

BASIC MECHANISMS OF CARDIAC ARRHYTHMIAS

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BASIC MECHANISMS OF CARDIAC ARRHYTHMIAS

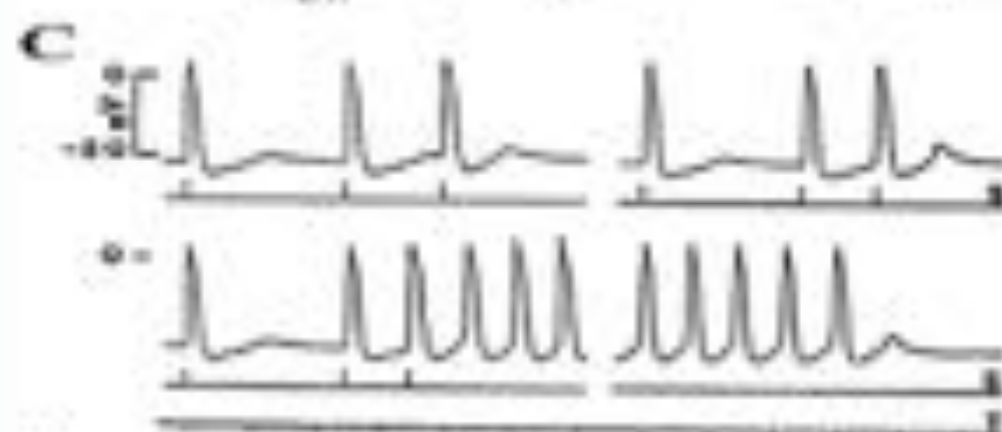
- **1. FOCAL ACTIVITY**
- **2. REENTRANT ACTIVITY**

Normal
Automaticity

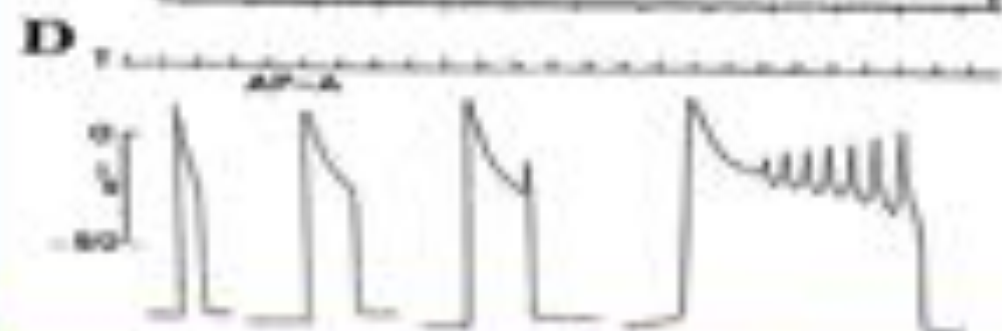


Abnormal
Automaticity

DAD



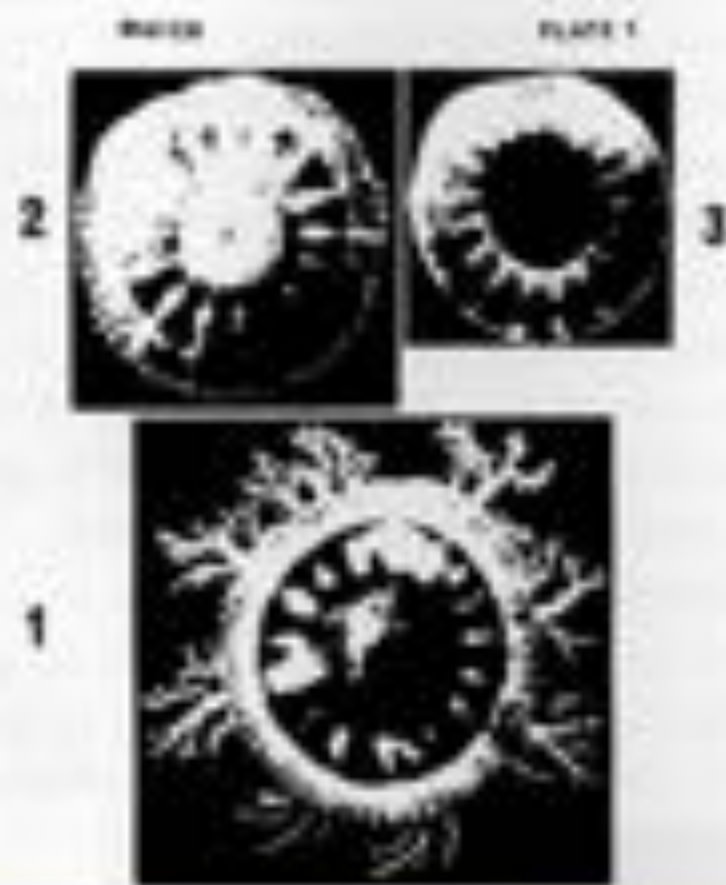
EAD



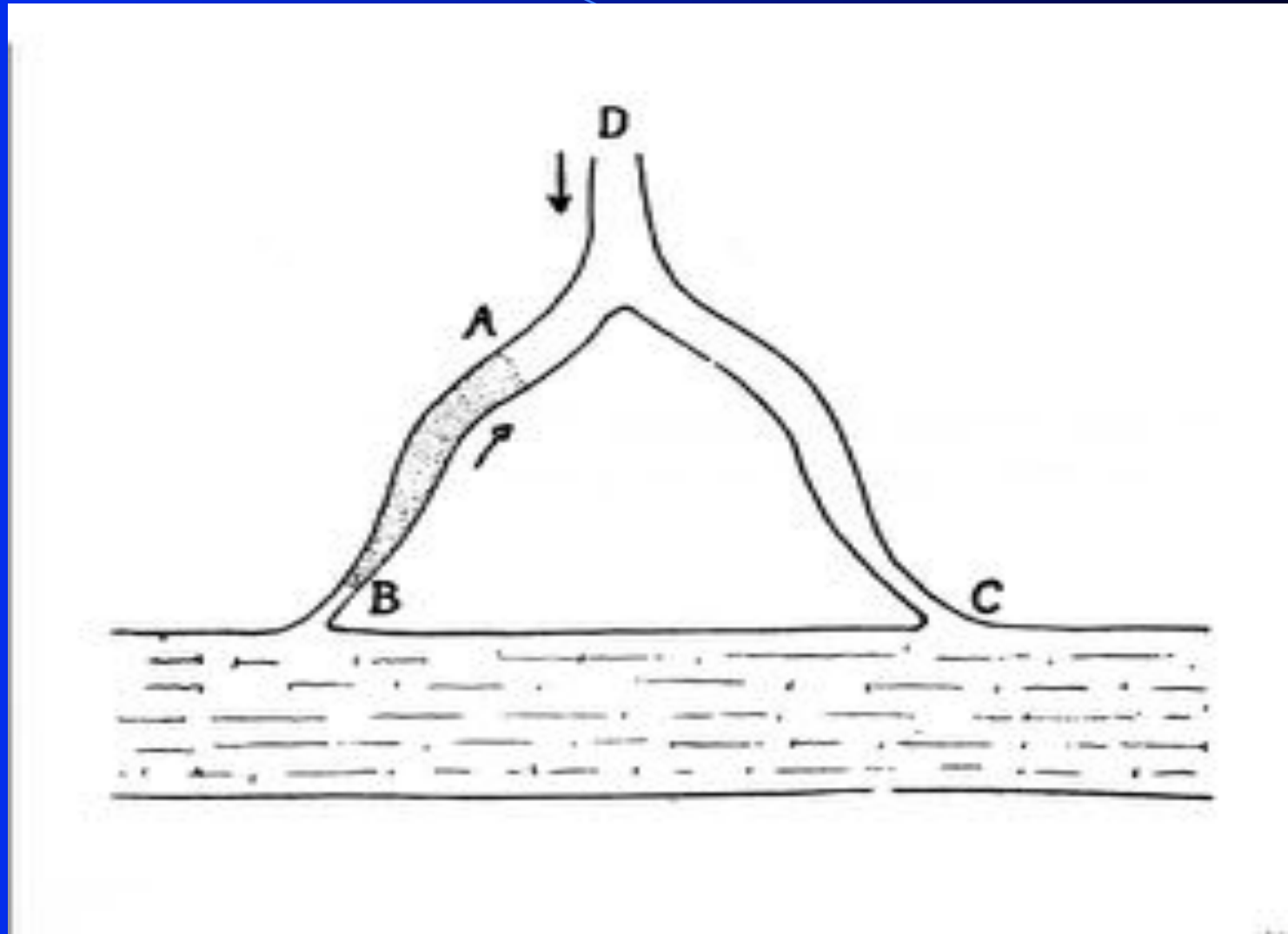
BASIC MECHANISMS OF CARDIAC ARRHYTHMIAS

- Reentrant activity typically is induced by a premature impulse acting on a substrate of dispersion of repolarization.
- Reentrant activity can circulate around:
 - +Anatomical core obstacle
 - +Functional core obstacle

