1106-11-641 **Steven J Miller*** (sjm1@williams.edu). *From Fibonacci Quilts to Benford's Law through Zeckendorf Decompositions.*

Zeckendorf's theorem states that every integer can be writen uniquely as a sum of non-adjacent Fibonacci numbers; we call this a legal decomposition. We report on some recent progress on generalizations and related questions. In particular, we discuss two very different situations where Benford's law of digit bias emerges (which states that the probability of observing a first digit of d is $\log_{10}(1 + 1/d)$). The first is in the distribution of leading digits of the summands in the Zeckendorf decompositions of integers; we concentrate on the Fibonacci case, but the proof extends to other difference equations. The second involves another sequence generated by a difference equation, which can be interpreted as the unique sequence arising from imposing a rule for a legal decomposition from the geometry of the Fibonacci spiral. In this situation we lose uniqueness of decomposition. We prove that approximately 92.6% of the time the greedy algorithm terminates in a legal decomposition here, and the average number of legal decompositions of numbers at most n follows Benford's law. This is joint work with many colleagues, especially A. Best, M. Catral, P. Dynes, X. Edelsbrunner, P. Ford, P. Harris, B. McDonald, D. Nelson, K. Tor, C. Turnage-Butterbaugh and M. Weinstein. (Received September 03, 2014)