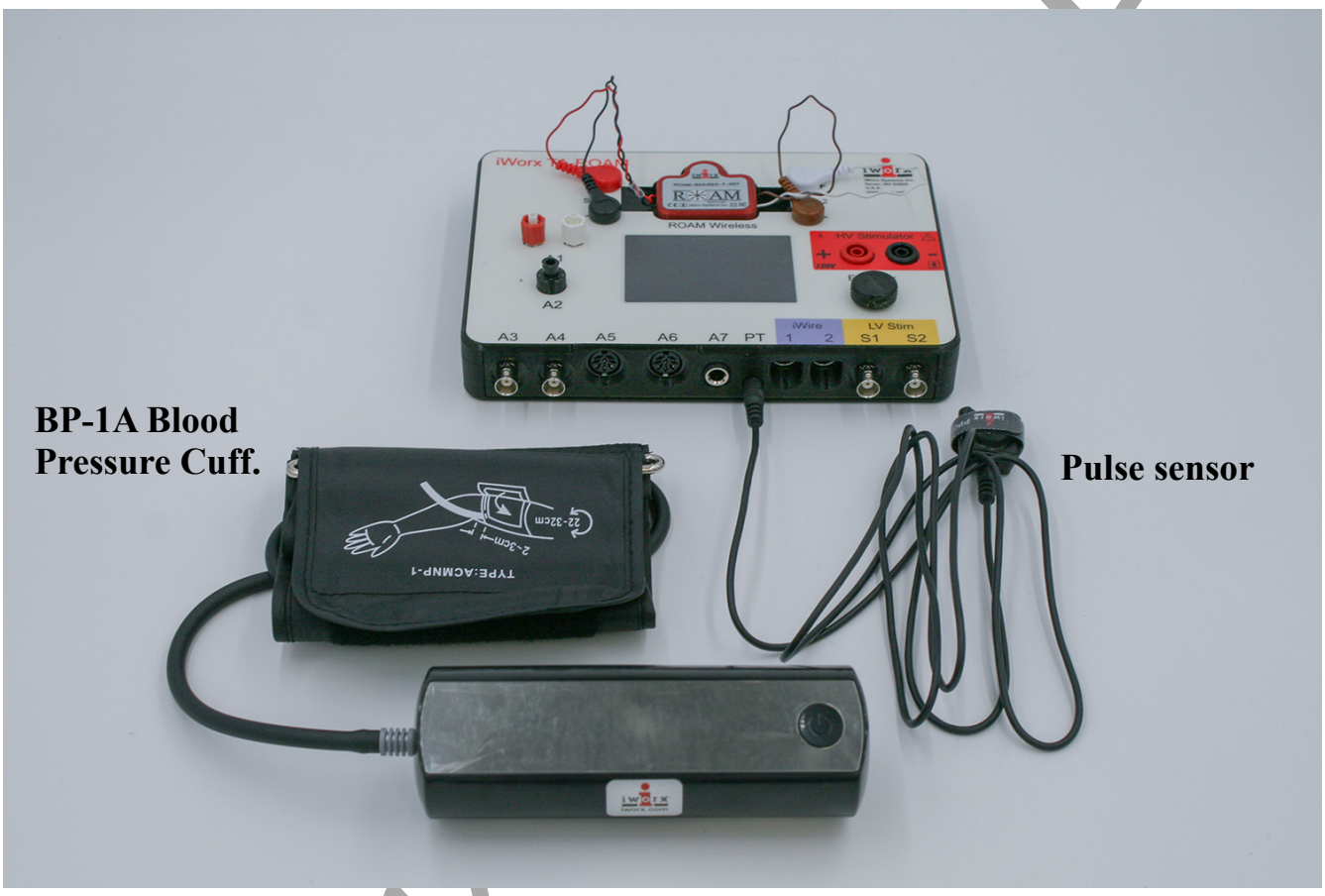
Foundation Lab 5: Blood Pressure and Circulation

Automated Blood Pressure and Pulse Transducer Setup

1. Find the automatic blood pressure monitor and blood pressure cuff.
2. Slide the gray connector on the tubing of the BP cuff into the port on the left side of the BP monitor.
3. To turn on the BP monitor using the On/Off switch on the right side of the monitor.
4. Plug the pulse sensor into the PT port.