MAYER 1906

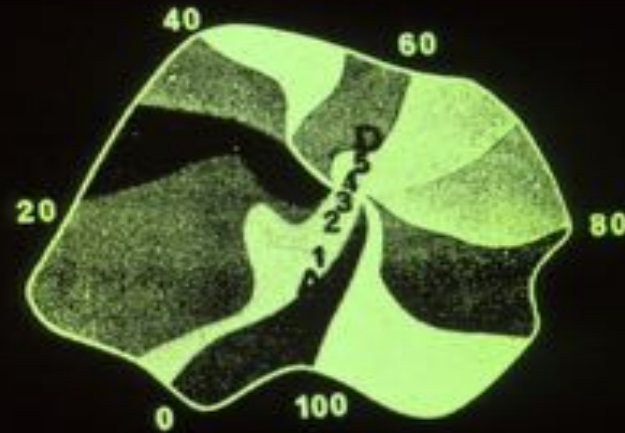


SCHMITT & ERLANGER 1928



THE LEADING CIRCLE MODEL

ALLESSIE, 1973



Vortices with linear cores in excitable media



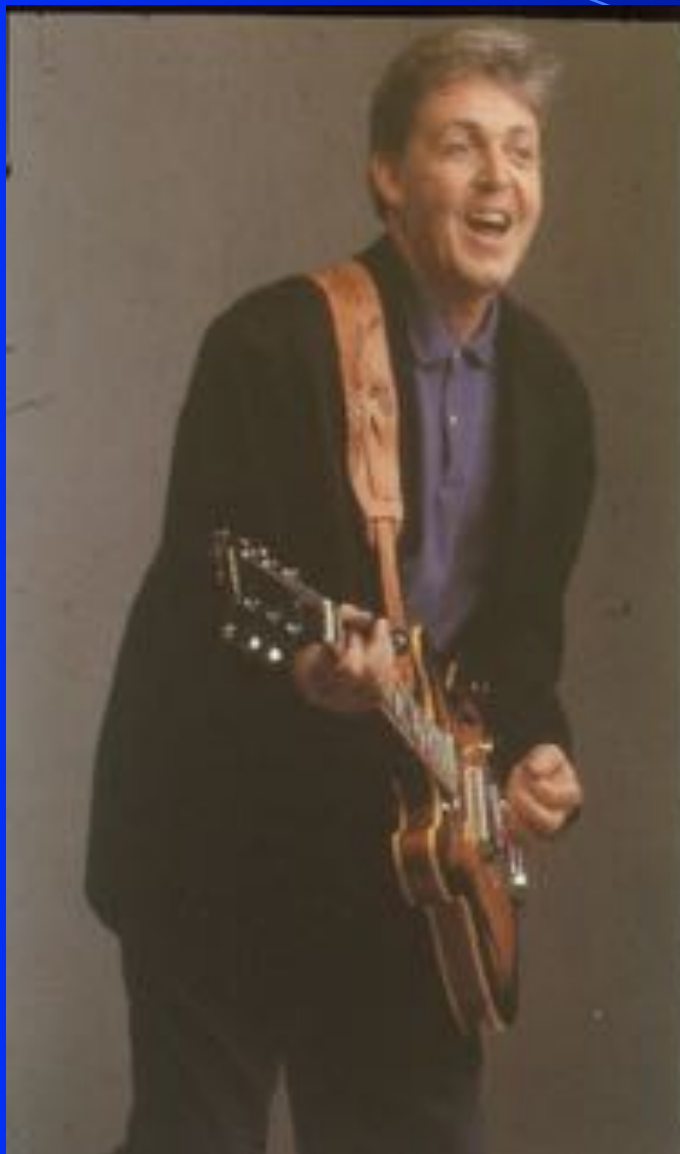
KRINSKY et al, 1992

SPIRAL WAVE REENTRY WAS FIRST SUGGESTED BY KRINSKY, BIOPHYSICA (USSR). 1996;11:776-84

EL-SHERIF ET AL,
CIRC RES 1986



FIGURE OF 8
CIRCUIT

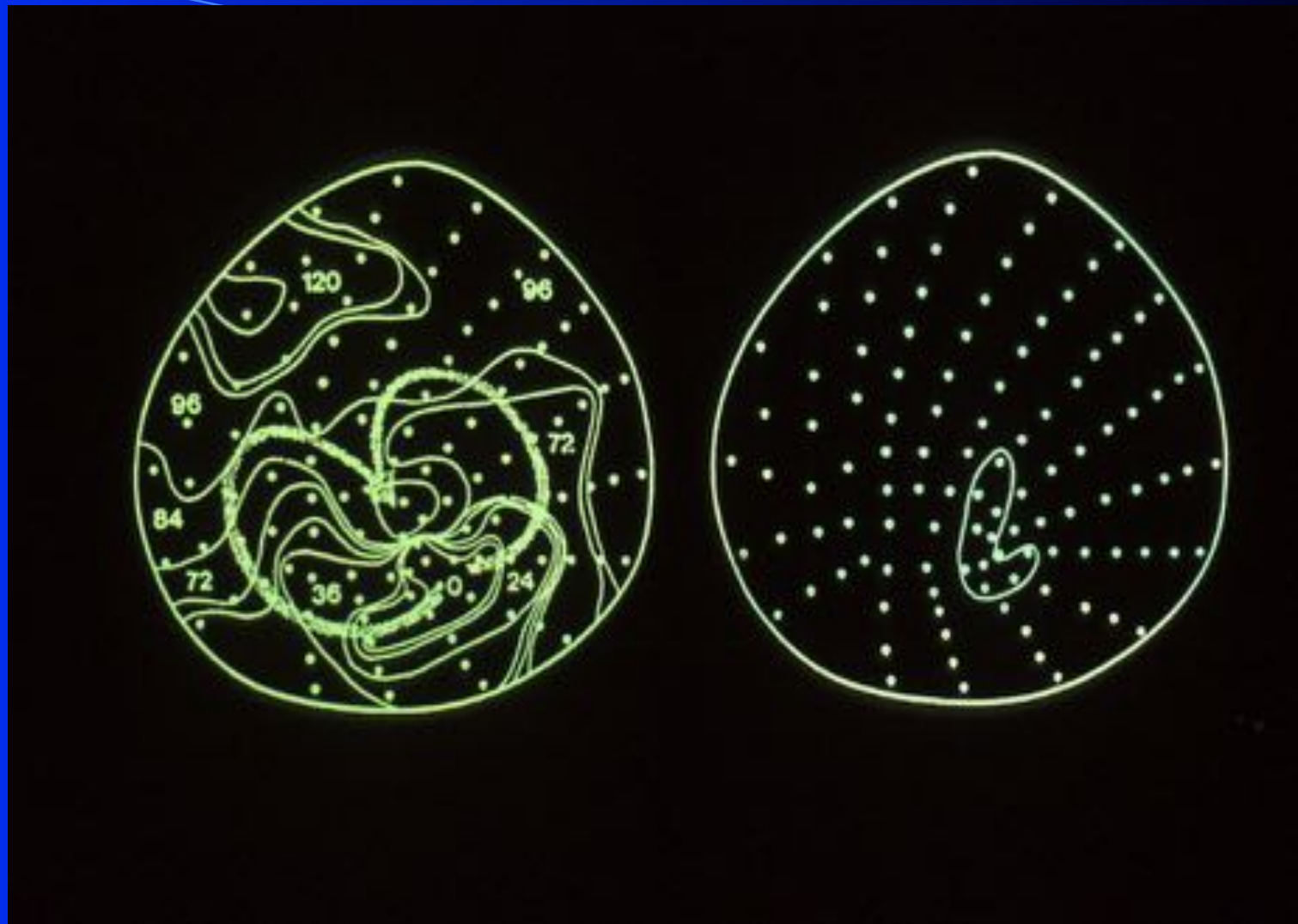


PAUL McCARTNEY

FIGURE OF EIGHT

(Well) You've got me dancing
In a figure of eight.
Don't know if I'm coming or going,
I'm early or late.
Round and round the ring I go,
I want to know, I want to know,

IL DISCO E' USCITO NEL 1989



ABLATION OF FIGURE-8 REENTRANT VT
DURING CARDIAC SURGERY

MICKLEBOROUGH ET AL, 1992

To compare Reentry around a functional obstacle versus reentry around an anatomical obstacle

The Anthopleurin-A Model of Neonatal Rat Ventricular Myocyte **Monolayer** (*Himel et al, J physiol 2013*)

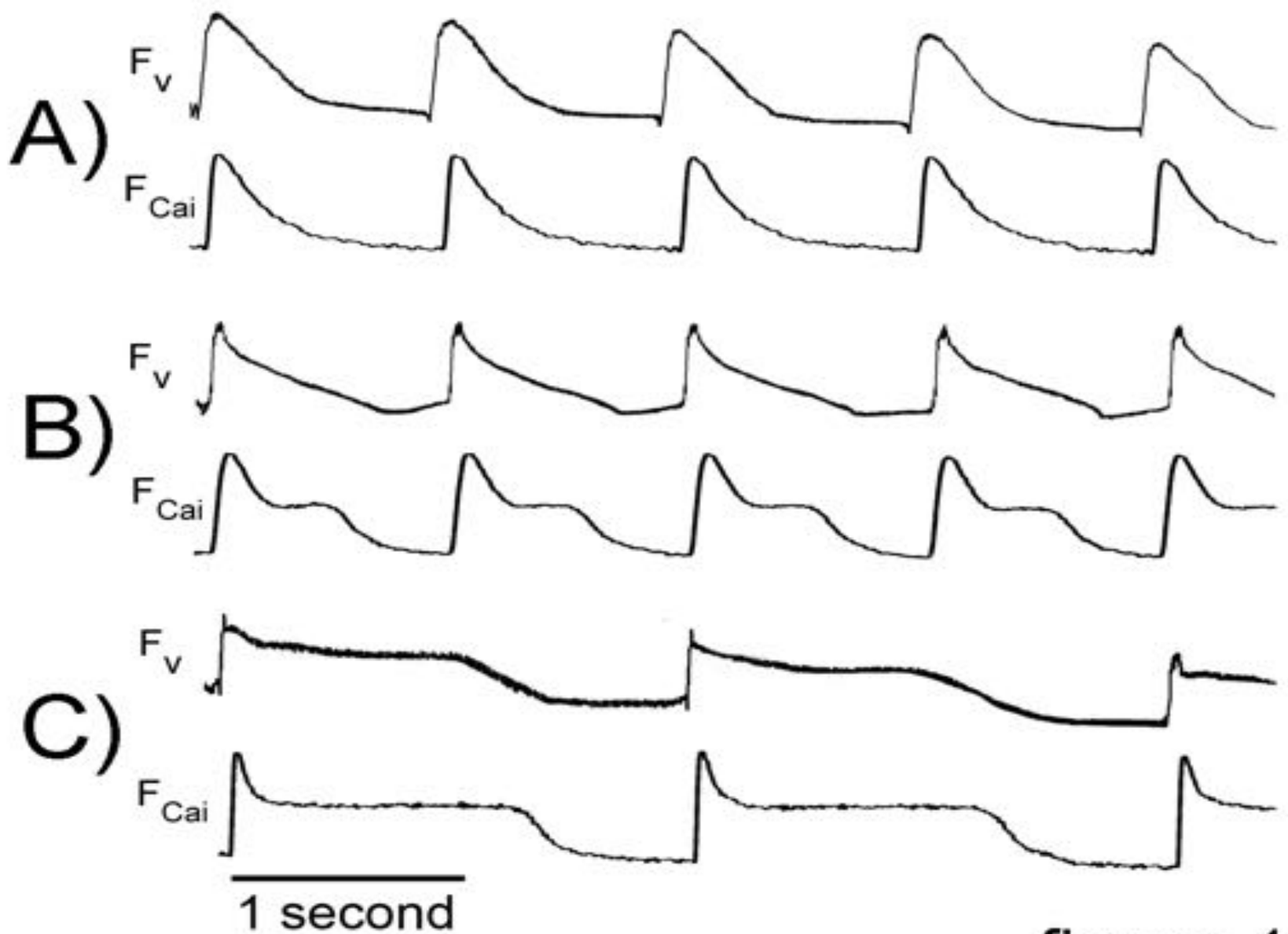
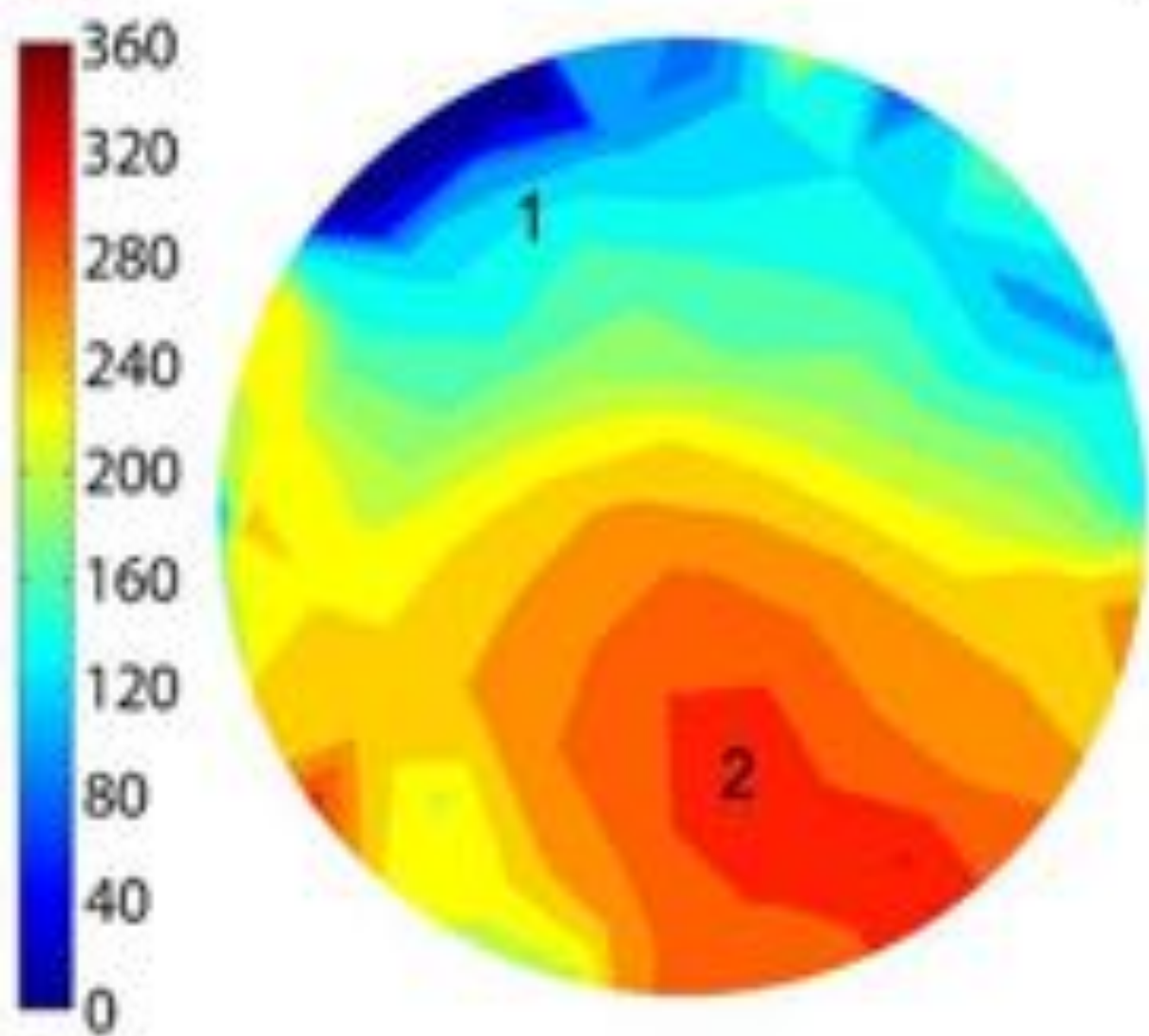


