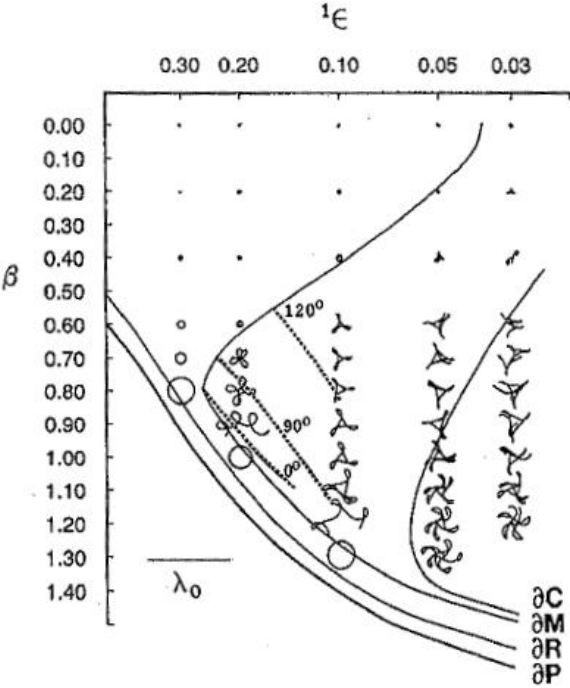


Bellow some examples of tip trajectories from various models/papers

Flower distribution for FHN for Epsilon vs beta



From A.T. Winfree. "Varieties of Spiral Wave Behaviour: An Experimentalists Approach to Spiral Wave Behaviour". Chaos, 1:303 – 334, 1991.

Example of spiral wave trajectories for the Barkley (FHN type model) model as a function of two parameters

