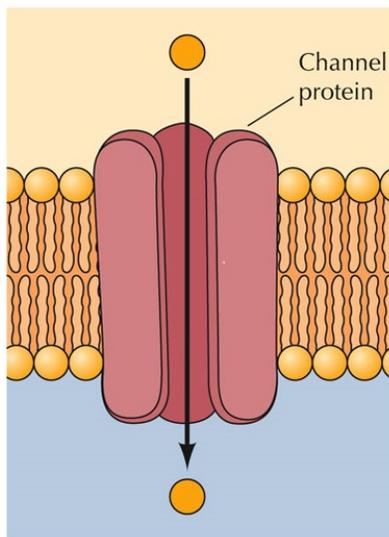*Project 4*

Working with Links in the Membrane Formation Model

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Prepared for

Math 314: Agent-Based Modeling

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In this lab you will (with a group) modify the membrane formation model in the NetLogo Models Library to gain an understanding of how links work, add a channel protein to transport water soluble molecules (a new breed of agent) across a membrane, and then develop a measure to determine if your modified model is working as you predict it should.

Assignment

You will start with the membrane formation model found in the NetLogo Models Library. Set the global parameters to the following values:

- `num-water = 750`

- `num-lipids = 390`

- `water-water-force = 0.2`

- `water-oil-force = -0.7`

- `too-close-force = -0.3`

- `random-force = 0.01`

Change the world size in the "Settings..." to create a world which is 51 patches wide, 7 patches high, and wraps vertically but not horizontally.

Complete the following within your assigned group (there will be time dedicated in class to working on this project, though some elements will need to be completed outside of class time):

1. Create another breed of agent which represents a channel protein. Modify the code of the model so that the channel protein will be attracted to and sit on a membrane layer once formed. You do not need to create the channel protein agent at the beginning of the simulation; you may choose to introduce the channel protein into the simulation after the membranes have formed.

2. Create another breed of agent which represents a water soluble molecule which acts like a water agent, but has the ability to move across the channel protein. In the model, create only a single water soluble molecule agent.

3. Create a measure which is the ratio of how many times a single water soluble molecule agent crosses a channel protein relative to the number of ticks since the membrane formed. Report this value at the end of the simulation.

4. Create a list of the location of the water soluble molecule agent at each time step. On the Interface tab, create a histogram of the water soluble molecule agent's location at each time step (using the list you created). Run the model multiple times and take a screenshot of the interface tab showing the value of your measure and the histogram.

5. Modify the model so that two or more channel proteins are created and each channel protein establishes itself in a different membrane. Run your model multiple times to be sure that a single water soluble molecule agent is able to pass through multiple membranes via channel proteins. Take a screenshot of the interface tab showing the value of your measure and the histogram.

6. **Submit via Box:**

- Your NetLogo file (`P04_Group?.nlogo`)

- Your Screenshot A (`P04_Group?-ScreenshotA.jpg`)

- Your Screenshot B (`P04_Group?-ScreenshotB.jpg`)