figure 1

Voltage and ICa optical signals from the AP-A monolayer model
A) Control monolayer; B) monolayer perfused with AP-A

A)



B)

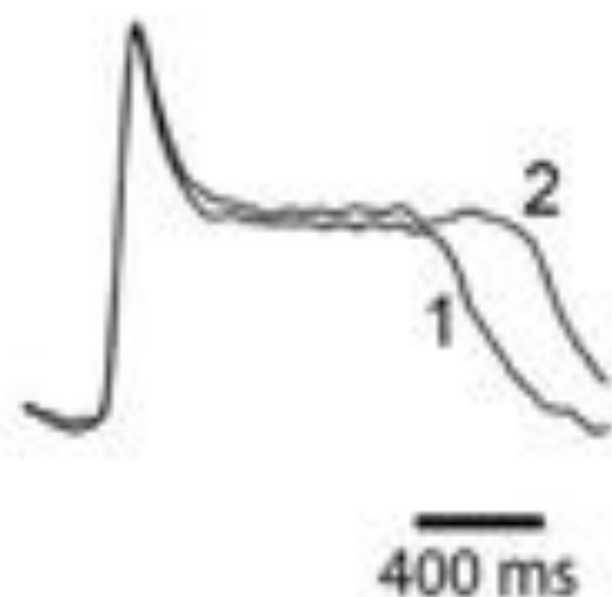


figure 6

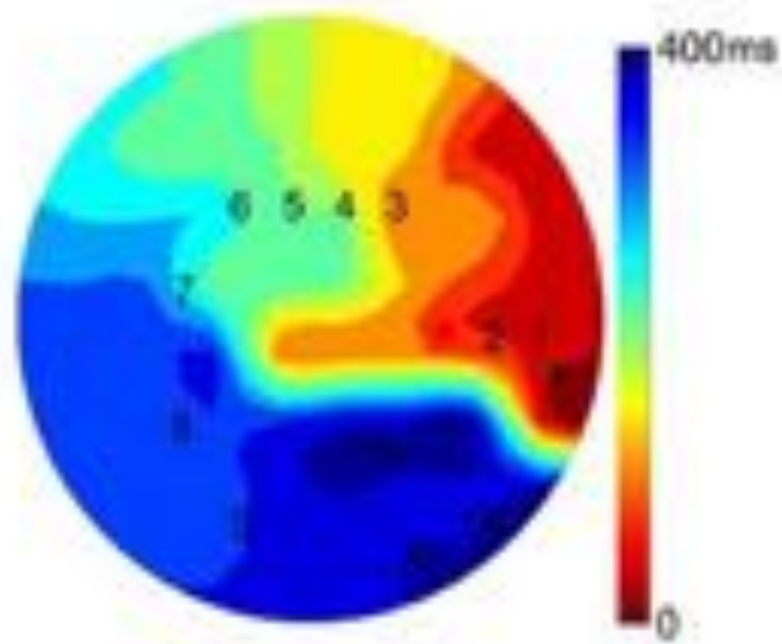
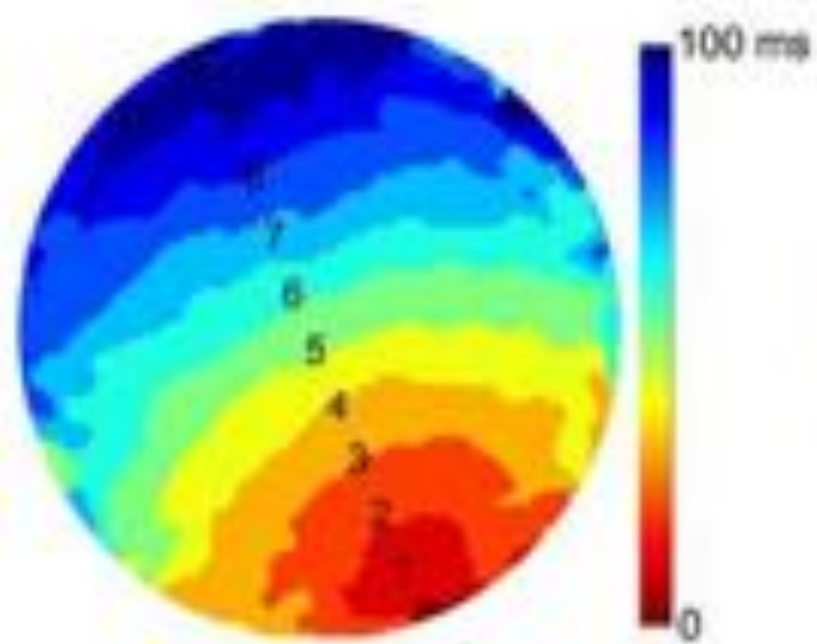
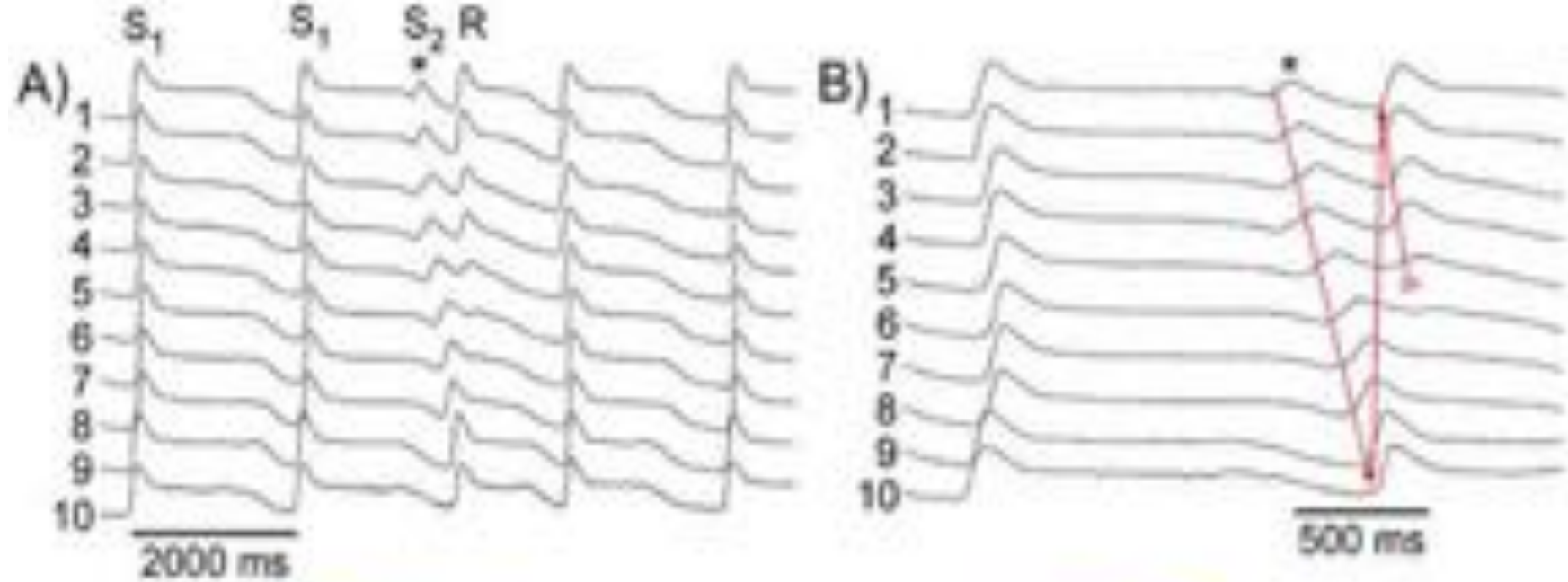


