On median eigenvalues of graphs

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Median eigenvalues of a graph are closely related to the HOMO-LUMO separation properties from mathematical chemistry. The talk will give an overview of recent results about the median eigenvalues. One particular surprising discovery is that the median eigenvalues of every connected bipartite graph G of maximum degree at most three belong to the interval $[-1,1]$ with a single exception of the Heawood graph, whose median eigenvalues are $\pm\sqrt{2}$. Moreover, if G is not isomorphic to the Heawood graph, then a positive fraction of its median eigenvalues lie in the interval $[-1,1]$. This result has a generalization to larger vertex degrees, where the only exceptions appear to be point-line incidence graphs of finite projective planes.