5. Click AutoBP on the Views menu on the LabScribe toolbar.

Manual Blood Pressure and Pulse Transducer Setup

1. Find the blood pressure cuff, black extension tubing and the pulse sensor in the kit. This is a different type of cuff from the automated one.
2. Plug the extension tubing into the BP cuff tubing, and then connect the other end of the tubing into channel A2.
3. Plug the pulse sensor into the PT port.
4. Click IXTA View on the Views menu on the LabScribe toolbar.

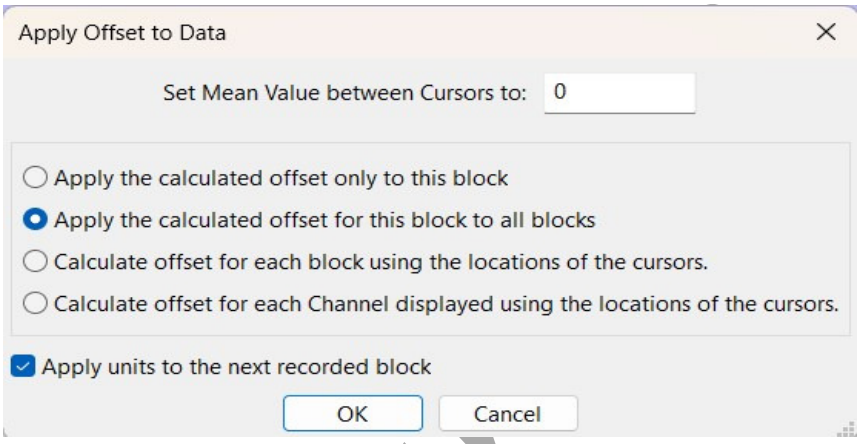
Pulse sensor

Cuff and extension tubing

If using the Manual BP Cuff

Procedure to Set the Offset for the Blood Pressure Cuff

1. Lay the cuff of the BP-220 on the lab table and click on the Record button. Record for about 20 seconds. Click Stop.
2. On the Blood Pressure channel, move one cursor to the left side of the screen and the other to the right, spanning about 6-8 seconds of data.
3. Click V2-V1 on the right side of the Blood Pressure channel and click Set Offset.
4. When the Set Offset window opens, set the values and radio buttons as in the image below. Click OK.
5. Click Save As in the File menu and save your data file.



Exercise 1: Blood Pressures from the Left Arm (Automated and Manual BP)

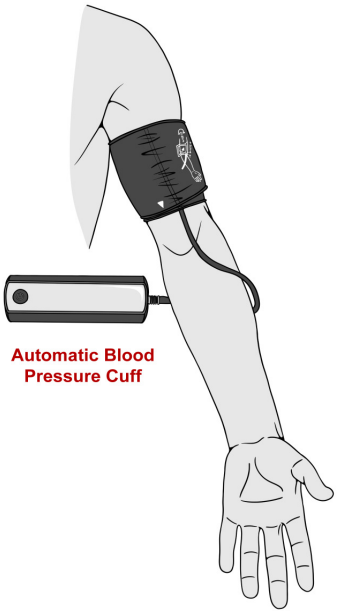
Aim: To determine the systolic and diastolic blood pressures in a subject, and determine if the subject is hypotensive (low blood pressure), normotensive, or hypertensive (high blood pressure).

Procedure

1. Have the subject sit and relax for a few minutes.
2. Place the blood pressure cuff around the upper portion of the left arm, just above the elbow. Fasten the cuff securely. The **diagram on the cuff** shows how to place it on the arm.
3. Place the pulse sensor on the fleshy part of the left thumb. Tighten the velcro strap so the subject can just feel the pulse in their thumb. It should not be too tight or too loose. Wrap the Velcro strap around the end of the finger to attach the unit firmly in place.
4. Click Record.
5. Make sure the pulse channel show good, clean pulse waves with no noise. If not, click Stop, and check the tension on the pulse sensor.