figure 3

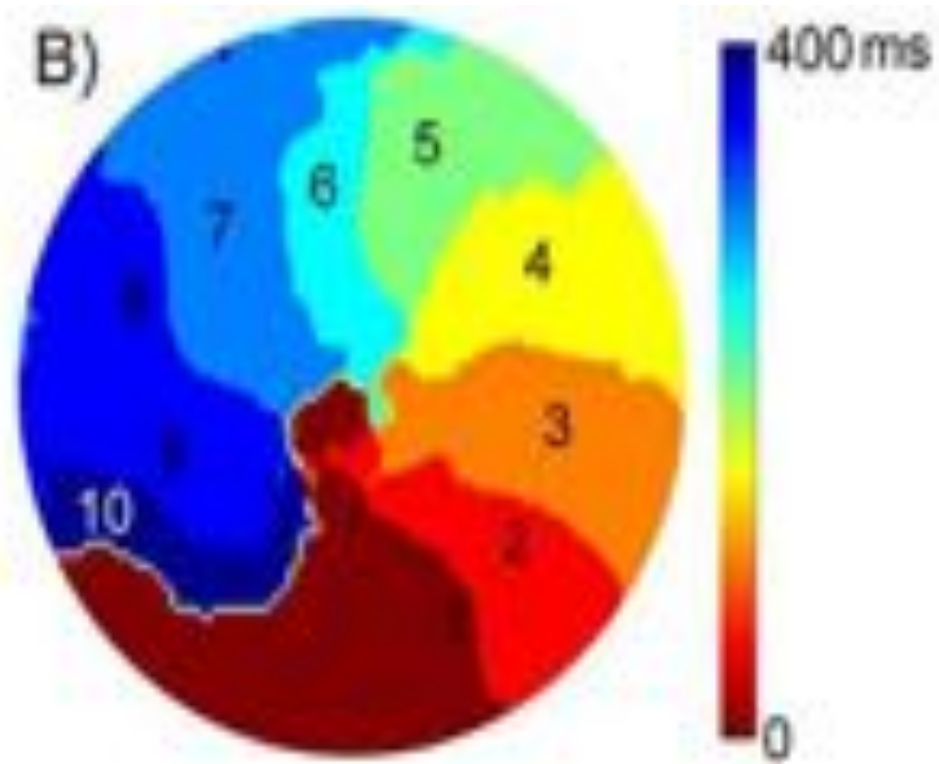
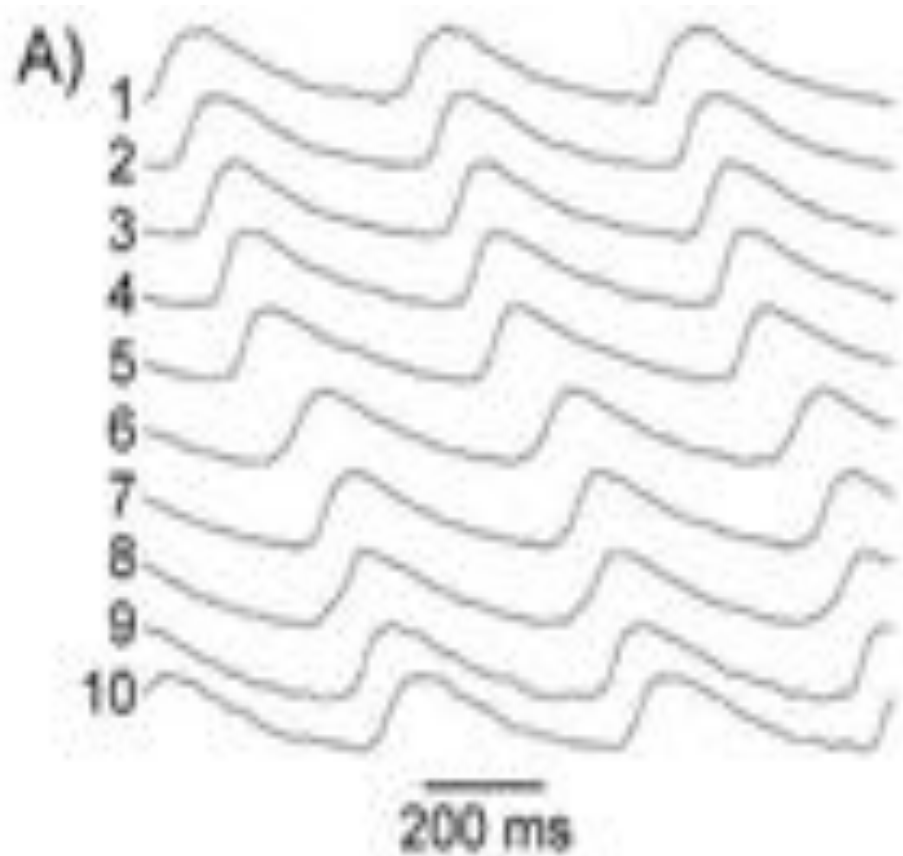
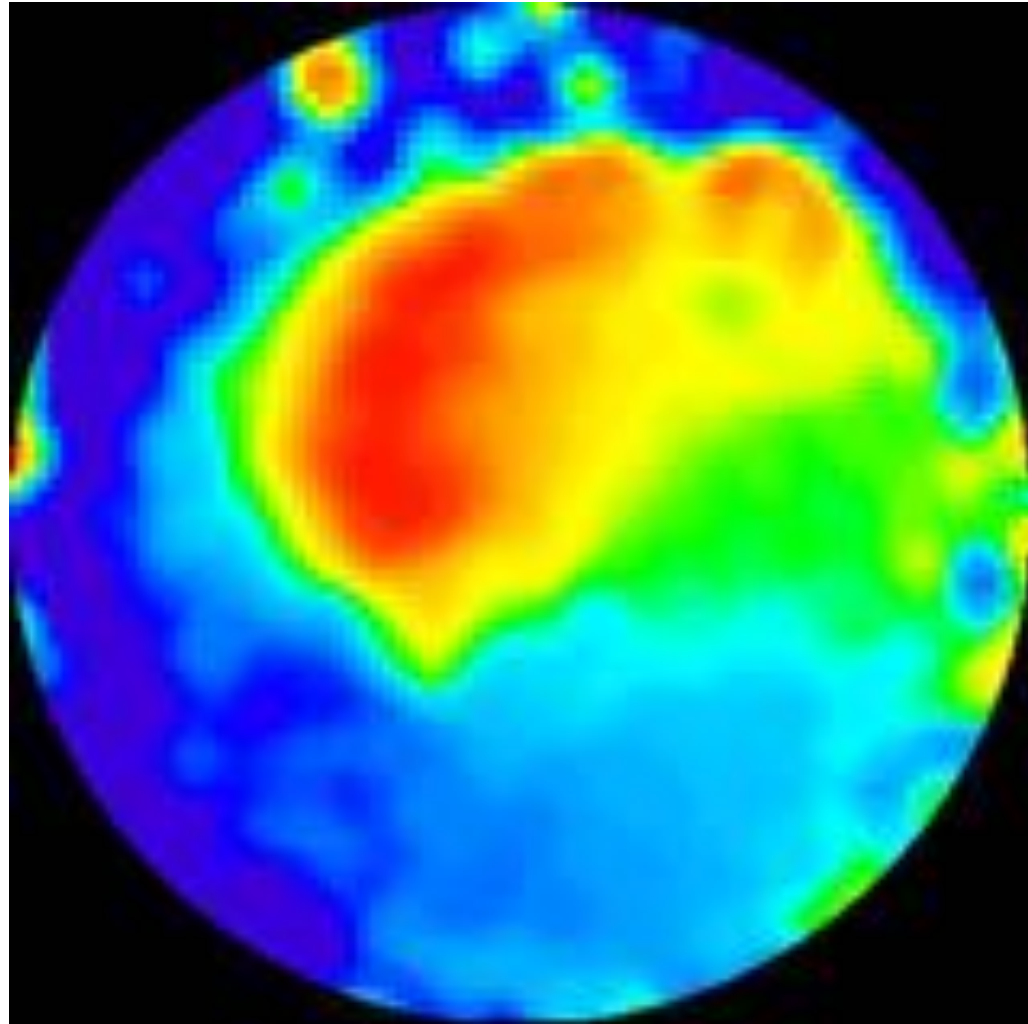


