Subhrangshu Sekhar Manna

Senior Professor
Theoretical Sciences
manna@bose.res.in

Dr. S. S. Manna worked for his Ph. D. in Saha Institute of Nuclear Physics and received the degree from the Calcutta University. Later, he did Post doctoral researches in Melbourne University, Australia; Forschungzentrum, Germany; St. Francis Xavier University, Canada and Yale University, USA. He joined the Physics department in Indian Institute of Technology, Bombay in June 1992 and later moved to Satyendra Nath Bose National Centre for Basic Sciences in January, 1998.

Supervision of Research / Students

Ph.D. Students

1. Biplab Bhattacherjee, Spontaneous Evolution of Long-Range Correlations in Dynamical Systems, about to submit shortly.
2. Sumanta Kundu, Some Studies of Percolation Phenomena in Disordered Systems, Ongoing.
3. Chandreyee Roy, Some studies of the brittle to quasi-brittle transition in fiber bundle models, Ongoing.

Teaching activities at the Centre

1. PHY104; Fall 2016; Full course
2. PHY204; Winter 2017; Half course

Publications in Journals

1. Biplab Bhattacherjee, Amitava Datta, **S. S. Manna**; *Asymptotic properties of restricted naming games;* Physica A; 2017; **478**; 177.
2. Sumanta Kundu and **S. S. Manna**; *Percolation model with an additional source of disorder*; Phys. Rev. E; 2016; **93**; 062133.
3. Chandreyee Roy and **S. S. Manna**; *Brittle-to-quasibrittle transition in bundles of nonlinear elastic fibers*; Phys. Rev. E; 2016; **94;** 032126.

Conference / Symposia / Workshops / Seminars etc. organized

1. Discussion meeting on the occasion of 60 years of Broadbent and Hammersley (1957) paper on percolation phenomena, 23-24 January, 2017, S. N. Bose National Centre for Basic Sciences, Convener.

Collaborations including publications (Sl. No. of paper/s listed in 'Publications in Journals' jointly published with collaborators)

International

1. Sl. No. 1

Member of Editorial Board

1. Fractals

Significant research output / development during last one year

General research areas and problems worked on

- Introduced a generalized model of lattice percolation
- Introduced a model of colored percolation
- Introduced a model of oscillating percolation
- Studied effect non-linear fiber bundle model.
- Restricted naming games

Interesting results obtained

The fiber bundle model has been studied with nonlinear fibers. This model exhibits a brittle to quasi-brittle phase transition. This transition has weak power law modulated logarithmic (brittle) and logarithmic (quasi-brittle) dependence of the relaxation times.

Symmetric and asymmetric naming games have been studied where the vocabulary sizes of the agents are restricted to finite capacities. The power law exponents are different from the original naming game.

The model of `Colored Percolation' has been introduced where the sites of a regular lattice are randomly occupied with probability p and are then colored by one of the n distinct colors using uniform probability q = 1 / n. Here, only those lattice bonds having two different colored atoms at the ends are defined as connected. Biased and unbiased versions of this model has been studied.

The model of lattice percolation has been studied using a system of pulsating discs. Here, every site i of a square lattice has been assigned a circular disc of radius R_i(t) that varies sinusoidally with time. A bond is occupied when two end discs overlap. Interestingly, for R_0 < R_{0c} when there exists no spanning cluster, information can still be transmitted across the system by propagating through different finite size clusters that appear in different instants of time. Consequently, the average transmission time increases as R_0 decreases and it diverges as R_0 approaches to its second critical value.

Proposed research activities for the coming year

- Models of percolation problems
- Collective behavior of self-propelled agents
- Self-organized critical models