Random Superpatterns

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The number of *preferential arrangements* or *rankings* of length a on an alphabet of size a are given by the so-called ordered Bell numbers $B(a) = \sum_{k=1}^{a} k!S(a,k)$, where $S(a,k)$ are the Stirling numbers of the second kind. A word of length n that contains all preferential arrangements of length a is called a *superpattern*. It is known by joint work of Burstein, Hästö, and Mansour that the minimum length $n(a,a)$ of a superpattern satisfies $n(a,a) \leq a^2 - 2a + 4$ and it conjectured that $n(a,a) = a^2 - 2a + 4$. In this talk we will focus on alphabets of size 2 and 3 and consider a sequence $X_1, X_2, \ldots$ of independent and identically distributed variables, each taking the value j with probability $1/a; a = 2, 3$. The distribution of the waiting time W till the sequence becomes a superpattern is obtained in closed form, as are the generating function and moments. For example, it is shown for $a = 3$ that

$$p(n) = P(W = n) = \frac{6}{3^n} \sum_{m=7}^{n} [(n-4)^2 - 2] \binom{n-2}{m-2}.$$

This is joint work with Anant Godbole.