If $A$ is the adjacency matrix of a graph $X$, we say that the matrix
$U(t) = \exp(itA)$
is the transition matrix of a continuous quantum walk.

Continuous quantum walks were introduced by physicists as a tool for quantum computing, and have a number of potential applications. A continuous quantum walk on a graph can be viewed as an analog of a classical random walk. The analogy is vague and not particularly useful, because quantum walks have a number of unexpected behaviors.

Not surprisingly, the properties of the continuous walk depend on the structure of the underlying graph. What is perhaps surprising is that tools from algebraic graph theory are particularly useful in studying these walks. My talk will present some of the results we have obtained in our work in this area, including a number of open problems.