Solitary Waves and Fluctuations in Fragile Matter

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PROPOSITONS
accompanying the thesis
SOLITARY WAVES AND FLUCTUATIONS IN FRAGILE MATTER

- The simple approximate description of the solitary wave as a quasi-particle first introduced by Nesterenko, also helps to understand the interaction of the solitary wave with an interface and by extension, the solitary wave propagation in a weakly disordered medium.
  This thesis Chapter 2,3.

- The disorder in an initially jammed amorphous packing that is near its critical point, causes the disintegration of the nonlinear excitation. This in turn leads to the emergence of a fluid-like state.
  This thesis Chapter 4.

- The dynamics of the Nesterenko solitary wave quasi-particle propagating along a one-dimensional chain coupled to a source of thermal fluctuations, can be described in analogy with that of a Brownian particle.
  This thesis Chapter 5.

- A two-dimensional nearly isostatic random network of harmonic springs that is being sheared at a uniform rate, generates a nonlinear shock-like wave whose width grows super-diffusively with time.
  This thesis Chapter 6.

- The role of fluctuations and nonlinearity can not be ignored in describing the equilibrium properties of a one-dimensional Navier-Stokes fluid.
  V. Yakhot and Z. She, Phys. Rev. Lett., ***60****, 18 (1988).*

- The absence of phonons in a perfectly ordered lattice of unstressed nonlinear springs leads to nonlinear waves as the elementary excitations.
  V. F. Nesterenko, A. N. Lazaridi, and E. B. Sibiryakov, Prikl. Mekh. Tekh. Fiz. ***36****, 19 (1995)[J. Appl. Mech.Tech. Phys.,* ***36****, 166 (1995)].*

- The mechanical properties of a random network of harmonic springs can be tuned by changing the average number of neighbours that each node is connected to.
  M.F. Thorpe, Journal of Non-Crystalline Solids, ***57*** *(1983) 355-370.*

- An approximate way to model quantum fluctuations within classical molecular dynamics simulation is by coupling the system to a heat bath that has a power spectral density given by the Bose-Einstein distribution.
  H. Dammak et. al. , Phys. Rev. Lett. ***103****, 190601(2009).*

- Even calligraphically, 'I' stands as a tall barrier between you and me.