Graph limits and Markov spaces

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Limit objects for sequences of finite structures, larger and largerin size but more and more similar in some sense, have been constructedsporadically, perhaps since von Neumann constructed continuous geometries, butthis research has become quite extensive in the last decade and a half. Graphsare perhaps the simplest structures, and accordingly, the limit theory ofgraphs has made the most progress. The theory of graph limits is only understood, to a somewhat satisfactorydegree, in the cases of bounded degree graphs (initiated by Benjamini andSchramm) and of dense graphs (initiated by Borgs, Chayes, Lovász, Szegedy, Sósand Vesztergombi). More recently there is a lot of interest in the intermediatecases. It appears that the most important constituents of graph limits in the general case will be Markov spaces (Markov chains on measurable spaces with astationary distribution). Several important theorems can be extended from finite graphs to Markov spacesor, more generally, to measurable spaces: flow theory, expanders and spectra,mixing of random walks, etc. In this talk we will give a glimpse into thisemerging theory, based on the work of Á. Backhaus, D. Kunszenti-Kovács, B.Szegedy and the speaker.