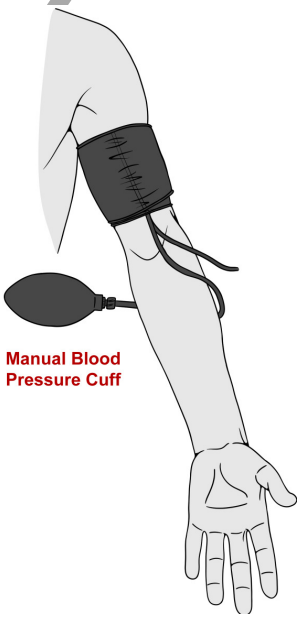
There will only be a pulse channel. BP is measured on the LCD screen of the automated cuff.

6. Measure Blood Pressure:



- AUTOMATED BP CUFF: Push the "Start" button the front of the unit. The LCD screen will turn on and the unit will automatically inflate the cuff and slowly deflate the cuff as it measures both the systolic and diastolic pressures.

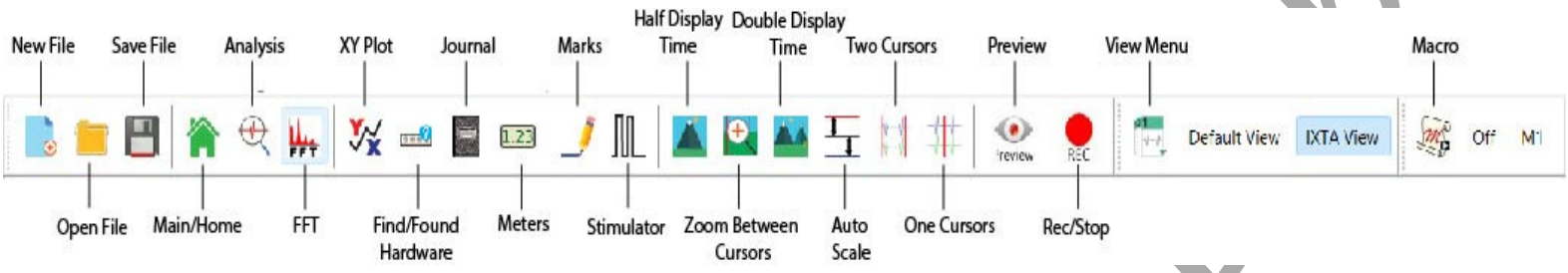
- MANUAL BP CUFF: Once there is a clean pulse recording, inflate the blood pressure cuff to about 180 mmHg. This value will be shown on the right side of the blood pressure channel. As the cuff is inflated, the pulse wave will disappear.
  - Once the pulse wave disappears, SLOWLY release the air in the cuff at a rate of about 10mmHg per second.



7. Once the pulse waves reappear and the blood pressure cuff has been sufficiently deflated, click the Stop button. Make sure the blood pressure cuff is completely deflated and is not putting any unnecessary pressure on the subject's arm.
8. Save your data file.

Data Analysis

1. Use the Display Time icons to double the display time ("two mountains" icon) until you can see data before the cuff was inflated, when the pulse waves disappear and while the cuff was being deflated.



2. **Automated BP Cuff:**
   - Look at the pulse waves. You should notice that the pulse is occluded during the measuring of the BP by the automated cuff. The pulse waves return as the cuff deflates.
   - Read the systolic and diastolic blood pressures on the LCD screen of the BP monitor. Heart rate can also be measured automatically.
   - Record blood pressure values.