$$f(u, v) = \frac{1}{\epsilon} u(1 - u) \left(u - \frac{v + b}{a} \right),$$

a and b, from the cubic equation

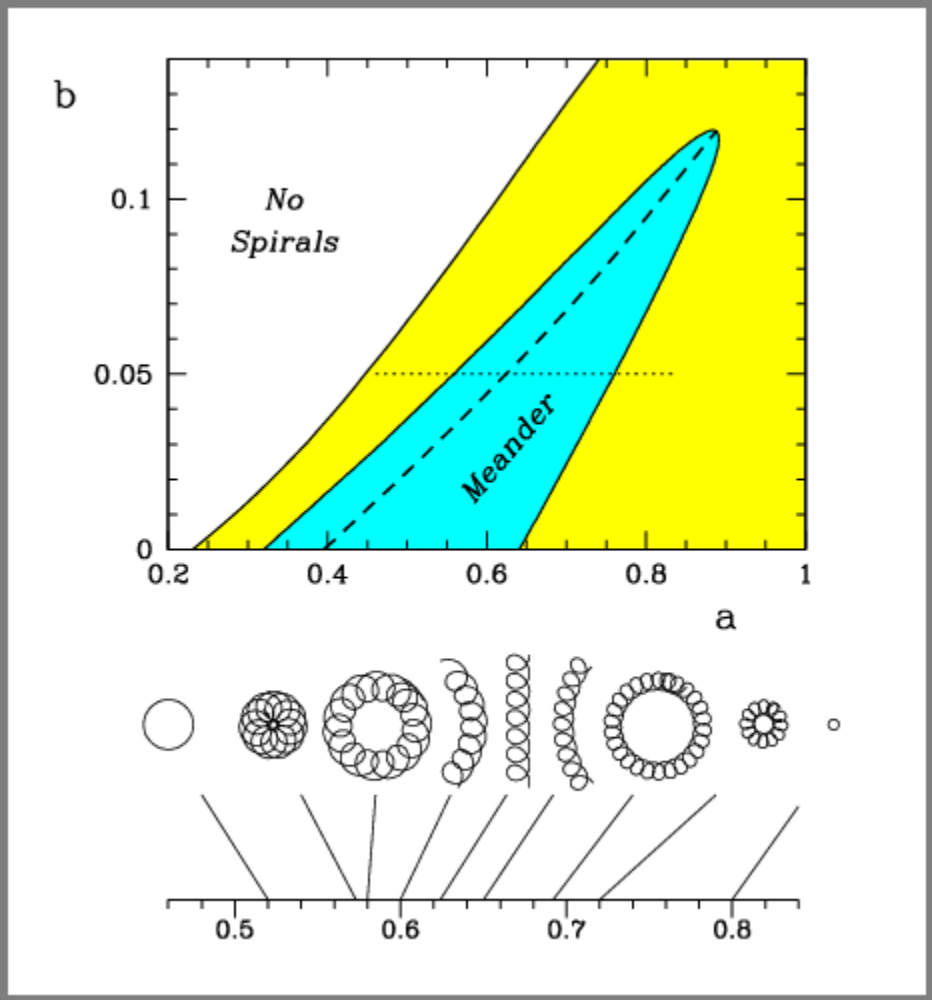
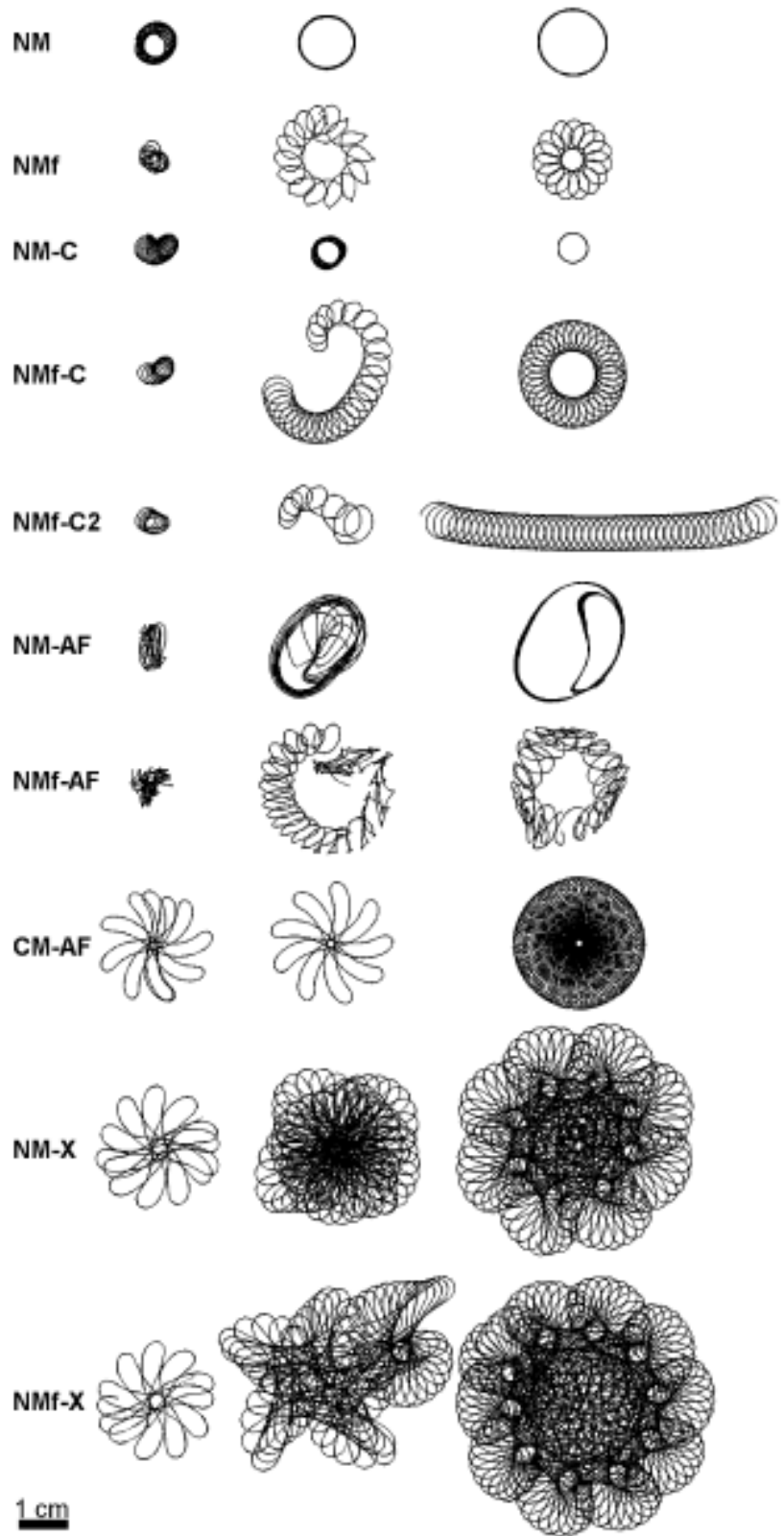


