SPIRAL WAVES IN EXCITABLE MEDIA

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Rotating spiral wave patterns are a signature of oscillating chemical reactions (the Belusov-Zhabotinsky reaction, and AMP pulses in slime mold), and are believed to be involved in heart fibrillation and neural siezures. The organizing centers for spiral wave patterns are points in 2-dimensional media, and curves in 3-dimensional media, so codimension 2 topology (knot theory) is useful in the analysis of these patterns. This talk will discuss a mathematical characterization of these spiral wave patterns and their time evolution, in terms of phase maps and the homotopy of phase maps. A quantization condition that is necessary and sufficient for the (mathematical) existence of a rotating spiral wave pattern will be derived.

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