figure 4



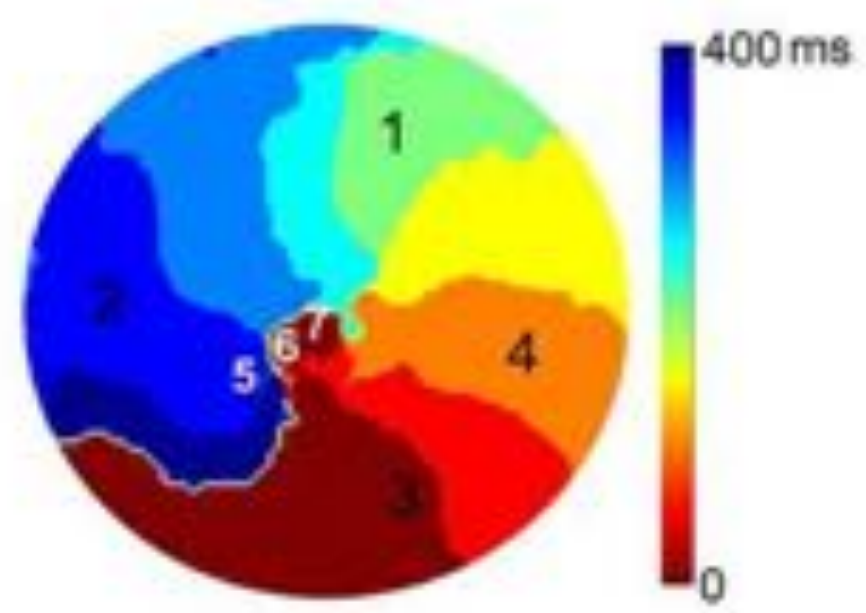
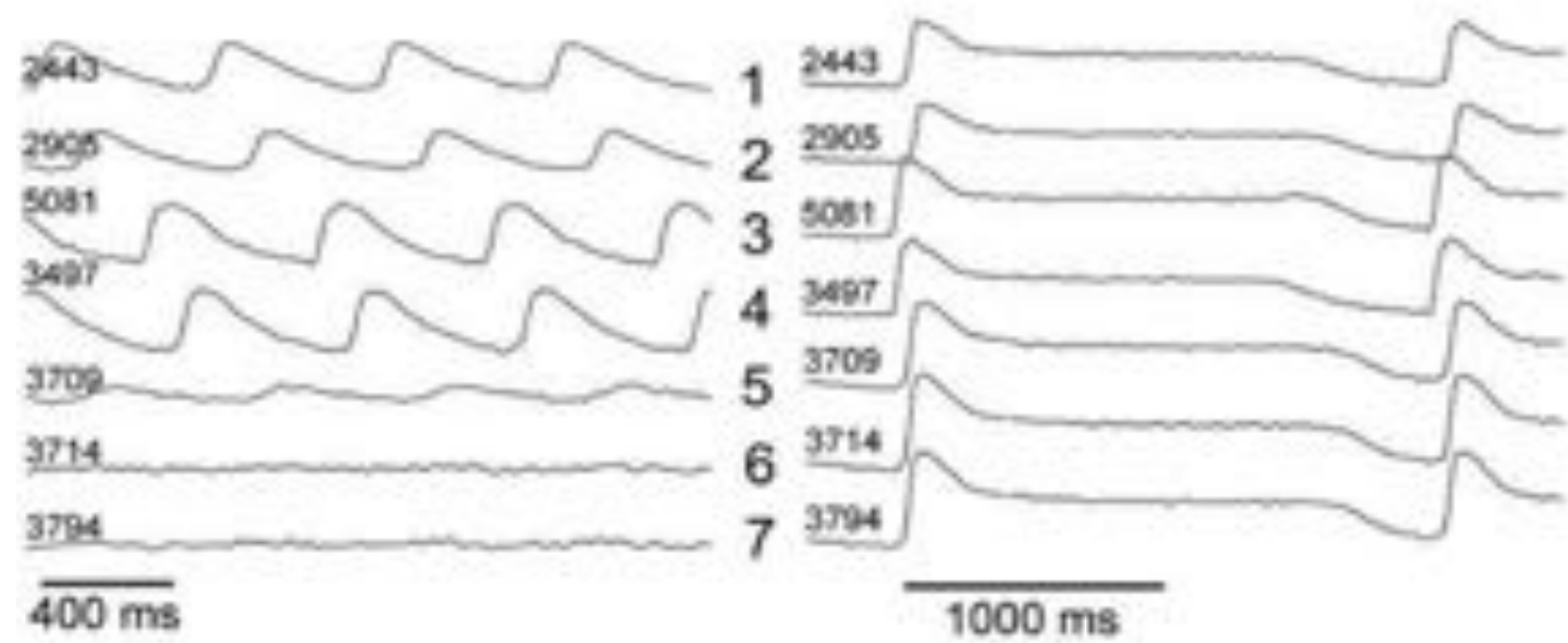
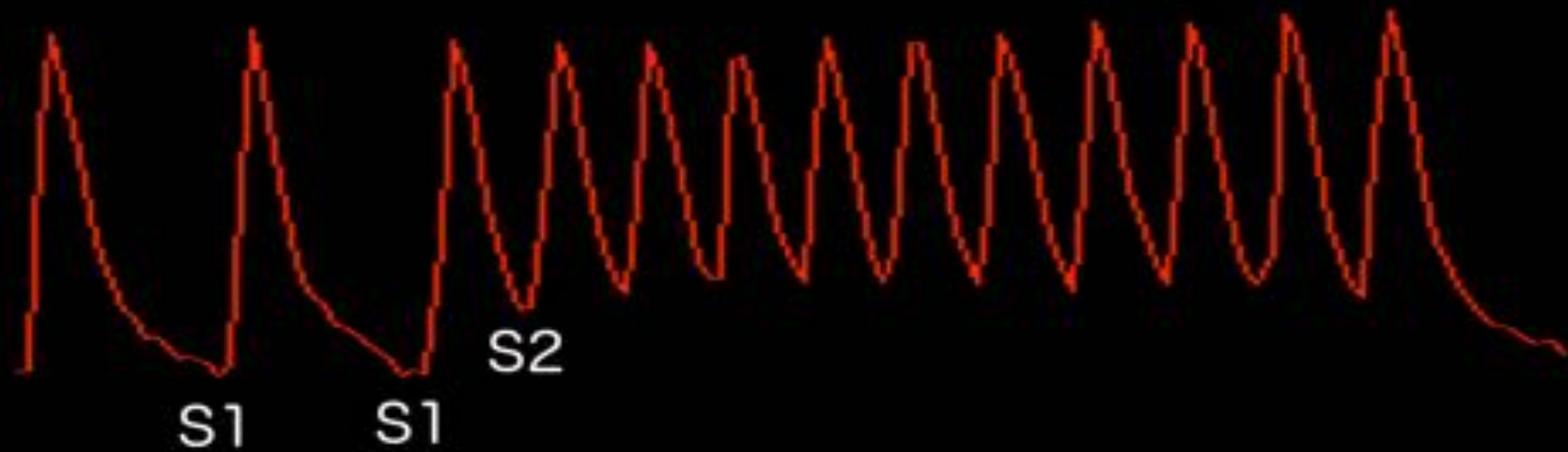
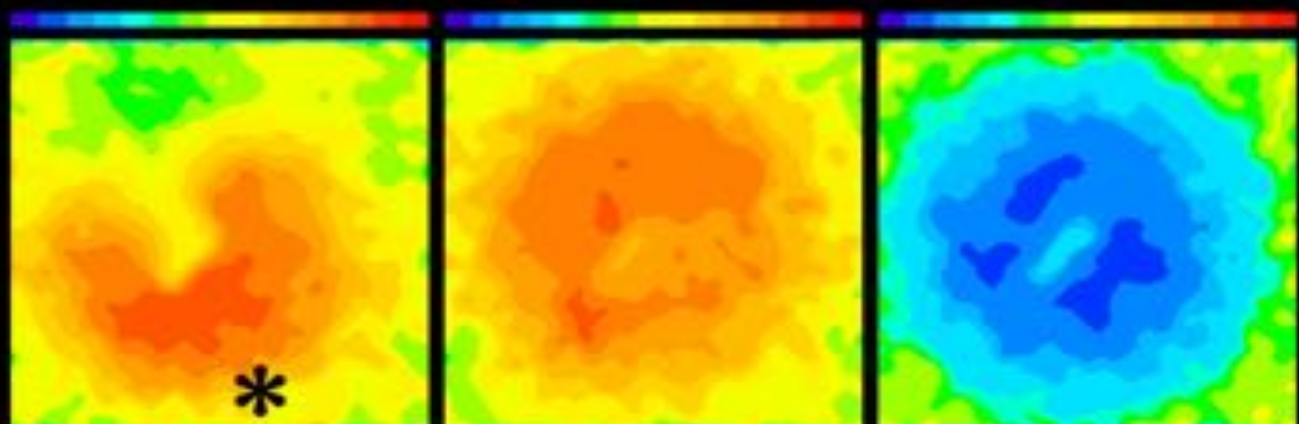
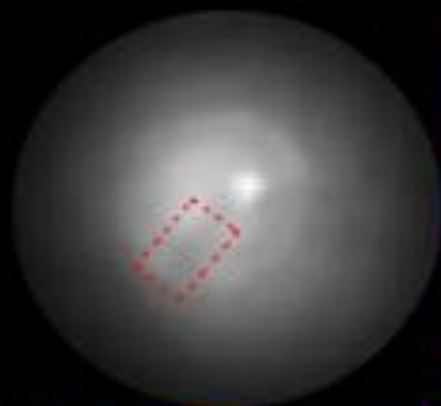
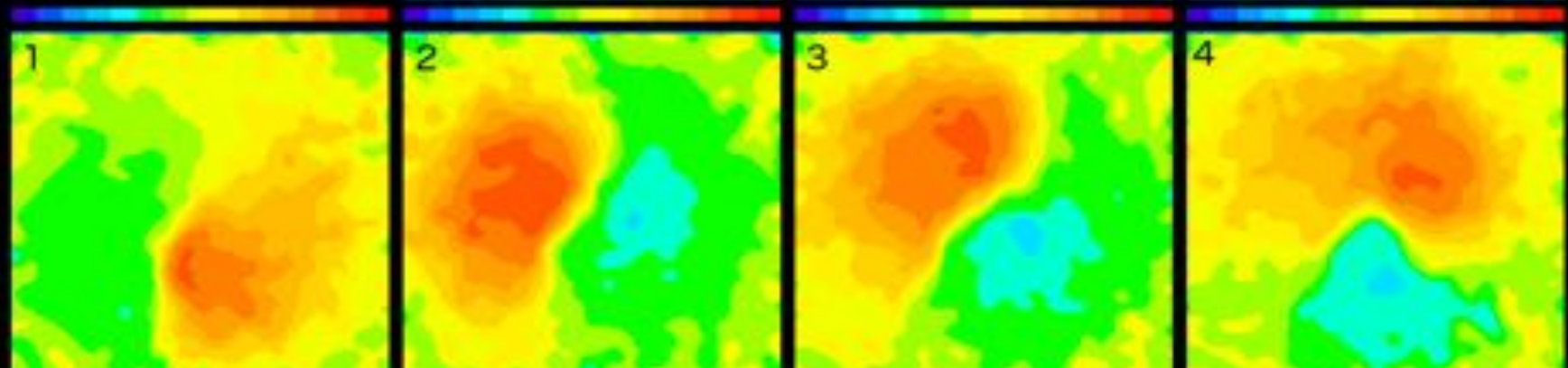
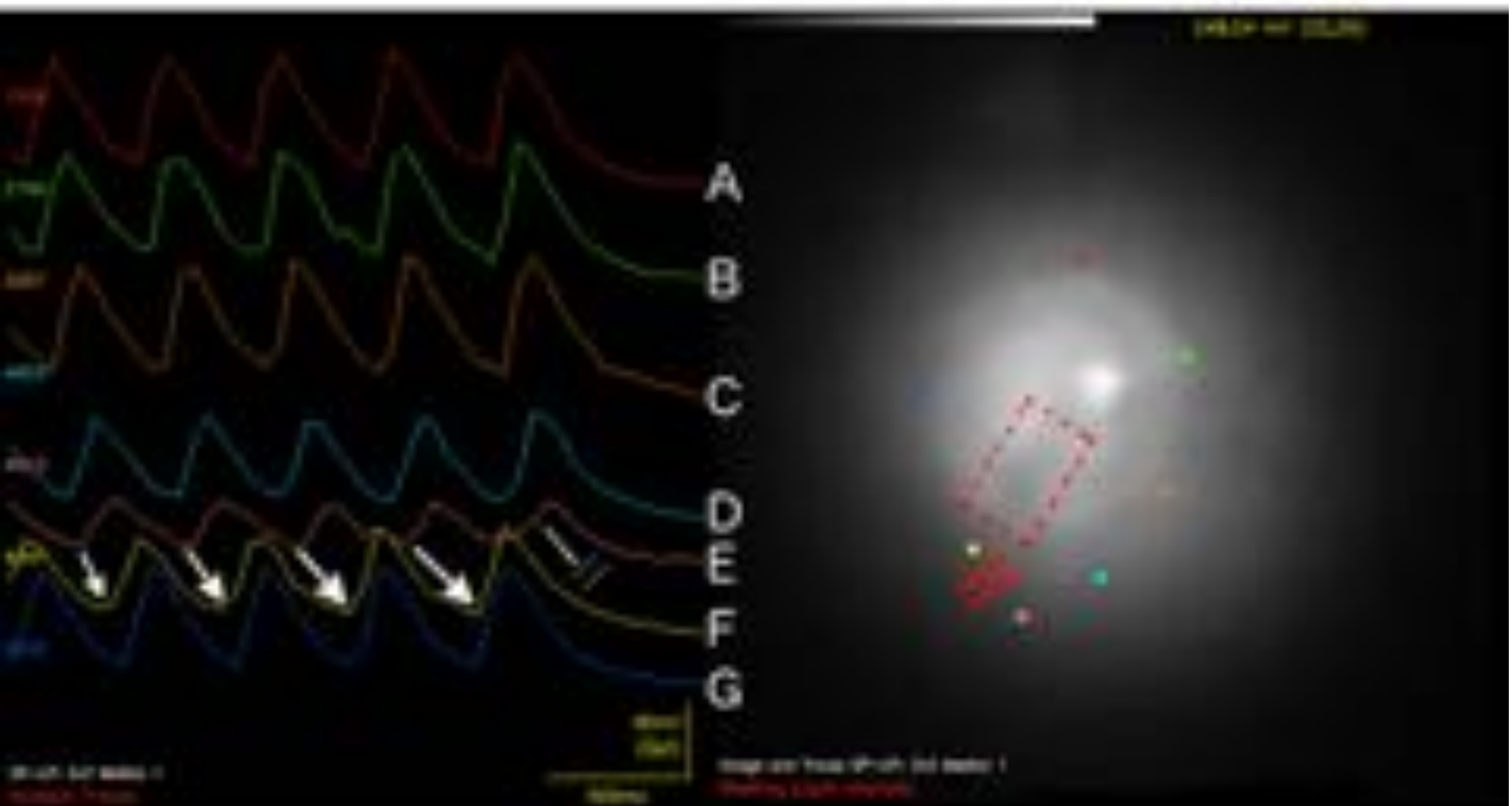
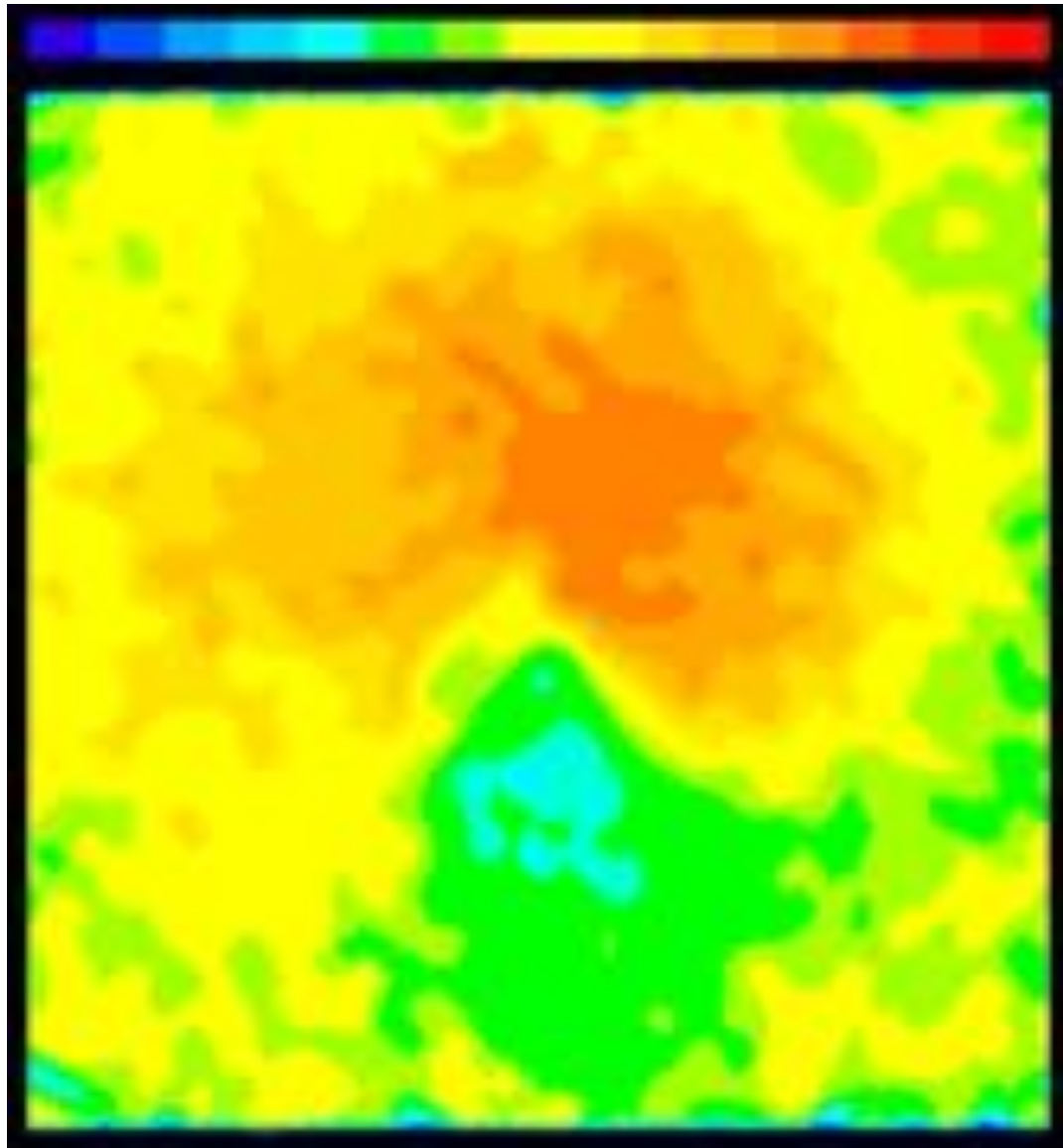


