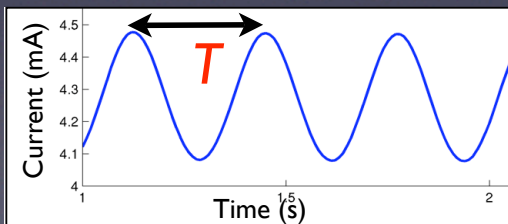# Description of complicated reaction systems with optimal mathematical complexity

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•Electrochemical systems have complicated underlying mathematical description because of interplay of chemical and various physical (e.g., diffusion) processes

•Simplified description is being developed based on two different approaches:

Principle of critical simplification

•Close to critical behavior (e.g., oscillations) the mathematical structure is simplified

•Frequency of oscillations is directly related to geometric means of characteristic electrical and chemical time scales

$$\frac{1}{T} = \omega \approx \frac{1}{2\pi}\sqrt{\frac{2k(e^*)}{aC_dRA}}$$

Method of nullclines

•Many physicochemical systems evolve along mathematical objects called 'nullclines'

•We have developed a methodology through which small perturbations to system parameters can be used to measure nullcline points from direct experiments: alternative to traditional kinetics based modeling