LECTURE 4, 03 FEB 2005

(1) review of I-V curves
- (A) the interaction of driving force and activation in determining INa
- (B) INa = gNa(V,t)(Vm - ENa)
- (C) IK = gK(V,t)(Vm - EK)
- (D) IL = gL(Vm - EL)
- (E) simulations of voltage-clamp experiments

(2) conductance determined by diving out driving force
- (A) gNa(V,t) = INa/(Vm - ENa)
- (B) gK(V,t) = IK/(Vm - EK)

(3) Gating variables
- (A) m
- (B) n
- (C) h
- (D) differential equations
  - (i) steady-state voltage-dependence
  - (ii) kinetics

(4) Response of gating variables to voltage-clamp commands
- (A) simulations of gating variables
- (B) compare voltage-dependent activation properties and kinetics

(5) assembly of the full HH model
- (A) simulate the action potential
- (B) note behavior of gating variables as f(V) and f(t)
- (C) repetitive firing behavior in response to long duration currents
- (D) the **frequency-current (F-I)** curve as analytical tool

(6) Neuromodulation
- (A) behavioral responses to modulation (what changes?)
  - (i) spike width
  - (ii) repetitive firing behavior (sporadic vs. regular)
  - (iii) "bursting" versus quiescence
  - (iv) **after-hyperpolarization** versus **after-depolarization (plateaus)**
- (B) 4 main systems for neuromodulation
  - (i) adenylate cyclase
  - (ii) guanylate cyclase
  - (iii) inositol triphosphate/diacylglycerol
  - (iv) calcium!!!!!