In this talk, we introduce random walks in a sparse random environment on $\mathbb{Z}$ and investigate basic asymptotic property of this model (recurrence-transience, asymptotic speed, and limit theorems in both transient and recurrent regimes). The new model combines features of several existing models of random motion in random media and admits a transparent physics interpretation. More specifically, the random walk in a sparse random environment can be characterized as a “locally strong” perturbation of the simple random walk by a random potential induced by “rare impurities” which are randomly distributed over the integer lattice. The most interesting seems to be the critical (recurrent) case, where Sinai’s scaling $(\log n)^2$ for the location of the random walk after $n$ steps is generalized to basically $(\log n)^\alpha$, with $\alpha > 0$ being a parameter determined by the distribution of the distance between two successive impurities of the media.

REFERENCES