Restricted Multicompositions

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In 2007, George Andrews introduced $k$-compositions, a generalization of integer compositions, where each summand has $k$ possible colors, except for the final part which must be color 1. Last year, Stéphane Ouvry and Alexios Polychronakos introduced $g$-compositions which allow for up to $g - 2$ zeros between parts. Although these do not have the same definition and came from very different motivations (number theory and quantum mechanics, respectively), we will see that they are equivalent. One reason these are compelling combinatorial objects is their count: there are $(k + 1)^{n-1}$ $k$-compositions of $n$. Results from standard integer compositions can have interesting generalizations. For example, there are three types of restricted compositions counted by Fibonacci numbers—parts 1 & 2, odd parts, and parts greater than 1. We will explore the diverging families of recurrences that arise from applying these restrictions to multicompositions.

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