1086-11-1098 **Steven J Miller*** (sjm1@williams.edu), Department of Mathematics and Statistics, Williams College, Williamstown, MA 01267, and **Amanda Bower**, **Rachel Insoft**, **Shiyu Li** and **Philip Tosteson**. *Distribution of summands in generalized Zeckendorf decompositions.*

A beautiful theorem of Zeckendorf states that every positive integer can be written uniquely as a sum of non-consecutive Fibonacci numbers. Once this has been shown, it's natural to ask how many Fibonacci numbers are needed. Using continued fractions, Lekkerkerker proved that the average number of such summands needed for integers in $[F_n, F_{n+1})$ is $n/(\phi^2+1)$, where ϕ is the golden mean. We present a combinatorial proof of this through the cookie problem and differentiating identities, and further prove that the fluctuations about the mean are normally distributed and the distribution of gaps between summands is exponentially decreasing. These techniques apply to numerous generalizations (many involving representations arising from continued fractions), which we'll discuss as time permits. (Received September 18, 2012)