Lab 1: Introduction to Biology 480 Lab

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Overview of the course - 5 modules

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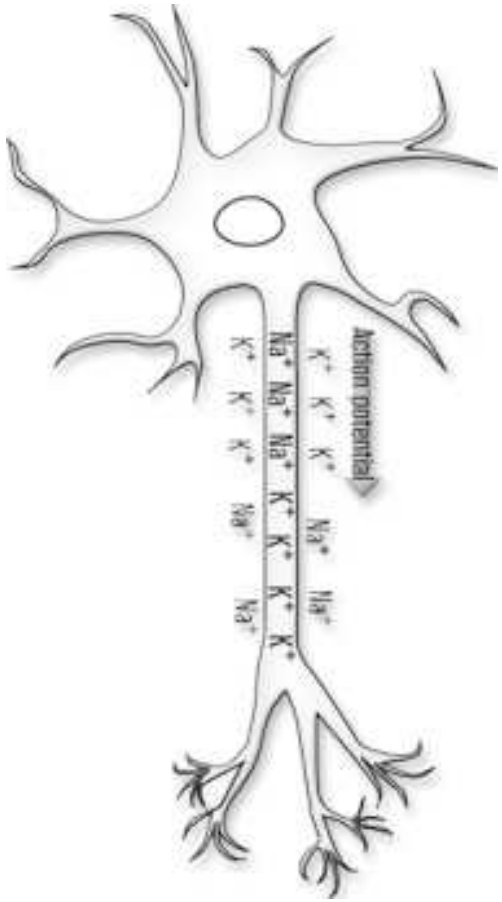
1. Biomechanics

Overview of the course - 5 modules

1. Biomechanics
2. Neurophysiology



Overview of the course - 5 modules

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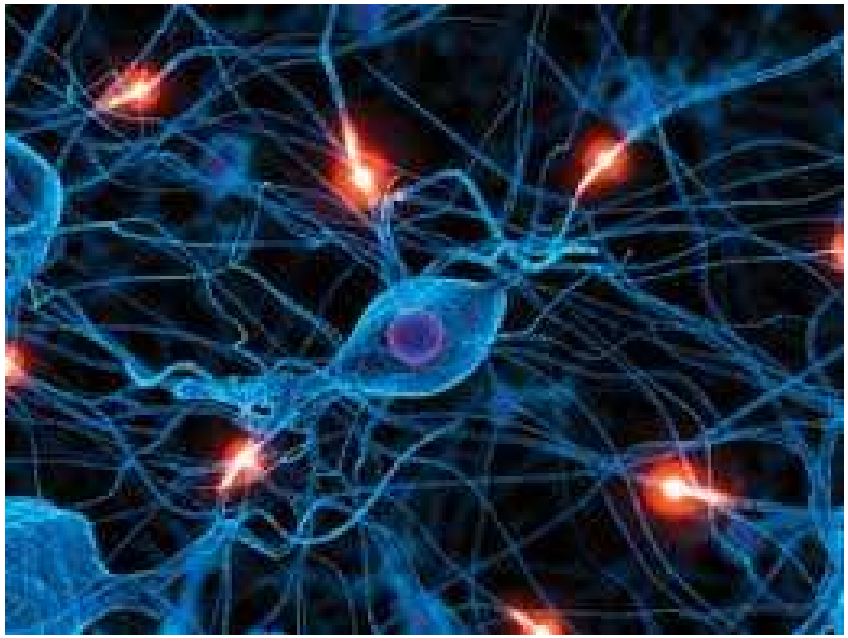
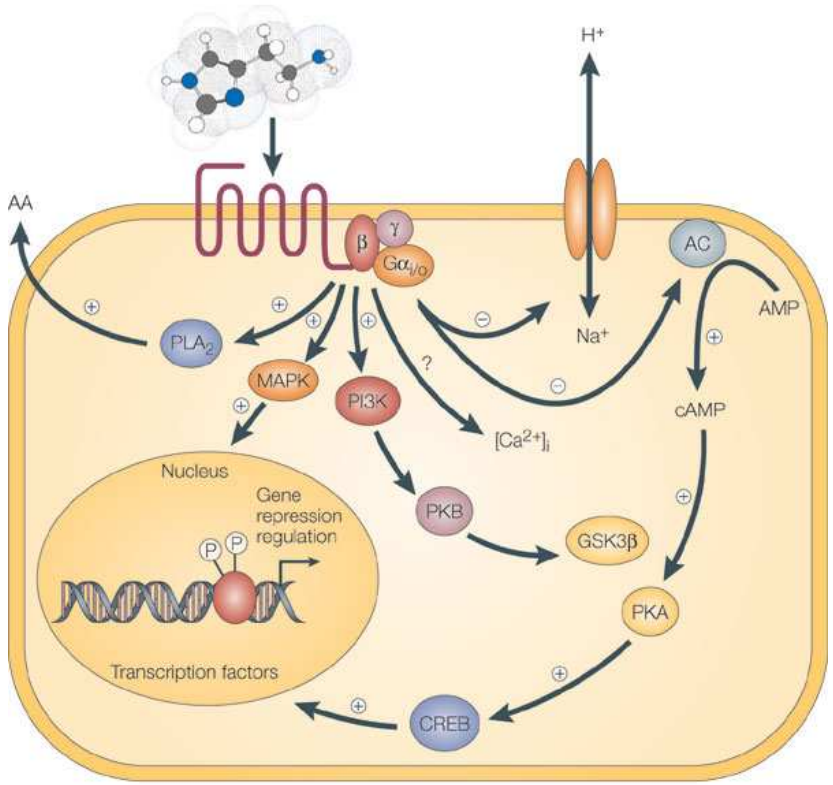
2. Neurophysiology
3. Neuroanatomy