figure 5

A**B**
S1**C**
S2

Termination of Spiral Wave Reentry in a Monolayer with Anatomical Obstacle





CONCLUSION

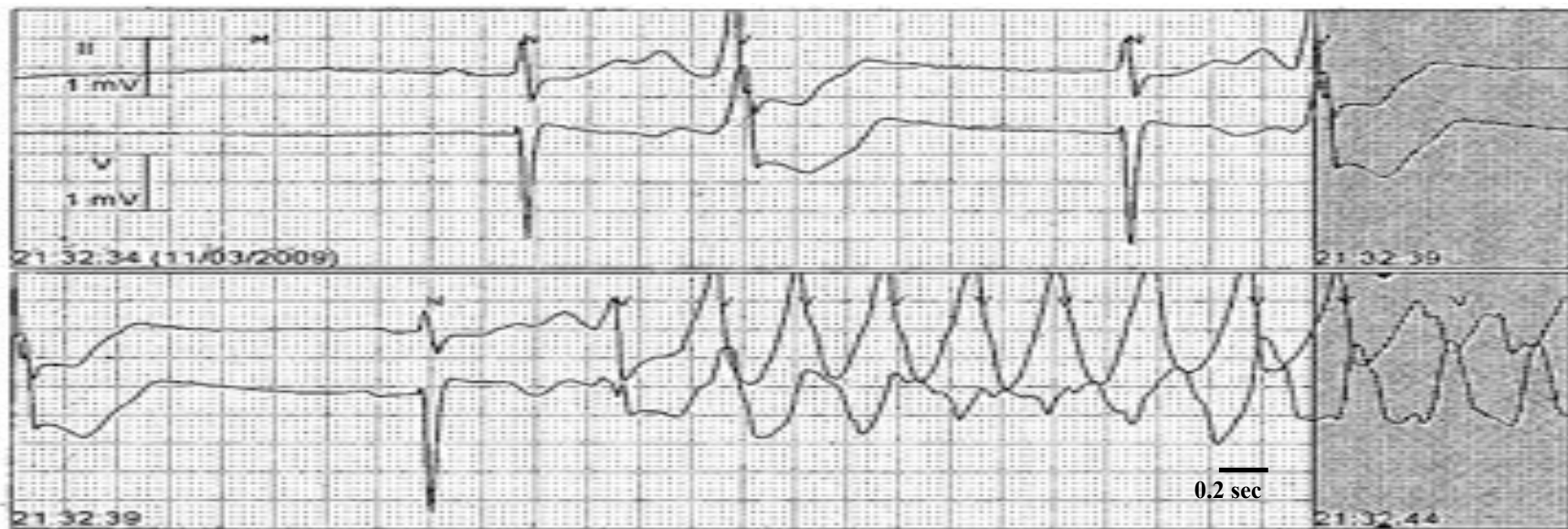
Reentry around an anatomical obstacle always requires an adjacent zone of functional conduction delay. Reentry always terminates by conduction block in this functional zone

