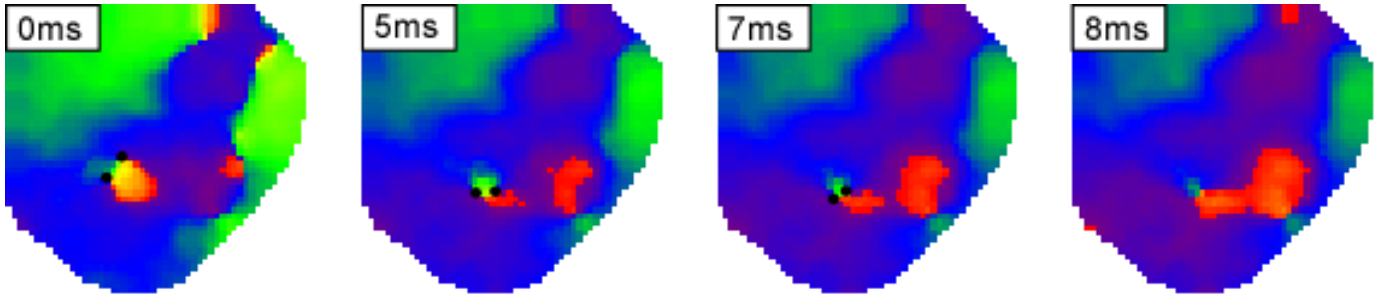
Homework *

1- A) Perform a literature search to determine experimental values of conduction velocity (CV) and of action potential duration (APD) and/or effective refractory period (ERP) in the human and guinea pig myocardium. B) If possible find values of the aforementioned parameters for more than one cycle length. C) Calculate the wave wavelength associated to these values. D) Does the wavelength depend on the cycle length and how; on the species and how. E) Provide details regarding the type of tissue (i.e. atrial, ventricular, etc), regarding the types of heart (for ex. if they had disease, age, etc), as well as the experimental conditions under which measures were taken (for ex. cycle length or type of protocol used for the measure). F) Provide the reference/s and the keywords used for the search.

2- Construct an activation map from the movie of Di-4-ANEPPS fluorescence depicting one cycle of a reentrant excitation wave measured in the guinea pig anterior ventricular wall during perfusion with a high potassium solution. The 64x64 pixel and 45 frame long movie was recorded at a temporal resolution of 600 frames/s. Use a threshold of 50% as indicative of activation. Try one additional threshold value of your choice and observe the differences in the resulting activation map.

3- Describe as precisely as possible the sequence of events shown in the phase snapshots (see below). Suggest a possible mechanism by which the singularity points/wavebreaks were extinguished.



* Exercises 1 and 3 should be done individually. Exercise 2 can be optionally done in pairs.

Algorithm to construct activation map

For each single pixel recording out of 64x64 pixels:

1- Determine the time at which the absolute maximum value of fluorescence occurs (t_{max}). If the maximum value is achieved at various instances of time, select the earliest.

2- Determine the time at which the minimum value of fluorescence prior to the maximum value determined in 1) occurs (t_{min}).

3- Determine the amplitude of the action potential (AP) by calculating the difference between the max and min values of fluorescence determined in 1) and 2).

4- For a given threshold value (expressed as a percentage) determine the value of fluorescence between the min and max values calculated in 1) and 2) which represents this number (F_{th}).

5- For a given threshold value, the activation time is the time between t_{min} and t_{max} at which the fluorescent signal first attains or surpasses F_{th}.