1098-05-84 **Shiyu Li**, **Steven Miller** and **Philip Tosteson*** (`ptoste@umich.edu`). *Coin flips, Fibonacci numbers and the longest gap!*

A beautiful proposition of Zeckendorf states that any integer may be written uniquely as a sum of non-adjacent Fibonacci numbers. This can be generalized to any sequence defined by a recurrence relation with positive coefficients, uniting Fibonacci decompositions and binary expansions. Given these Zeckendorf representations, we consider a statistic: the longest gap between summands. Given the Zeckendorf representation for a number x, the longest gap of x is the largest space between summands in its representation. We consider the distribution of the longest gap of numbers in the interval $[G_n, G_{n+1})$ and look asymptotically for large n n. There is a direct connection between the longest gap and the longest run of heads after flipping a coin n times, given by taking the special case $G_{n+1} = 2G_n$. Extending results on the longest run of heads, we find that the distribution is strongly concentrated with finite variance about the mean, which grows on the order of $\log n$ with computable constants depending on the recurrence. We discuss the difficulties of numerically exploring our results for indices on the order of a million (it is necessary to explore such large values as the rate of convergence is at most on the order of the logarithm of the index). (Received January 12, 2014)