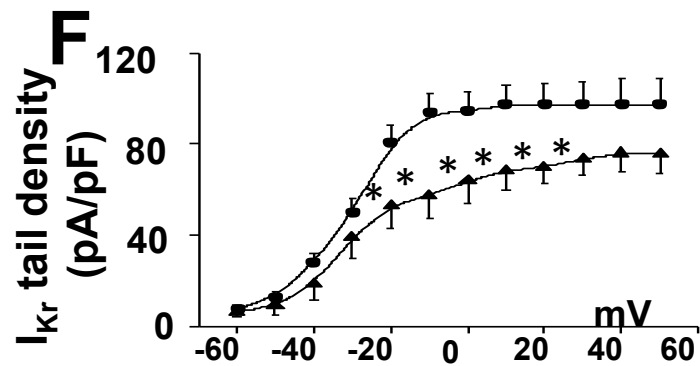
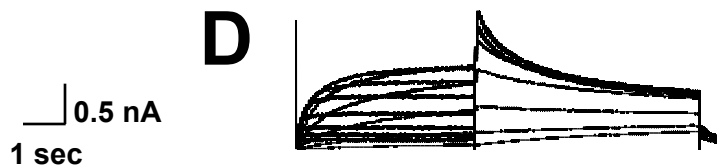
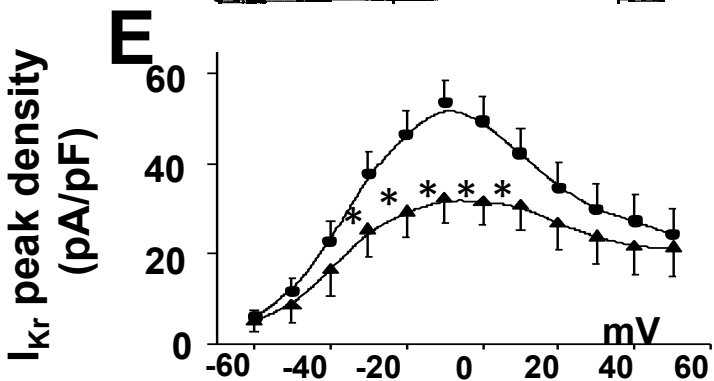
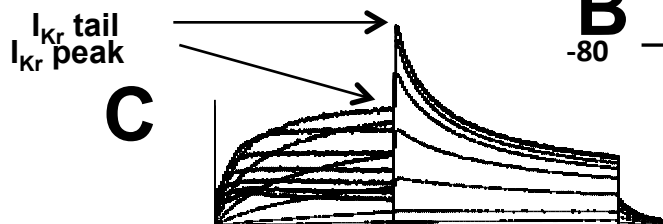
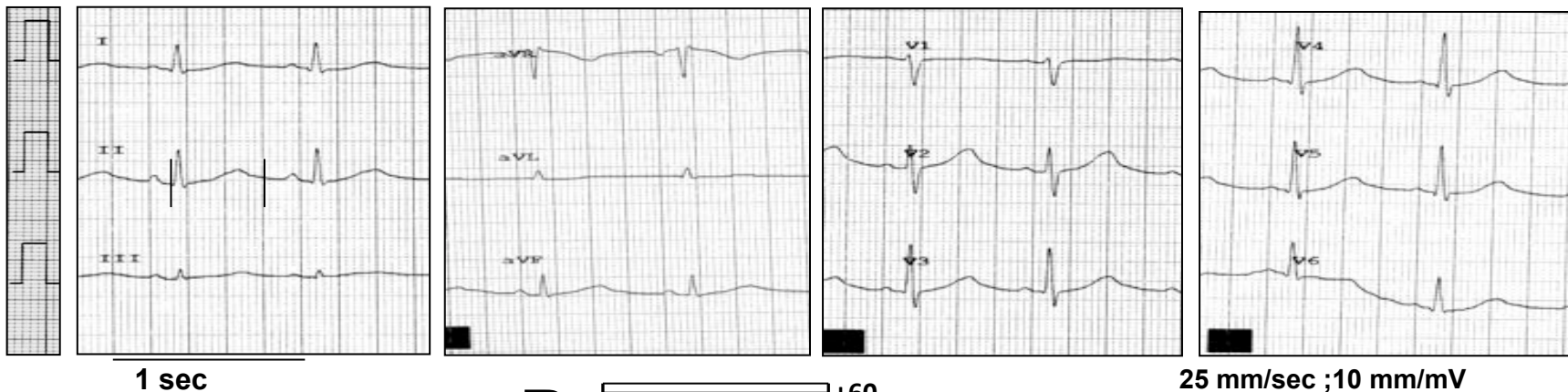
THE CLINICAL EQUIVALENT

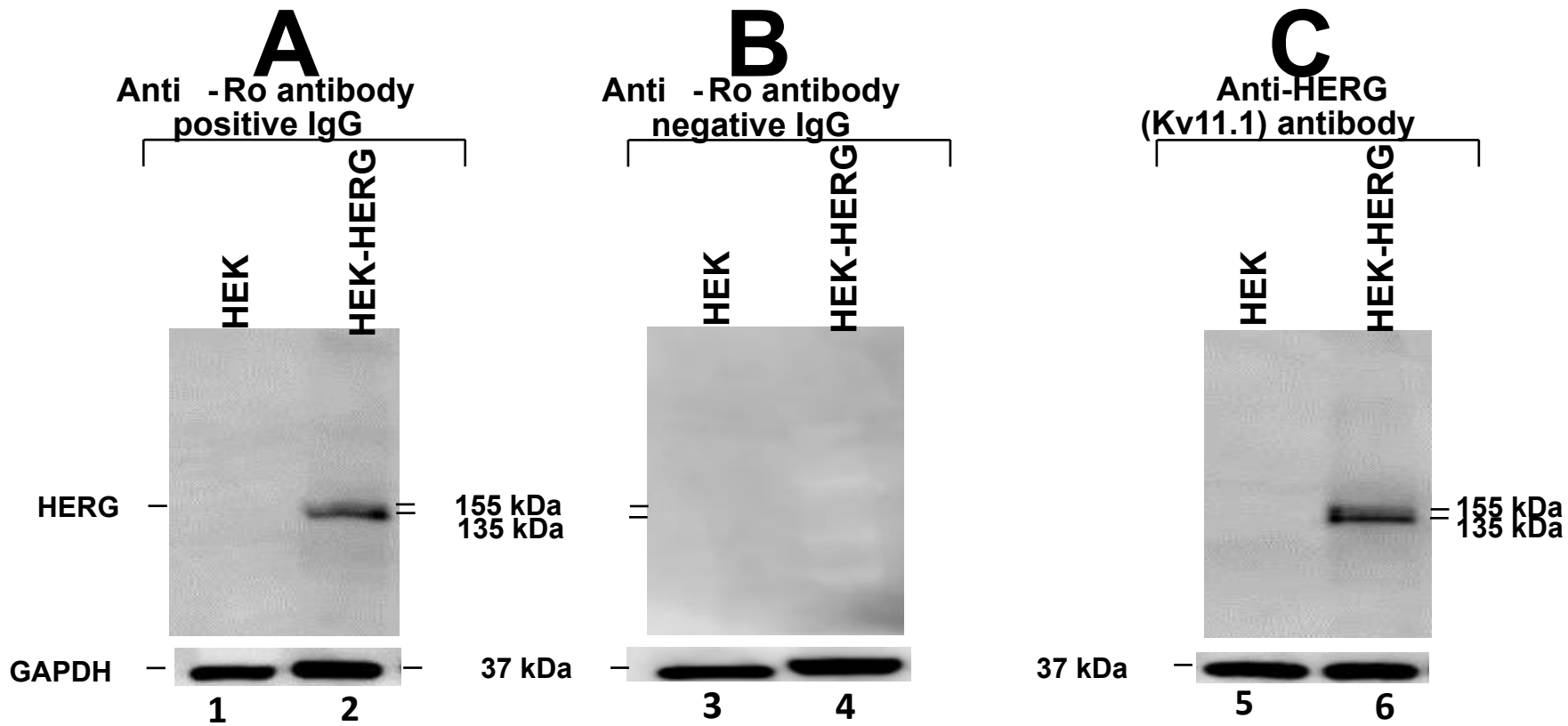
To ablate a reentrant VT around a post-MI scar: do scar mapping to identify the anatomical obstacle and apply RF energy to the adjacent surrounding viable myocardium

Pathogenesis of the Novel Autoimmune-Associated Long-QT Syndrome

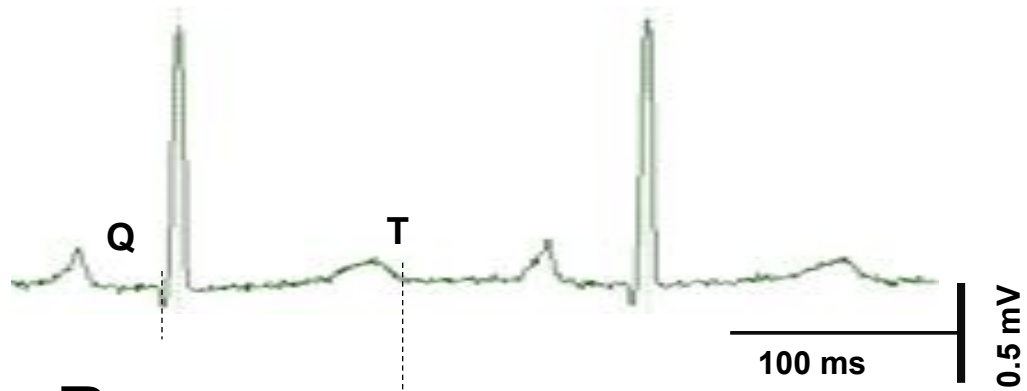
*Yue, El-Sherif, Lazznerini, Boutjdir, et al,
Circulation 2015;132:230-240*



