

Bi-State Math Colloquium

Who: Sheryl Wills

Where: Thursday, September 12, 4:00 pm

When: Ottensman 122, UW-Platteville

Dynamical Systems and the Logistic Map

In 1976, the biologist Robert May published a seminal paper on the discrete version of the logistic model for population growth. This model, known as the logistic map, is given by the recurrence relation

$$x_{n+1} = rx_n(1 - x_n)$$

where $0 \leq x_n \leq 1$, $0 \leq r \leq 4$, and $n = 0, 1, 2, 3, \dots$. In other words, given some starting number x_0 , one can generate a new number x_1 using $x_1 = rx_0(1 - x_0)$, and then repeat the process to generate x_2, x_3, x_4, \dots

In this talk, we will consider the question: What happens to the sequence of numbers $x_0, x_1, x_2, x_3, x_4, \dots$ when we vary the parameter r ? This seemingly simple question turns out to have a very complex and interesting answer. To help answer this question, we will discuss many of the fundamental notions of nonlinear dynamical systems, such as fixed points, stability, periodicity, bifurcations, chaos, universality, and fractals.

This talk should be accessible to anyone who has completed Calculus I.

Sheryl Wills received her Ph.D. in Mathematics from Northern Illinois University where she studied partial differential equations. She is currently in her 20th year of teaching at UW-Platteville.