3. **Manual BP Cuff:**
   1. **Pulses -** Measure the average amplitude of a few pulse waves before the cuff was inflated.
      - Place one cursor on the trough before the pulse wave, and the other cursor on the peak of the pulse wave.
      - Look at V2-V1 on the right side of the pulse channel to get this value.
      - Determine a mean value for 3 good pulse waves.
   2. Blood Pressure:

      - Click the single cursor icon on the toolbar.
      - Move this cursor to the peak of the first pulse wave that appears as the cuff was being deflated. Read Value on the right side of the blood pressure channel. This will be the systolic blood pressure.
      - Compare the pulse waves after the systolic pressure to the pulse waves before the cuff was inflated. Choose the pulse wave after the systolic pressure that is closest in amplitude to the waves before inflation. Move cursor to the chosen pulse wave
      - Look at the Value on the pulse channel to determine this. Once you have found the pulse wave, read the Value from the blood pressure channel. This will be the diastolic blood pressure.

Table: Classification of Blood Pressure Levels

Class	Systolic Pressure (mmHg)	Diastolic Pressure (mmHg)
Hypotensive	<90	<60
Normal	120	and 80
Prehypertensive	120-139	or 80-89
Hypertensive Stage 1	140-159	or 90-99
Hypertensive Stage 2	>160	or >100

Exercise 2: Repeatability of Blood Pressure Measurements

Aim: To determine the repeatability of the blood pressure measurement.

Procedure

1. Repeat the procedures outlined in Exercise 1 on the same subject, using the right arm and right thumb.
2. Click Save to save your data file.

Data Analysis

Use the same techniques used in Exercise 1 to determine the systolic and diastolic blood pressures of the subject.

Questions

1. Are the systolic and diastolic blood pressures from Exercises 1 and 2 identical? What are the possible sources of variation?
2. Since the pressures are determined using changes in the pulse amplitude, would slowing the rate at which pressure is released from the cuff make your readings more accurate?

Exercise 3: Blood Pressures from the Forearm

Aim: To examine whether blood pressure declines with distance from the heart.

Procedure

1. The subject should continue to rest before and during this exercise.
2. Move the blood pressure cuff from the upper right arm to the lower right arm.
3. Use the same procedure in Exercise 1 to record the subject's blood pressures from his or her lower right arm.
4. Click Save to save your data file.

Data Analysis

Use the same techniques used in Exercise 1 to determine the systolic and diastolic blood pressures recorded from the lower right arm of the subject.

Question

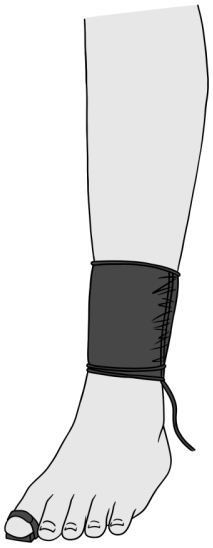
Are the values from the forearm the same as those obtained with the cuff on the upper arm? Explain any variations that you see.

Exercise 4: Blood Pressures from the Leg

Aim: To measure blood pressures from the leg.

Procedure

1. Instruct the subject to sit and relax.
2. Place the blood pressure cuff around the lower left leg, just above the ankle, and the pulse sensor on the left large toe (just like you did on the thumb). Wrap the Velcro strap around the end of the toe to attach the unit firmly in place.
3. Use the same procedures used in Exercise 1 to determine the blood pressures in the subject's left leg while they are sitting.
4. Save your data file.



Data Analysis

Use the same techniques used in Exercise 1 to determine the systolic and diastolic blood pressures recorded from the left leg of the subject.

Question

Are the blood pressure values from the leg the same as those obtained from the arms? Explain any differences.