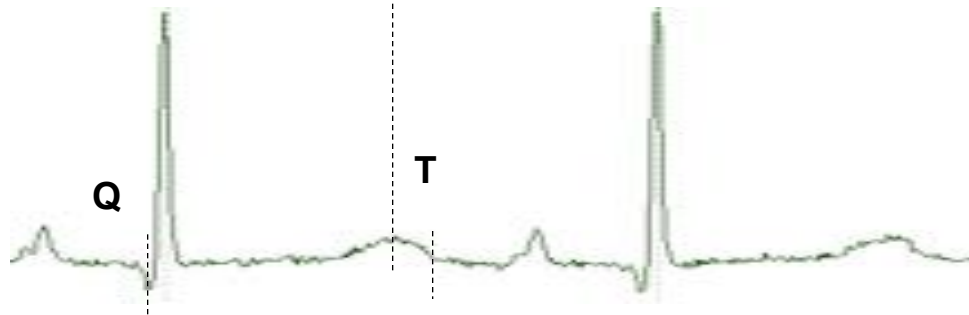
A



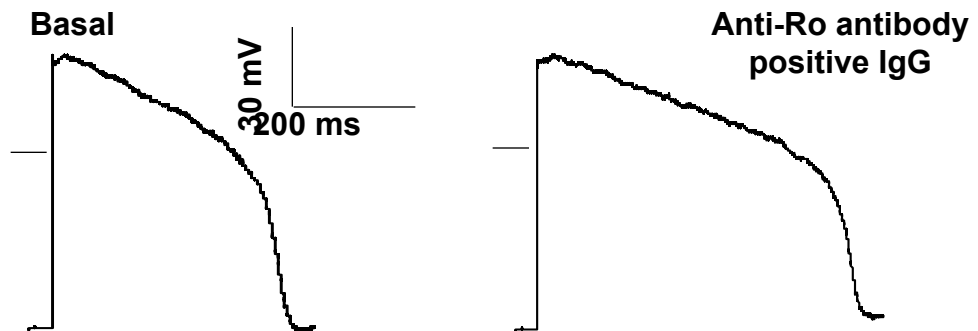
A Before Immunization

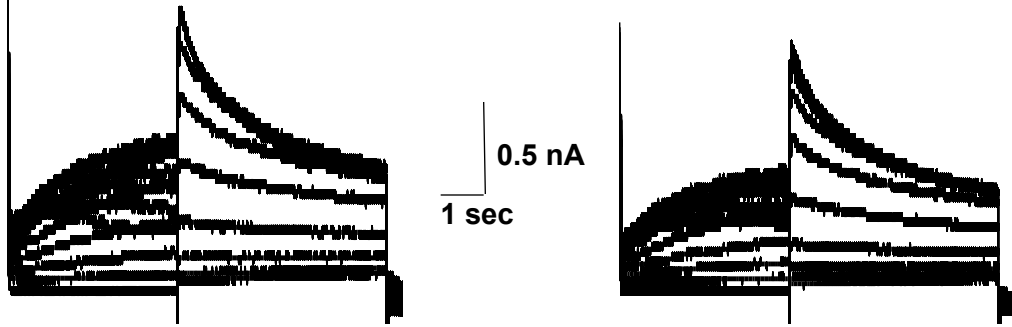
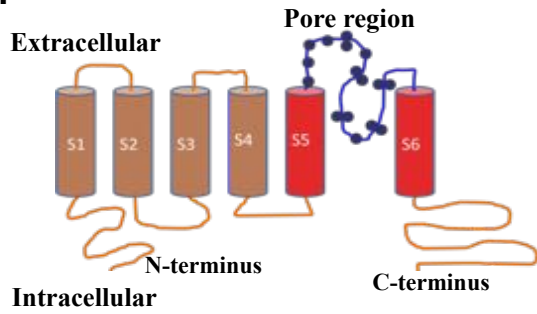


B After Immunization

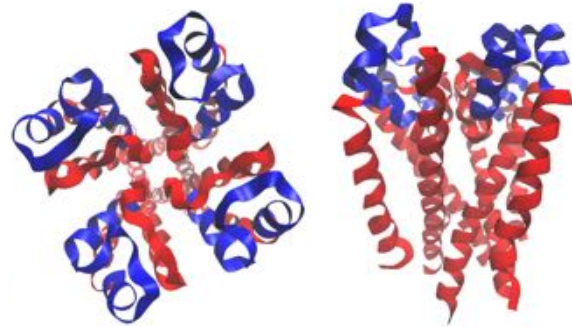


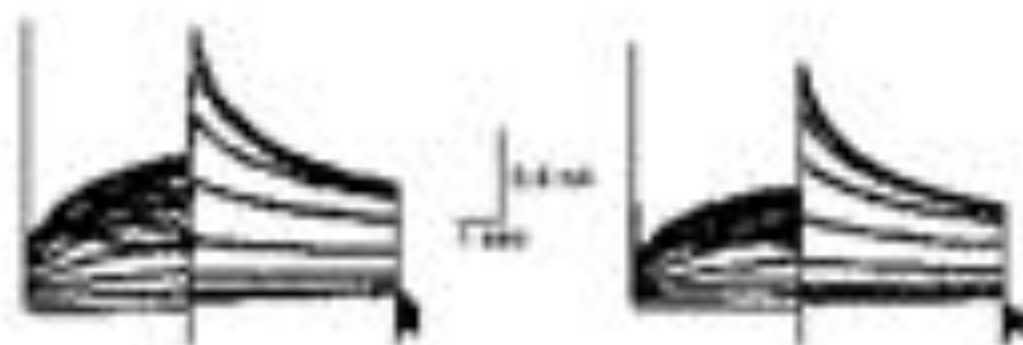
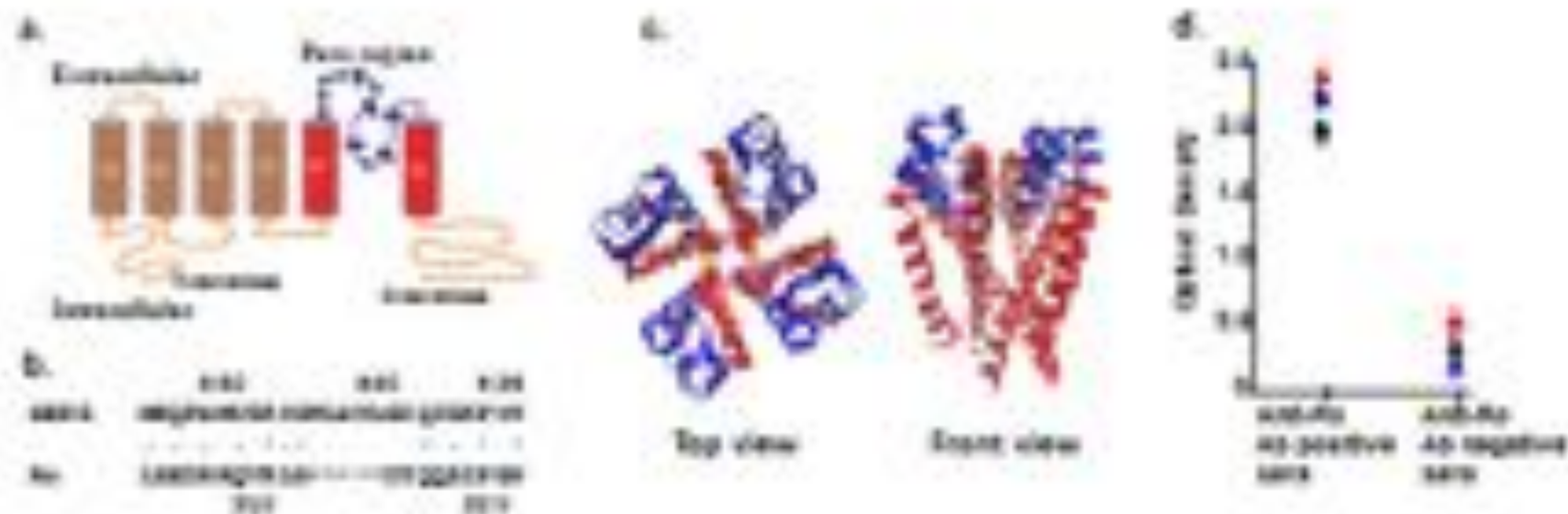
C



A**B****a.****b.**

	580	590	598
HERG	MEQPHMDSRIGWLNHNLGDQIGKPYN		
	:::	:::
Ro	LSEDRRQVRLG-----DTQQSIPGN		
	310		320

c.**Top view****Front view**

A**B**

Peptide based immunotherapy

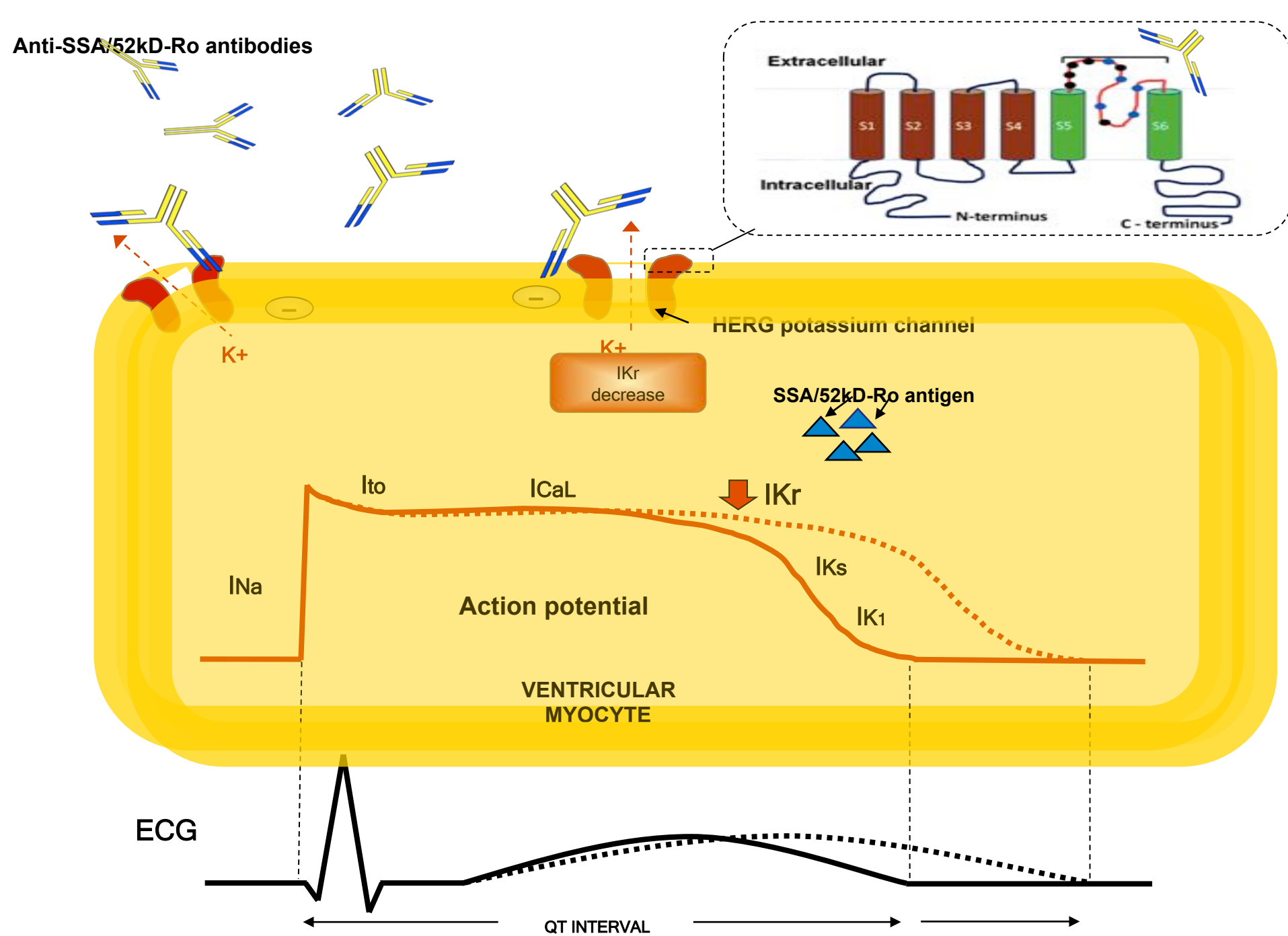


Figure 4



THANK YOU

NABIL EL-SHERIF

Electronic Suppression of early afterdepolarizations In the Neonatal Rat Ventricular Myocyte Monolayer

Himel et al, J Physiol 2013

