

**Why I love Monovariants: From Zombies to Conway's
Soldiers via the Golden Mean**

Steven J. Miller

MathCorps and Williams College

A monovariant is a quantity which is either non-increasing or non-decreasing (such as the number of primes up to x or the volume of a sphere of radius r , but not the number of factors of n). Amazingly, many challenging problems can easily be solved by associating the right monovariant to it; unfortunately it is often challenging to 'see' the right quantity to study. We'll explore three interesting cases: understanding the growth of the Zombie apocalypse, the famous Conway checker problem, and Zeckendorf's Theorem that every integer can be written uniquely as a sum of non-adjacent Fibonacci numbers (if we define them by $F_{n+1} = F_n + F_{n-1}$ with $F_1 = 1, F_2 = 2$). If time permits we will discuss a game I created based on the Fibonacci problem, with a \$500 reward for a solution!