Experiment GB-7: Venus Flytrap ~ Reactions

Exercise 1: The Effect of Delayed Stimuli on Trap Closure

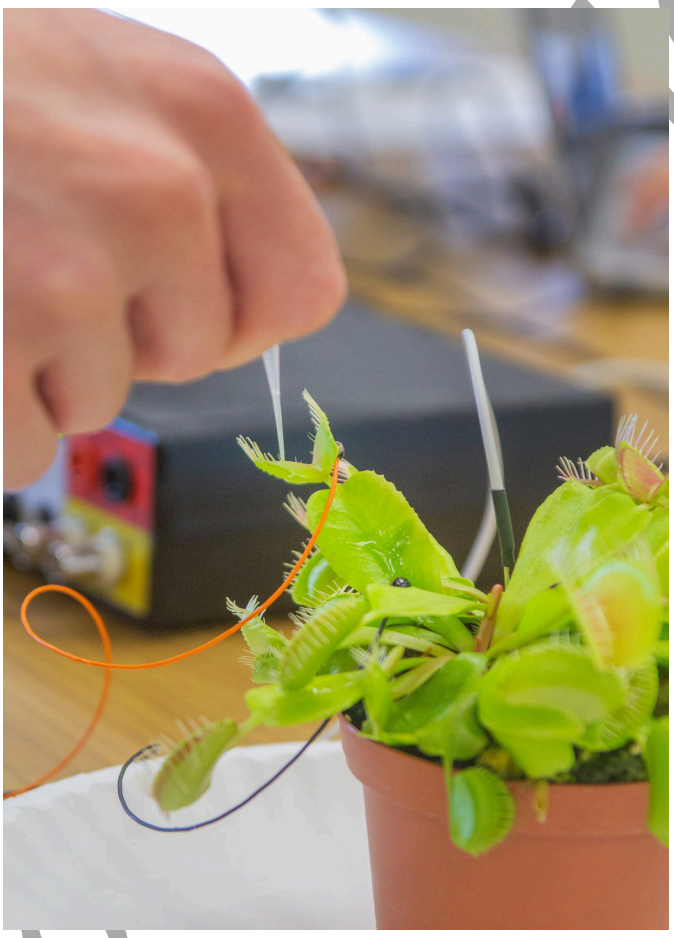
Aim: To observe how the timing of stimuli affects trap closure.

Approximate Time: 15

NOTE: Timing is important. The person operating the computer needs to be ready to immediately mark the recording when the internal spines are touched.

