

IUPAP Commission 3 Statistical Physics Working Group on Nanoscience

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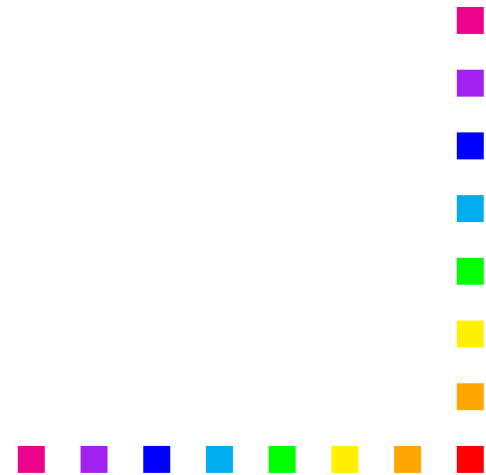
Ecole Normale Supérieure

Paris, France



Commission Conference

- STATPHYS 22: Bangalore, India



Session Titles at STATPHYS 22

- 1. Rigorous results and exact solutions
- 2. Phase transitions and critical phenomena
- 3. Non equilibrium processes
- 4. Pattern formation in systems out of equilibrium
- 5. Dynamical systems and turbulence



Session Titles at STATPHYS 22

- 6. Liquid matter
- 7. Soft condensed matter (colloids, polymers, liquid crystals, microemulsions, foams, membranes, etc.)
- 8. Interfacial phenomena and wetting; surface effects and confined systems



Session Titles at STATPHYS 22

- 9. Quantum-mechanical problems (quantum phase transitions, strongly correlated fermions, Bose-Einstein condensation, mesoscopic quantum phenomena, etc.)
- 10. Disordered systems (random lattices, spin-glasses, glass transition, localization, etc.)



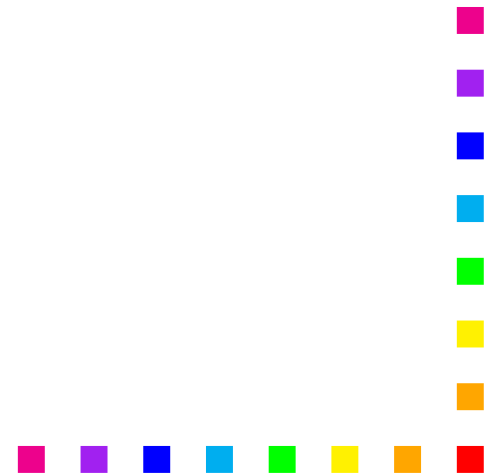
Session Titles at STATPHYS 22

- 11. Biologically motivated problems (protein-folding models, dynamics at the scale of the cell; biological networks, evolution models, etc.)
- 12. Other applications of statistical physics (networks, traffic flows, algorithmic problems, econophysics, astrophysical applications, etc.)



Transport in “nanostructures”

- dynamics of flow-induced currents in nanotubes
- electronic transport in DNA; effect of doping and coating



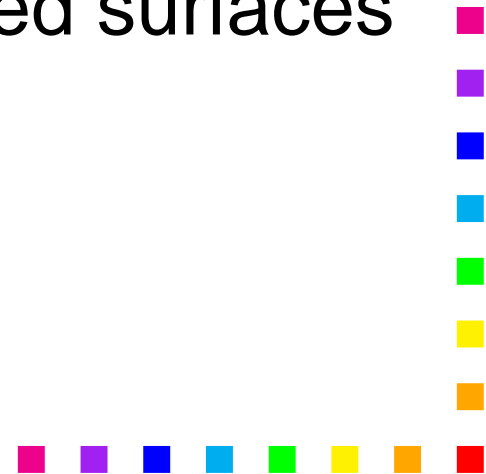
Interactions of colloidal “nanoparticles”

- long-range attraction between like-charged colloids
- long-range attraction between like-charged nanoparticles at interfaces: role of capillary interactions
- effect of hydrodynamic interactions on the brownian motion of nanoparticles
- complexation of DNA with dendrimers