Overview of the course - 5 modules

1. Biomechanics
2. Neurophysiology
3. Neuroanatomy
4. Signaling networks



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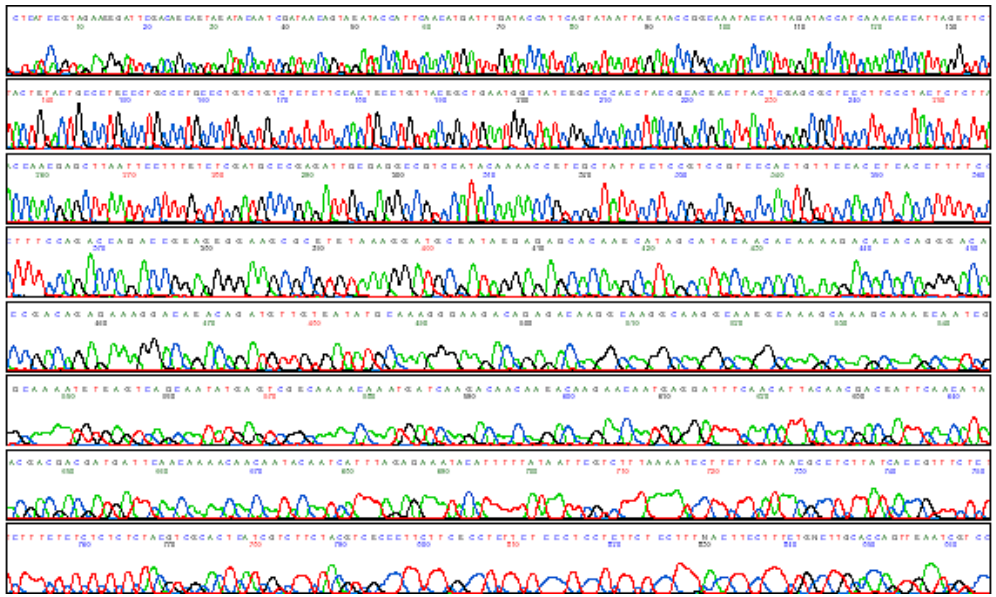
Overview of the course - 5 modules

