**PM Project 3**

**The Hodgkin-Huxley**

1. Analyze the m-files given in the project. Draw the flowchart of the program structures (i.e., input-output relations, main and sub-functions, etc.)
2. In this project, as you now the four differential governing model equations must be solved numerically. Write the four differential equations to difference equations so that they can be solved numerically. Explain the computational scheme (i.e., how they are solved on your computer).
3. Run the program HH.m. As you can observe, there are two current shocks to generate action potentials. (i) Explain what happens with the first shock. Check the changes in the membrane potentials, (ii) Explain the results with the second shock. What is different from the first shock?
4. In order to find a threshold for excitation for all-or-none response
   * 1. Turn off the second current pulse by setting **izero**=0 at all time steps
     2. Keep **vhold**=-70
     3. Change **vstart** in 3 millivolt increment starting from -70 millivolts
     4. Plot the results for different values of **vstart** on the same axis. Note. Fix the scale of the figures using the “axis” command of Matlab.
     5. Write down your final threshold value and explain the results

(i) Examine the behaviors of m, h, and n, (ii) Save the results of gNa and gK, and plot them. (iii) Explain the results.

1. We have considered depolarization so far. To see hyperpolarizing shocks, repeat the above experiments, but with **vstart** decreasing starting from rest (-70mV) in increments of -3 mV. (i) Examine the behaviors of m, h, and n, (ii) Save the results of gNa and gK, and plot them. (iii) Explain the results.