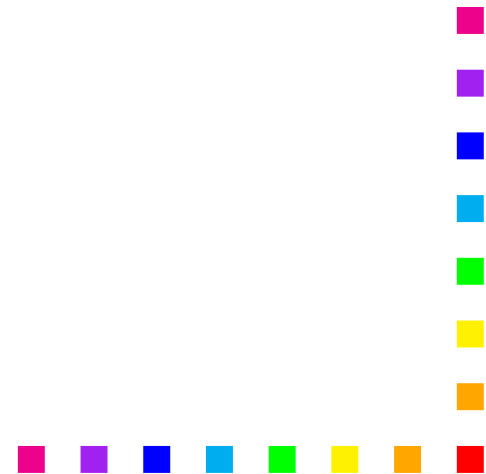
Effects of nanostructured surfaces

- phase transitions induced by nano-patterned surfaces in fluids
- pattern formation induced by structured surfaces in polymers
- transport of fluids on nano-patterned surfaces



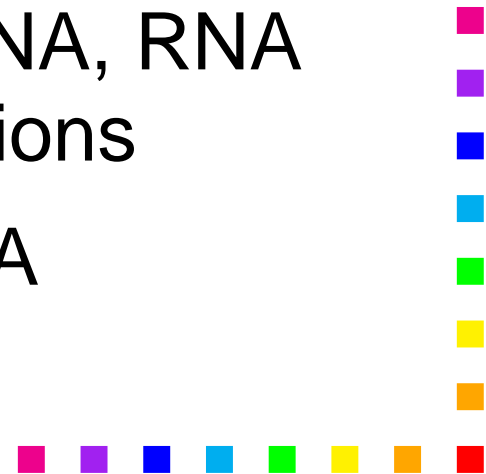
Quantum problems: BEC, BCS, strongly-correlated Fermions

- crossover from BEC to BCS in ultra-cold Fermions
- transport properties of single atom contacts



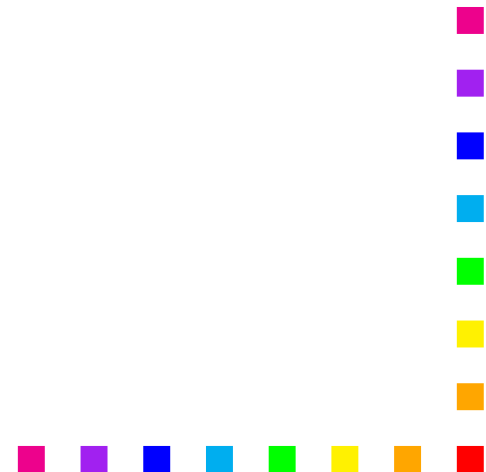
Biological systems

- biopolymer structure prediction (RNA, proteins)
- protein folding and dynamics
- molecular motors and ratchets
- single molecule experiments on DNA, RNA and proteins: force-extension relations
- free energy measurements on RNA



Biological systems

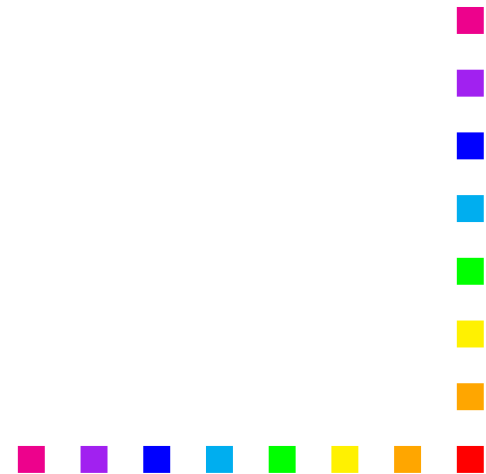
- drug delivery: how to force a chemical inside a cell
- RNA packing in viral capsid
- membrane fusion and fission
- functionalization of membranes
- biosensors



Biological systems

Should be included

- DNA “micro-arrays”
- DNA computing



Conclusion

- Possibility to organize a joined conference on Biological Physics between C3, C6 and C20