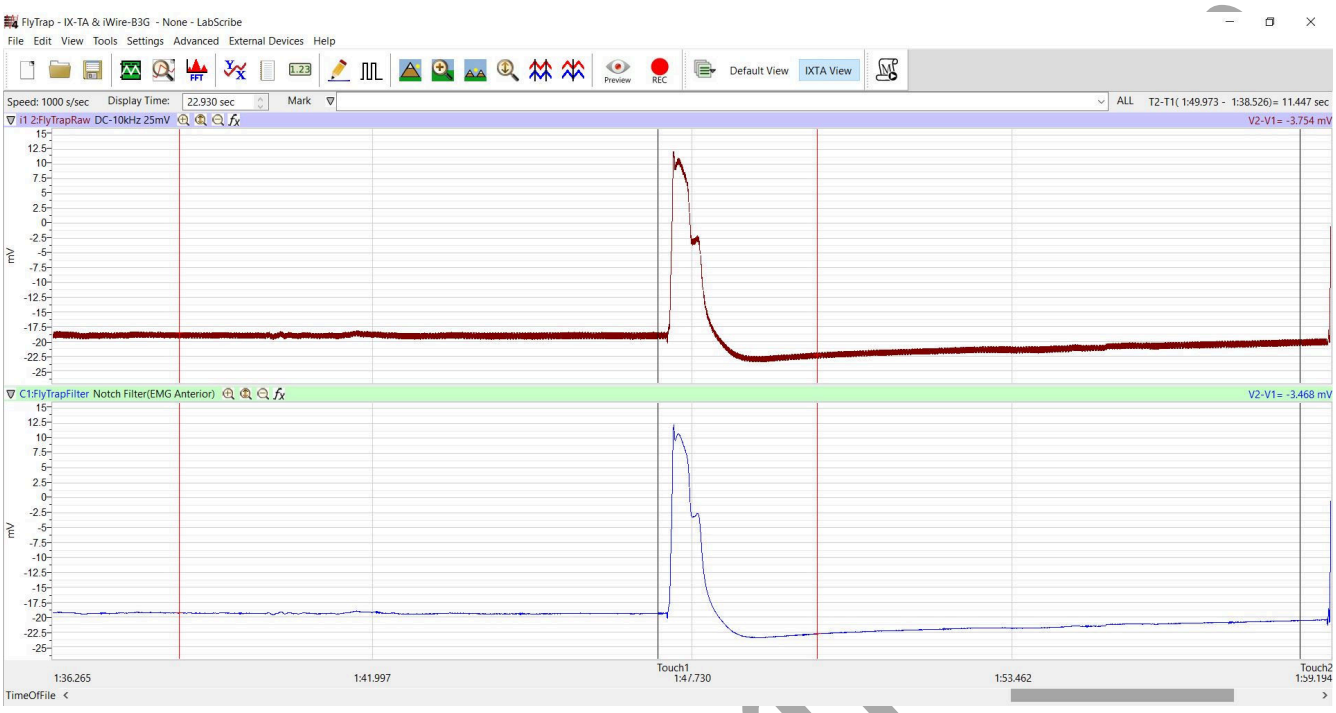
Procedure

1. After the electrodes have been placed on the Venus Flytrap, make sure they are adhered well.
2. Click Record.
3. Type **Touch 1** in the Mark box.



4. Drag the pipette or coffee stirrer along the internal spines – make sure to click the Mark button on the toolbar to annotate the recording as soon as this occurs.

5. You should see a reaction as seen below.



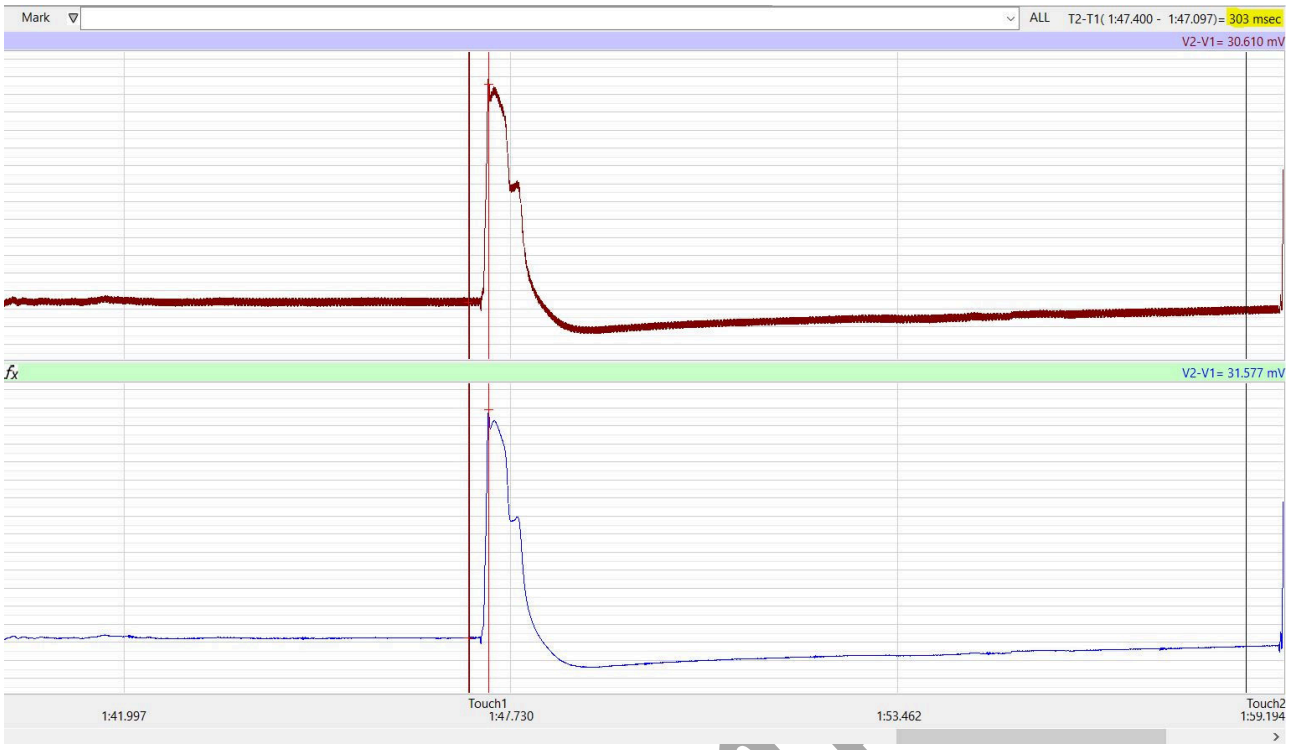
6. Continue recording but wait **AT LEAST** 30 seconds before doing the next touch.
7. After 30 seconds has elapsed – type **Touch 2** in the Mark box, drag the pipette across the internal spines and immediately click the Mark button.
8. Wait a few seconds and then click Stop.
9. Click Save As in the File menu. Save your data to the desktop or USB drive.

