

Don't Touch That!

- Purpose:** To demonstrate how a mechanoreceptor transduces touch into an electrical signal. We propose to make a simple model of a mechanoreceptor ion channel. Additionally, we plan to demonstrate discriminative touch between two points using this model.
- Materials:** large bed sheet, small bed sheets, bungee cord, rope, plastic balls, orange traffic cone, geometry compass, ruler, blind fold, blank paper.
- Procedure:** This model calls for four students. First, the four students will stand at the 4 corners of the bed sheet holding a corner. Each student acts as a point stimulus for the receptor field. Pulling on the corners will stretch the receptor and open the ion channel. The receptor is the bed sheet with a hole in the middle. The hole will stretch via the bungee cord with rope attached to the cord running out to the corners of the bed sheet. Once the students pull on the corners, the hole will open wider allowing the balls to rush through the hole, simulating the entry of ions through the channel leading to depolarization of the cell and transduction of the mechanical signal into an electrical signal. To demonstrate the difference between receptor field size, we will have two different experiments. The first will demonstrate a large receptor field that doesn't discriminate between short distance stimuli (the students pulling on the corners), by using a large sheet with four students pulling one to a corner. The second will use two smaller sheets and each student will be able to pull on two corners of the sheet, now the receptor field of each cell is smaller and the system can discriminate between two points (two students per cell). In a second model we will have the students participate in a two point discrimination experiment. We will integrate the concepts of mechanoreceptor field size into a practical application. We will have the students test each other using a geometry compass and vary the distance between the points (0.5, 1, 2, 4, 8 cm) to test what parts of the body have smaller or larger receptive fields (finger tip, back of hand, cheek, forearm).

Issues: This model only addresses one part of the signaling pathway—touch leading to depolarization. None of the higher order processes to discern differences from the receptors are explained. Additionally, this model doesn't look at the differences between rapidly adapting and slowly adapting cells.

Lesson Plan: Students will learn how mechanoreceptors function and learn about discriminative touch through the 2-point stimulus test.