Metal – insulator transitions in correlated electron systems with disorder

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Electron – electron interaction and disorder can both leads to a metal – insulator transitions in electronic systems. The transition induced by the interaction between particles is called a Mott – Hubbard metal – insulator transition whereas the name an Anderson metal – insulator transition is reserved for a transition caused by the disorder in the system. Since both the strong disorder and the strong interaction turn a metal into an insulator, one could naively think that when they both are present in the same system the insulating phase should be stabilized easier. In the present lecture I will show that the reverse takes place, the interaction and the disorder compete with each other and in turn the metallic phase is more stable. Using the dynamical mean – field theory supplemented with the geometrical averaging method over the disorder I will present the results for the Anderson – Hubbard and the Anderson – Falicov – Kimball models which support the above statement. Experimental systems where such a behavior is plausible observed will also be mentioned.

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