

SUMMARY CV  
**A. Bahraminasab**

**General**

Name: Alireza Bahraminasab  
Date of birth: 14 January 1978  
Place of birth: Shahrood, Iran  
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**Education**

2002-2005 Ph.D, Sharif University of Technology, Iran. Transcript grade: 19.31/20. Thesis: *Intermittency in Burgers turbulence and statistical theory of Kardar-Parisi-Zhang*. Ph.D adviser Prof. M. R. R. Tabar.  
2000-2002 M.Sc. Sharif University of Technology, Iran. Grade: 17.23/20. Thesis: *Using Entangled States in Quantum Secret Sharing*. M.Sc. adviser Prof. V. Karimipour.  
1996-2000 B.Sc. University of Tehran, Iran. Grade. 15.71/20.

**Employment**

2006-present Postdoctoral Research Associate, Lancaster University, UK. Advisors: Dr. A. Stefanovska and Prof. P. V. E. McClintock.  
2007-present Honorary Research Associate, Lancaster infirmary, Lancaster.  
2005–2006 Postdoctoral Researcher, The Abdus Salam International Center for Theoretical Physics (ICTP), Trieste, Italy. Advisor: Prof. K.R. Sreenivasan.

**Academic awards**

2005 Ranked 1st in the Seventh Khwarizmi Youth Festival – a national competition between graduate students in all branches of science in Iranian universities.  
2005 Best PhD graduate, in any subject, Sharif University of Technology.  
2000 Ranked 29th out of ~10,000 participants in the M.Sc. qualification exam.

**Media involvement**

2008 A demonstrative video about the synchronization of 5 metronomes has attracted more than 1.5 million viewings to become the “top favorite” educational YouTube video ever in the UK. Eventually, a related article was published in Times Higher Education (15 May 2008) titled “A beat in time strikes a chord on YouTube”. The video also penetrated in one documentary programme by BBC world and also a brand new television show for SKY one in the United Kingdom. See: <http://youtube.com/watch?v=W1TMZASCR-I>

**Research interests**

My research interests are centred on nonlinear dynamics in studying non-equilibrium systems and include: minimal models of turbulence like Burgulence; nonlinear surface growth surface problems; phase transitions of nonlinear wave dynamics in disordered media; nonlinear dynamics of the cardiovascular system and Brain system.

**Main research achievements**

Much of my research has involved team-work, with one or more collaborators, but the following are examples of significant results obtained where I played the leading role –

- **Lancaster University:** Development of a new method for identification of causal (driver-response) relationships between different oscillatory processes in cardiovascular and cardio-respiratory and Brain systems such as blood flow, heart and respiration and EEG recordings. Also, both analytically and numerically, the noise-induced synchronization and pattern formation of an ensemble of oscillatory particles and the interplay between coupling and noise were

characterized.

- **ICTP:** A neat analytical calculation for linking the Eulerian temporal intermittency in randomly forced burgers turbulence to the shock dynamics. The results analytically and numerically by means of the particle method using  $2^{15}$  collective points approve the role of singularities in the so called Taylor's frozen-flow hypothesis in Burgers turbulence without a large scale mean.
- **Sharif University of Technology:** Achievement of an analytic calculation of the finite time of singularity formation in the multidimensional Burgers turbulence and Kardar-Parisi-Zhang model. This model is used for describing a broad universality class of nonlinear far-from-equilibrium growth problems.
- **ICTP, Sharif University of Technology:** Discovery of a regime of superlocalization in the propagation of acoustic waves in strongly heterogeneous media. Gaussian-white distributed elastic constants, as well as those with non-decaying power-law correlation functions, were considered. The study was motivated in part by a recent discovery that the elastic moduli of rock at large length scales may be characterized by long-range power-law correlation functions.
- **ICTP, Sharif University of Technology:** Development of an effective equation that can reproduce data recorded from e.g. turbulent flows, the surface roughness of rock, fluctuations in the stocks prices and seismic recordings.

### Teaching experience

My teaching experience has included delivery of undergraduate lectures in fundamental physics (Mechanics, Electromagnetism, and Optics) based on the textbook by Halliday, Resnick and Krane, and acting as Teaching Assistant in Mathematics, Electromagnetism, Quantum Mechanics, and Scaling & Renormalization Group courses at Sharif University of Technology. Since coming to Lancaster I have been responsible for the day-to-day supervision of Ph.D and M.Phys. students.

### Selected scientific publications

My earlier, forthcoming, and submitted papers in international scientific journals include –

