)
52. R. Blumenfeld  
*Dynamics of fracture propagation 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)
49. R. Balakrishnan and R. Blumenfeld,  
*Transformation of general curve evolution to a modified Belavin-Polyakov equation*, J. Math. Phys. **38**, 5878 (1997)
48. R. Blumenfeld and Benoit B. Mandelbrot,  
*Mass fractal lacunarity, Lévy dusts, Mittag-Leffler statistics, and perceived dimension*, Phys. Rev. E **56**, 112 (1997)
47. R. Blumenfeld,  
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46. B. L. Holian, R. Blumenfeld and P. Gumbsch,  
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## II. Refereed contributions to symposia and compiled volumes

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*Structural characterisation of porous and granular materials*, in Proceedings of 16th European Symposium on Improved Oil Recovery 2011, Cambridge, UK.
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*Stress Transmission and Incipient Yield Flow in Dense Granular Materials*, in IUTAM-ISIMM Symposium on Mathematical Modeling and Physical Instances of Granular Flows, pp 167-182, eds. J. Goddard, P. Giovine and J. Jenkins (AIP Publications, Melville New York, 2010, )
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*Thermodynamics of granular materials*, in Physics of Granular Materials, ed. A. Mehta (Cambridge University Press, Cambridge 2007)

16. R. Blumenfeld,  
*Stress transmission and isostatic states of non-rigid particulate systems*, IMA Volumes in Mathematics and its Applications, Vol. **141**:  
*Modeling of Soft Matter*, eds. M.-C.T. Calderer and E. M. Terentjev, (Springer-Verlag, New York 2005); (also: arXiv:cond-mat/0501700 [cond-mat.soft])
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
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*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)
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*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.
11. 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,  
*A theory for the morphology of Laplacian growths from statistics of equivalent many-body systems* in Fractal Reviews in the Natural and Applied Sciences, Ed. M.M. Novak (Chapman-Hill, 1995)
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*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,  
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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
2. 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

1. 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

- 2023 **”DKU Soft Matter Symposium: Model, Simulation and Application of Complex Fluids and Particulate Materials”**, DKU University, Kunshan, China, January 26-28: *Exact solution of the random close packing problem in  $d=2$  and extensions*
- 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-from-equilibrium structural dynamics of dense granular fluids*
- 2020 **Edwards Centre Mini-conference**, Cambridge, UK, January 10 (Keynote talk): *Structural self-organisation 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, Netherlands 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, Anisotropy, 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: *Formulating 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-dimensional cracking growth*; 2) *Vortex-antivortex pairing of holes in frustrated XY spin system*.

Invited colloquia and departmental seminars

- 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 Physics, 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 für Experimentelle Physik, Universität 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 characterization to macro-scale structure-property predictions*
- 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*
- 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 Théorique, Ecole Normale Supérieure, Paris, France, *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 noise-driven 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*.