1084-11-108 **Steven J Miller*** (sjm1@williams.edu), **Amanda Bower** (amandarg@umd.umich.edu), **Rachel Insoft** (rinsoft@wellesley.edu), **Shiyu Li** (jjl2357@berkeley.edu) and **Philip Tosteson** (philip.d.tosteson@williams.edu). *Mind the Gap: Distribution of Gaps in Generalized Zeckendorf Decompositions.*

Zeckendorf proved that any integer has a unique decomposition as a sum of non-adjacent Fibonacci numbers, $F_n$. Using continued fractions, Lekkerkerker showed that the average number of summands for $m \in [F_n, F_{n+1})$ is essentially $n/(\phi^2+1)$, where $\phi$ is the golden ratio. Miller-Wang generalized this by adopting a combinatorial perspective, proving that for any positive linear recurrence $A_n = c_1A_{n-1} + c_2A_{n-2} + ... + c_LA_{n+1-L}$, the number of summands for integers in $[A_n, A_{n+1})$ converges to a Gaussian distribution as $n \to \infty$.

We prove that the probability of a gap larger than the recurrence length converges to decaying geometrically, with decay rate equal to the largest eigenvalue of the characteristic polynomial of the recurrence. These results hold both for the average over all $m$ in $[A_n, A_{n_1})$, as well as holding almost surely for the gap measure associated to individual $m$. The techniques work for related problems, including the distribution of the longest gap between summands (which is similar to the distribution of the longest gap between heads in tosses of a biased coin), as well as for far-difference representations (where positive and negative summands are allowed). (Received August 27, 2012)