1. Biomechanics
2. Neurophysiology
3. Neuroanatomy
4. Signaling networks
5. Gene sequence analysis



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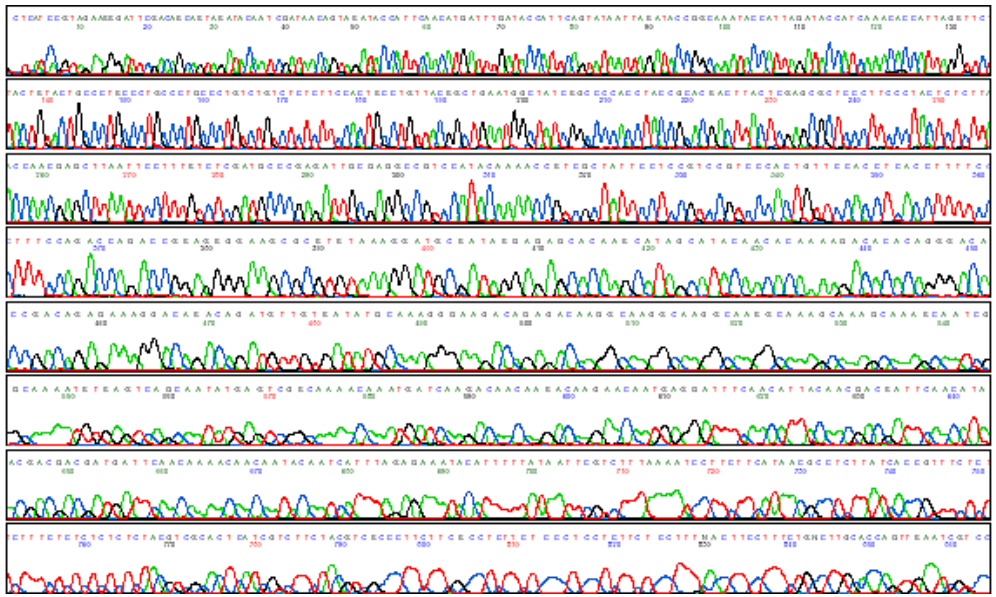


Goal of the labs: familiarize you with software and basic computational approaches to the mathematical problems we will study.

