Second Centenary lecture, Physics Deparment, University of Calcutta

Date and time: 7 March 2017, 3PM

Meghnad Saha Auditorium, Rajabazar Science College campus, University of Calcutta

<u>Title</u>: Rich structure in the correlation matrix spectra of non-equilibrium steady states

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<u>Abstract</u>

The spectrum of creation matrices has found successful applications in the understanding of financial markets but has been little used for stochastic dynamical systems. The reason seems to be that most systems studied have a clear spatial structure and many other techniques have been successfully applied. We therefore revisited some well known systems and in particular found analytically that a power law in space implies a power law in the eigenvalues of the correlation spectra [1]. The proof is not invertible and therefore we got interested in analyzing the a case where spatial correlation are known analytically and display no power law; namely the totally antisymmetric simple exclusion process (TASEP) [2]. Here we found [3] a power law for one critical line in parameter space and further interesting deviations from the random matrix behavior, mainly in what is known as the constant current region.

[1] T. Prosen, B. Buča and T.H. Seligman, (2014). Spectral analysis of finite-time correlation matrices near equilibrium phase transitions. *EPL (Europhysics Letters)*, 2015; *108*(2), 20006.

[2] Derrida B. Phys. Repts. 1998; 301(1), 65–83

[3] S. Biswas, F. Leyvraz, P. Monroy Castilero and T.H. Seligman, <u>Sci Rep</u>. 2017; 7: 40506.

<u>About Prof Thomas Seligman</u>

Prof Thomas Seligman, one of the most versatile and active physicists of current times, is attached to the department of Physics in the University of Mexico (UNAM) as a professor since 1989. He has also enjoyed research positions in several universities like Cologne (Germany), Basel (Switzerland), Ecole Polytechnique (France) to name a few. He originally worked in Nuclear Physics and group theory; his current interest covers diverse topics like Molecular physics and nano structures, Quantum chaos, Random matrix theory, Quantum and classical scattering, Decoherence and quantum dynamics of open systems, Econophysics, Multivariate analysis etc.

Prof Seligman has received several awards like Research award of the University of Mexico (UNAM) (1993), Moshinsky Medal (1997), Humboldt Award (2003) and Mexican national prize for arts and sciences (2003).

Some other distinctions received by Prof Seligman are:

Fellow Wissenschaftskolleg, Berlin 1992-1993

Special Fellow of the Slovenian research council 2013

Special life time professorship, University of México (UNAM) 2008