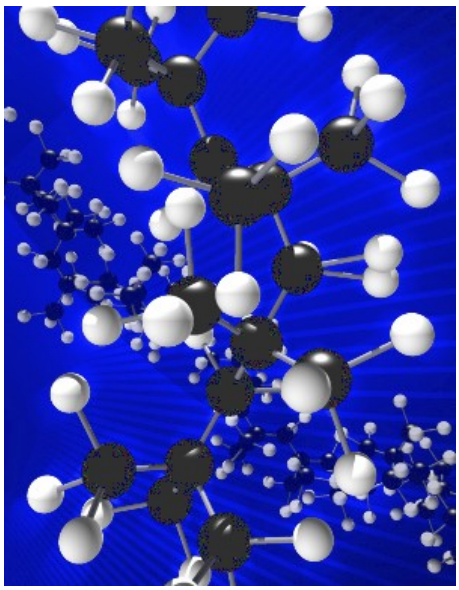
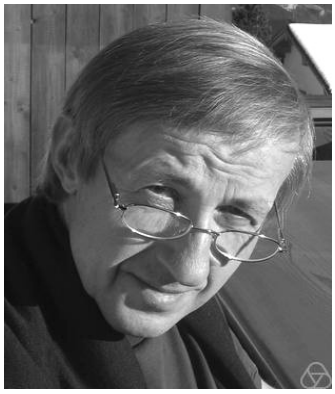


PHD SPRING SCHOOL

RANDOM POLYMERS and RANDOM MATRICES

Luminy, March 4*th*-8*th* 2013

ERWIN BOLTHAUSEN – Random Polymers



The basic model is a one-dimensional random walk with a random interaction with either a "wall" or with half spaces. There are natural generalizations where the return times of the random walk to the origin are replaced by fairly arbitrary distributions. We will focus on the so called *copolymer* which models a polymer chain at an interface of two liquids with nodes of the chain which are repellent randomly to either of the liquids, but we will also discuss the case of random interactions with the wall. The basic methods come from *large deviation theory*, the analysis of *fractional moments*, and *renormalization techniques.*

BENJAMIN SCHLEIN – Random matrices

Wigner matrices are NxN hermitian or real symmetric matrices whose entries are independent (up to symmetry constraints) and identically distributed random variables. We will discuss statistical properties of the spectrum of Wigner matrices, in the limit of large N. Already in 1955 Wigner proved the convergence of the density of states of Wigner matrices towards the famous semicircle law. We will discuss Wigner's result and its recent extension to small *microscopic* intervals, containing only a bounded number of eigenvalues. We will consider some consequences of the validity of the semicircle law on microscopic intervals (e.g. complete delocalization of the eigenvectors, repulsion among eigenvalues). Finally, we will show, starting again from the microscopic semicircle law, that the local eigenvalue correlations are independent of the particular choice of the probability law of the matrix entries, a property known as *universality*.

Organisation: Veronique Gayrard (CNRS), Nicola Kistler (Jean Morlet Chair 2013)