Figure 4: Top: yellow region denotes periodically rotating spirals and cyan denotes meandering spirals. Bottom: Cut through the parameter space at $b = 0.05$ with the different states illustrated by tip paths

From Comparing 2 human atria models:

004 *Chen, et al., 2010, Journal of ...*



Tip trajectories in the 3V model

Chaos, Vol. 12, No. 3, 2002

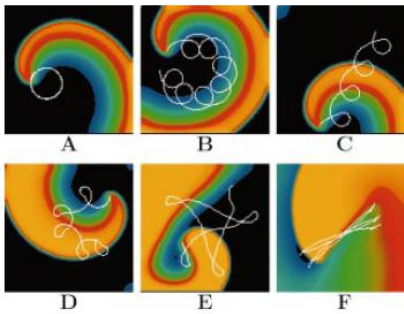


FIG. 1. (Color) Varieties of spiral wave tip trajectories. Shown are (a) circular, (b) epicycloidal (also known as meander with inward petals), (c) cycloidal, (d) hypocycloidal (also known as meander with outward petals), (e) hypermeandering, and (f) linear trajectories. Spirals are obtained with the model described in the Appendix by using parameter set 1 for (a)–(e) with progressively increasing excitability [(a) $\tau_d=0.41$; (b) $\tau_d=0.392$; (c) $\tau_d=0.381$; (d) $\tau_d=0.36$; (e) $\tau_d=0.25$] and by using parameter set 2 for (f). The voltage field colors range from orange and red (excited) to green and blue (resting).

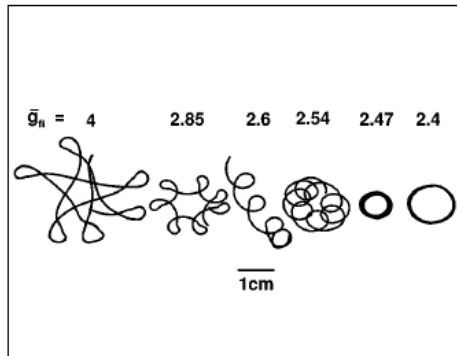


FIG. 7. Wavetip trajectories for the MBR parameter set in a 2D isotropic tissue obtained by varying the conductance parameter g_s of the fast inward (sodium) current.

Some References:

http://arxiv.org/PS_cache/arxiv/pdf/0912/0912.4247v1.pdf

<http://europace.oxfordjournals.org/content/7/s2/S10.full>

Project to do:

Start with a spiral wave and change parameters to do tables such as the first two figures at the beginning. That is, given two parameters, change both and make a survey of spiral waves (if they exist or not) and where they exist, what tip trajectory they have.

I'm working on pair of parameters for the students to do. As they change the parameters they need to do the changes slowly otherwise they can kill the spiral wave. Each time they fix the parameter they need to wait a couple of rotations for the system to adjust to the change. Then they should record the spiral wave trajectory in a file and label it with the set of parameters. It will be good idea to save the spiral wave for a few rotations, depending on the shape of the spiral they may need few rotations or many.