1125-55-2457 **Hein van der Holst*** (hvanderholst@gsu.edu), 30 Pryor St SW, Atlanta, GA 30303, and **Robin Thomas** and **Sergey Norin**. *Decomposing 2-cycles.*

For a graph $G = (V, E)$, a 2-cycle $A = [a_{e,f}]$ is an $E \times E$ matrix such that $a_{e,f} = 0$ if $e$ and $f$ have a common vertex and each row and each column of $A$ is a circulation on $G$. Examples of 2-cycles are 2-cycles coming from pairs of disjoint cycles of $G$. Also on each subgraph of $G$ that is a subdivision of $K_5$ or $K_{3,3}$, there is a 2-cycle. It has been a conjecture that each 2-cycle can be written as a sum of these types of 2-cycles. For symmetric matrices, the presenter proved this in his work on a polynomial-time algorithm for finding a linkless embedding of a graph. For general matrices, this has recently been disproved by Barnett.

In this talk, we give a finite list of types of 2-cycles such that each 2-cycle is a sum of 2-cycles from this list. This solves a problem which has been open for over 40 years. We also show that for Kuratowski-connected graphs, it suffices to have 2-cycles coming from pairs of disjoint cycles of $G$ and 2-cycles on subgraphs of $G$ that are subdivisions of $K_5$ or $K_{3,3}$. (Received September 20, 2016)