Advanced Topics in Cardiac Electrophysiology

Course Directors: David Christini, Ph.D. and Trine Krogh-Madsen, Ph.D.
When: Quarter I; Tuesdays and Thursdays 10am - 12pm.
Location: Starr 460 (except as otherwise noted).
Grading: Based on student participation and end-of-course student presentation.

Summary: This course will survey current areas of scientific interest in cardiac electrophysiology. Material for this course will include: introduction to cardiac electrophysiology (ion channels, action potentials, basics of cardiac electrophysiology); basic and clinical aspects of cardiac arrhythmia; dynamics, initiation, maintenance, and termination of arrhythmia; atrial and ventricular fibrillation and defibrillation; experimental methods; and mathematical modeling. The course will be comprised of lectures as well as moderated videotaped presentations recorded recently by international experts in the field.

Introduction to cardiac electrophysiology
9/5 Ion channels, session 1 Christini
9/7 Ion channels, session 2 Christini
9/12 Basics of cardiac electrophysiology Christini
9/14 The specialized conduction system of the heart Krogh-Madsen

Mathematical modeling in cardiac electrophysiology
9/19 Ionic models Krogh-Madsen
9/21 Markovian ion channel models (Clancy video) Krogh-Madsen
9/26 Modeling Ca\(^{2+}\) dynamics (Shiferaw video) Krogh-Madsen

Dynamics of arrhythmogenesis
9/28 Initiation of ventricular arrhythmias (in A-321) Krogh-Madsen
10/3 Dynamics of ventricular arrhythmias (Garfinkel video) Christini
10/5 Cardiac alternans (Weiss video) Christini
10/10 Dynamics of conduction block (Gilmour video) Gong
10/12 Ischemia and structural heterogeneity Krogh-Madsen
10/17 Non-sustained cardiac reentry (Glass video) (in A-321) Krogh-Madsen

Ventricular arrhythmias and their termination
10/19 Ventricular arrhythmias and their termination Krogh-Madsen
10/24 Clinical aspects of VT (Stevenson video) Christini
10/26 Low voltage defibrillation (Efimov video) Christini

Atrial arrhythmias
10/31 Atrial activation and arrhythmias Gong

Student presentations
11/2 No session
11/7 Student presentations Christini & K-M
11/9 Student presentations Christini & K-M