1. A. Bahraminasab, F. Ghasemi, A. Stefanovska, P. V. E. McClintock, H. Kantz “Direction of coupling from phases of interacting oscillators: A permutation information approach”, *Phys. Rev. Lett.* **100**, 084101 (2008).
2. A. Bahraminasab, M. D. Niray, J. Davoudi, M. Reza Rahimi Tabar, A.A. Masoudi, K.Sreenivasan, “Taylor's frozen-flow hypothesis in Burgers turbulence ”, *Phys. Rev. E.(R)* **77**, 065302 (2008).
3. A. Bahraminasab, D. Kenwright, A. Stefanovska, F. Ghasemi, P. V. E. McClintock, “Phase Coupling in the Cardiorespiratory Interaction”, *IET Sys. Biology* **2**, 48 (2008).
4. D. Kenwright, A. Bahraminasab, A. Stefanovska, P. V. E. McClintock, “The effect of low-frequency oscillations on cardio-respiratory synchronization”, *Eur. Phys. J. B* **65**, 425(2008).
5. R. Sepehrnia, A. Bahraminasab, M. Sahimi, M. Reza Rahimi Tabar, “Dynamic renormalization group analysis of propagation of elastic waves in two-dimensional heterogeneous media”, *Phys. Rev. B* **77**, 014203 (2008).
6. A. Bahraminasab, A. Esmailpour, S. M. Vaez, F. Shahbazi, M. Sahimi, M. Reza Rahimi Tabar, Reply to ”Comment on 'Renormalization group analysis and numerical simulation of propagation and localization of acoustic waves in heterogeneous media' ”, *Phys. Rev B* **77**, 216302 (2008).
7. D. Kenwright, A. Bahraminasab, A. Stefanovska, P. V. E. McClintock, “Low Frequency noise and Cardiorespiratory Synchronization”, submitted , *Phys. Rev. E* (2008).
8. G. R. Jafari, M. Sadegh Movahed, P. Noroozadeh, A. Bahraminasab, F. Ghasemi, Muhammad Sahimi, M. Reza Rahimi Tabar, “Criticality and Uncertainties in Immerging Markets, *International Journal of Modern Physics C* **18**, 1689 (2008)
9. D. Garcia-Alvarez, A. Bahraminasab, A. Stefanovska, P. V. E. McClintock, “ Modelling high-order synchronisation epochs and transitions in the cardiovascular system” *Conference on Complex Systems II* **6802**, U8020-U8020 (2008).

10. A. Bahraminasab, S. M. Vaez, F. Shahbazi, M.D. Nirya, M. Reza Rahimi Tabar, M. Sahimi, "Renormalization group analysis and numerical simulation of propagation and localization of acoustic waves in heterogeneous media", *Phys. Rev. B*, **75**(6), 064301 (2007).
11. F. Farahpour, Z. Eskandari, A. Bahraminasab, G. R. Jafari, F. Ghasemi, M. Reza Rahimi Tabar, Muhammad Sahimi, "Langevin Equation for the Rates of Currency Exchange Based on the Markov Analysis", *Physica A*. **385**, 601 (2007).
12. N. Abedpour, M. D. Nirya, A. Bahraminasab, A. A. Masoudi, J. Davoudi, M. Sahimi, M. R. R. Tabar, "Stochastic phi(4)-theory in the strong coupling limit, *Nuclear Physics B*, **761**(3), 93-108 (2007).
13. A. Bahraminasab, D. Kenwright, A. Stefanovska, P. V. E. McClintock, "The cardiorespiratory interaction: a nonlinear stochastic model and its synchronization properties", *Proceedings of SPIE* **6602**, X6020-X6020 (2007).
14. G. R. Jafari, A. Bahraminasab, P. Norouzzadeh, "Why does the Standard Garch (1,1) model work well?", *International Journal of Modern Physics C*. **18**(7) (2007)
15. A. Bahraminasab, M. Sadegh Movahed, S. D. Nassiri, A. A. Masoudi, M. Sahimi, "Exact analysis of level-crossing statistics for (d+1)-dimensional fluctuating surfaces", *Journal of Statistical Physics*, **124**(6), 1471 (2006).
16. M. Sadegh Movahed, A. Bahraminasab, H. Rezazadeh, A. A. Masoudi, "Level Crossing Analysis of Burgers Equation in 1+1 Dimensions", *J. Phys. A: Math.Gen.*, **39**,1-7 (2006).
17. M. R. R. Tabar, M. Sahimi, F. Ghasemi, K. Kaviani, M. Allamehzadeh, J. Peinke, M. Mokhtari, M. Vesaghi, M. D. Nirya, A. Bahraminasab, T. S. Tabatabaei, S. Fayazbakhsh, M. Akbari, "Short-term prediction of medium-and large-size earthquakes based on markov and extended self-similarity analysis of seismic data", *Lect. notes phys.*, Publisher Springer, Berlin, **705**, 291-301.(2006).
18. F. Ghasemi, A. Bahraminasab, S. Rahvar, K. Sreenivasan, M. Reza Rahimi Tabar, "Stochastic Nature of Cosmic Microwave Background Radiation", *J. Stat. Mechanics-Theory and Experiment*, **11**, 11008 (2006).
19. F. Shahbazi, A. Bahraminasab, S. M. Vaez, M. Reza Rahimi Tabar, M. Sahimi, "Localization of the Elastic Waves Sound in the heterogeneous media with Long Rang, Off-Diagonal Disorder", *Phys. Rev. Lett.*, **94**, 165505 (2005).
20. S. M. A. Tabei, A. Bahraminasab, A.A. Masoudi, S. S. Mousavi and M. Reza Rahimi Tabar, "Intermittency of height fluctuations in stationary state of the Kardar-Parisi-Zhang equation with infinitesimal surface tension in 1+1 dimensions", *Phys. Rev. E*, **70**, 031101 (2004).
21. A. Bahraminasab, S. M. A. Tabei, A.A. Masoudi, F. Shahbazi and M. Reza Rahimi Tabar, "Zero tension Kardar-Parisi-Zhang equation in (d+1) - Dimensions", *Journal of Statistical Physics*, **116**, 1521 (2004).
22. V Karimipour, A Bahraminasab, S Bagherinezhad, "Entanglement swapping of generalized Schrodinger cat states and secret sharing", *Phys. Rev A*, **65**, 042320,(2002).
23. V Karimipour, A Bahraminasab, S Bagherinezhad, "Quantum Key Distribution for d-level Systems with Generalized Bell States", *Phys. Rev. A*, **65**, 052331(2002).