Data Analysis

1. Scroll to the section of the data file when you did the first touch.
2. Place one cursor on the 'Touch 1' mark and the other cursor on the peak of the reaction.
3. Measure T2-T1 in the upper right hand corner of the screen.
4. Scroll to the 'Touch 2' mark and repeat steps 2 and 3.

Questions

1. Did the trap close after the first touch? Why or why not?
2. Did the trap close after the second touch? Why or why not?
3. Hypothesize what would happen if you touched a 3rd time, but still waited the full 30 seconds before doing so.



Exercise 1: The Effect of Multiple Stimuli on Trap Closure

Aim: To observe how the timing of multiple stimuli affects trap closure.

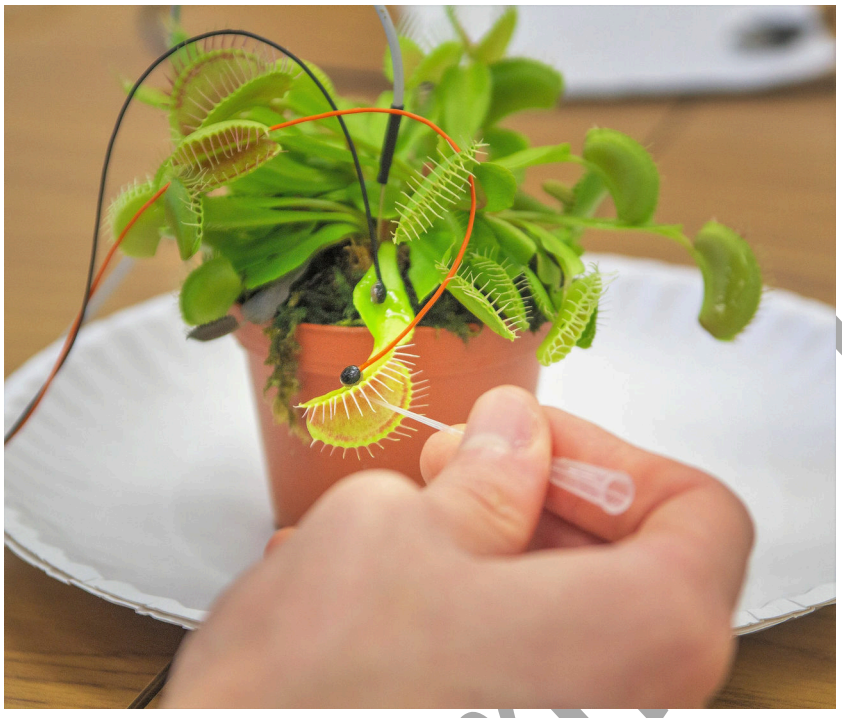
Approximate Time: 15 minutes

NOTE: Timing is important. The person operating the computer needs to be ready to immediately mark the recording when the internal spines are touched.

