

Friday, April 24th, 4:00 PM in Teasley Lecture Hall

# Contour maps, Julia sets, and a Perturbed Rat: using calculus ideas to glimpse into the 4th dimension.



Lecture by Dr. Julia Barnes, Western  
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In calculus, we study a variety of mostly continuous functions whose graphs lie in either 2 or 3 dimensions. What happens when we move to complex functions whose domain and range are both of the form  $a+bi$  where  $a$  and  $b$  are real and  $i$  is the square root of  $-1$ ? Any graph of a complex function to itself is going to be four dimensional and rather difficult to visualize. In this talk, we look at a collection of these complex functions and we try to discover something about their shapes by examining parts of them in 2 or 3 dimensions. That means we can use calculus techniques! In addition, the images obtained are rather impressive and start to resemble some well known Julia sets as well as some more elaborate Julia sets. One of those Julia sets is actually named a Perturbed Rat! Throughout the talk, we will also explore how mathematics can be done in the real world -- including how the presenter ended up working with a very diverse team of mathematicians (one member is a ballroom dancer). We will also mention how parts of this work was done at an art museum, at a military base, and at a pool in San Diego.