1125-15-887 **Chris Godsil***, Combinatorics and Optimization, University of Waterloo, Waterloo, Ontario N2L 3G1, Canada. *Average mixing of quantum walks.*

Let $X$ be a graph with adjacency matrix $A$. The family of matrices $U(t) = \exp(itA)$ (for $t \geq 0$) determines what physicists call a *quantum walk*. For matrices $M$ and $N$, let $M \circ N$ denote the Schur product. Then

$$\widehat{M} := \lim_{T \to \infty} \int_0^T U(t) \circ U(-t)\, dt$$

is the *average mixing matrix* of the walk. If $E_1, \ldots, E_m$ are the idempotents in the spectral decomposition of $A$, then

$$\widehat{M} = \sum_r E_r \circ E_r.$$

and so $\widehat{M}$ also has an algebraic definition. We can view it as a graphical invariant. In my talk I will discuss some of the properties of this matrix, and some of the related open questions. (Received September 12, 2016)