Our modules and the labs

Our modules and the labs

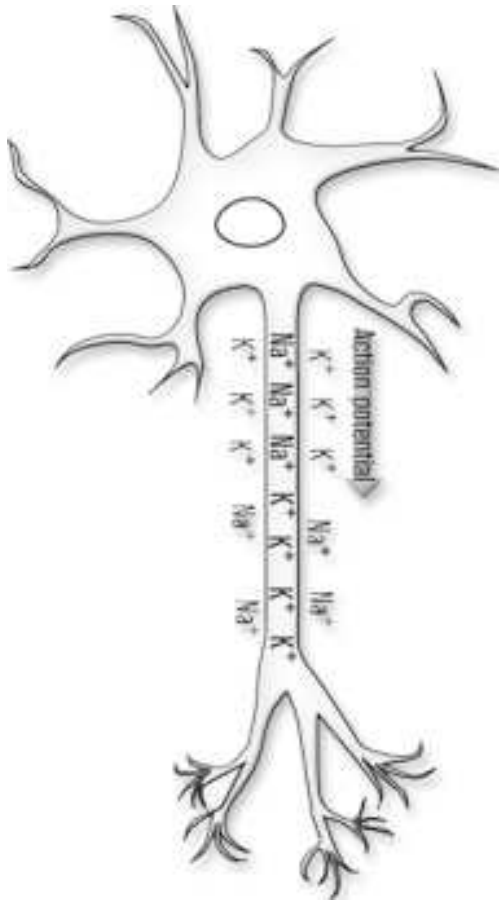
Biomechanics

1. Plotting functions (Winplot, Excel)
2. Basics of Matlab
3. Write simple Matlab scripts to plot a function

Our modules and the labs

Neurophysiology

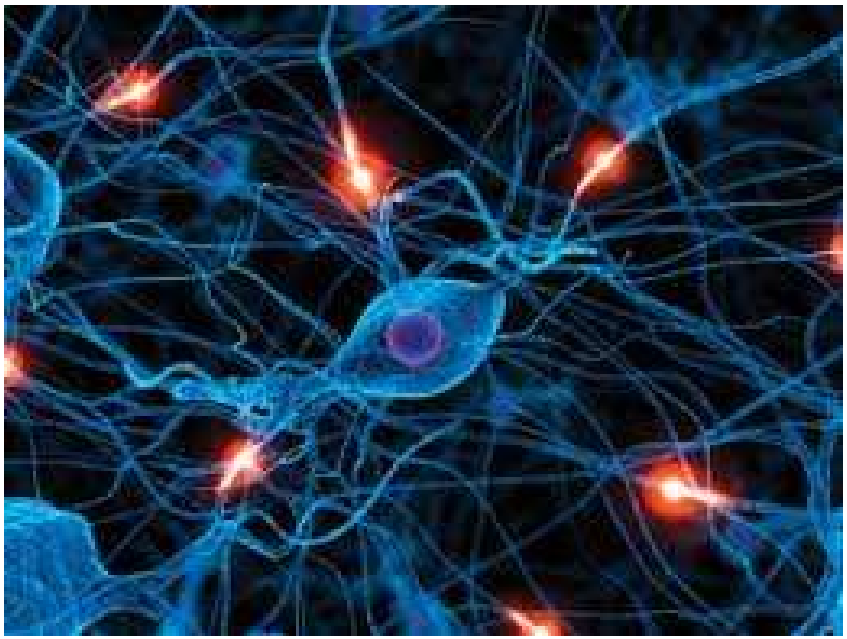
1. Solving differential equations (pplane)
2. Solving ODEs with Matlab (built-in solvers, numerical algorithms)
3. Phase-plane analysis and bifurcations (pplane, Xpp)
4. Example of solving a differential equation



Our modules and the labs

Neuroanatomy

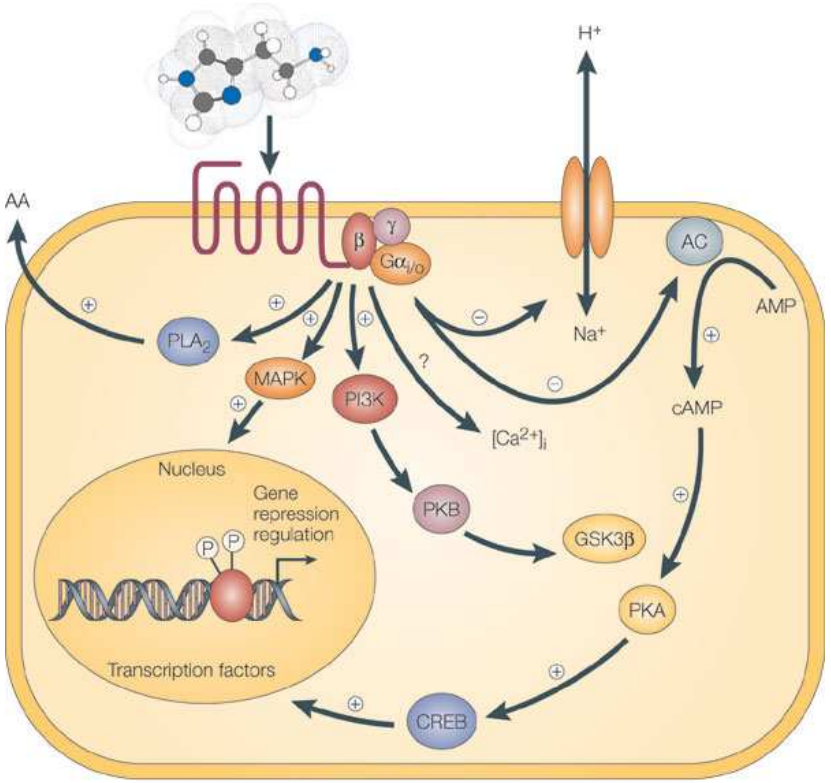
1. Turning graphs into a matrix (example)
2. Matrix-vector and matrix-matrix operations
3. Modify and write Matlab scripts to quantify a graph



Our modules and the labs

Large signaling networks

1. Simulating a large system of equations (connections: graph theory and ODEs)
2. Sensitivity analysis, dependence on parameters
3. Matlab and Simbiology (Matlab toolbox - show example)



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Our modules and the labs

Gene sequence analysis

1. Computational algorithms for searching a database
2. Algorithms for local and global sequence alignment
3. Matlab: bioinformatics toolbox