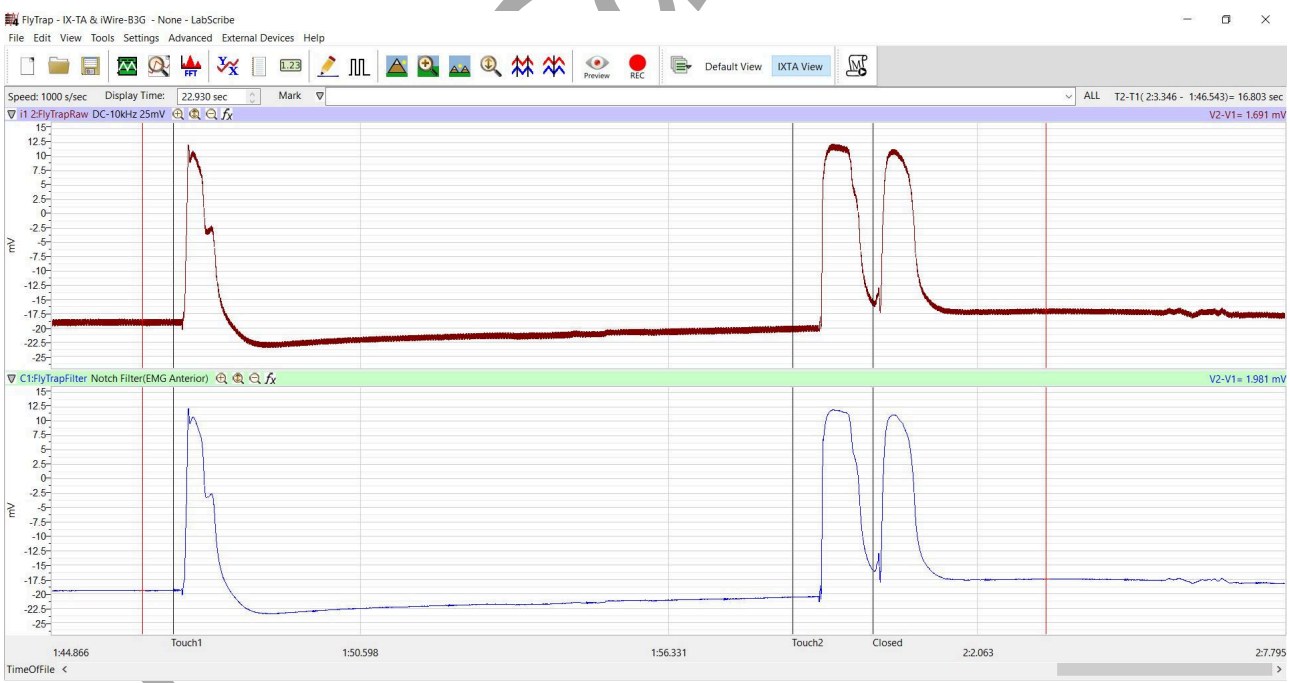
Procedure

1. After the exercise 1, double check the electrodes to make sure they are still adhered well.
2. Click Record.
3. Type **Touch 1** in the Mark box.
4. Drag the pipette or coffee stirrer along the internal spines – make sure to click the Mark button on the toolbar to annotate the recording as soon as this occurs.
5. You should see the same reaction as in Exercise 1.
6. Wait **5** seconds, type **Touch 2** in the Mark box and repeat step 4
7. If the trap does not close, repeat the process.

Note: If the trap still does not close, double check the electrodes. Reattach them with tac gel if needed and repeat Exercise 2.



5. Wait a few seconds and then click Stop.
6. Click Save As in the File menu. Save your data to the desktop or USB drive.



Data Analysis

1. Scroll to the section of the data file when you did the first touch.
2. Place one cursor on the 'Touch 1' mark and the other cursor on the peak of the reaction.
3. Measure T2-T1 in the upper right hand corner of the screen.
4. Scroll to the 'Touch 2' mark and repeat steps 2 and 3.
5. Place one cursor on the peak of the first action potential when the trap closed, and place the other cursor on the 2nd peak. Measure T2-T1 to find the time between the 2 successive reactions.

Questions

1. Did the trap close after the first touch? Why or why not?
2. Did the trap close after the second touch? Why or why not?
3. Explain how the Venus Flytrap knows when to close or not to close.

Comparative Labs

This lab is an excellent comparative lab with frog, earthworm and human action potentials.

These are the Animal Nerve and Human Nerve labs:

- Action Potentials-Worm
- Compound Action Potentials (Frog)
- Human Nerve Conduction