Cricket Teacher's Packet

## I. Instructions for Cricket Spreadsheet:

Open, and make a copy for your class, the following Google Spreadsheet:
Cricket Google Sheet (https://goo.gl/jUrhtO)

Click on "File"
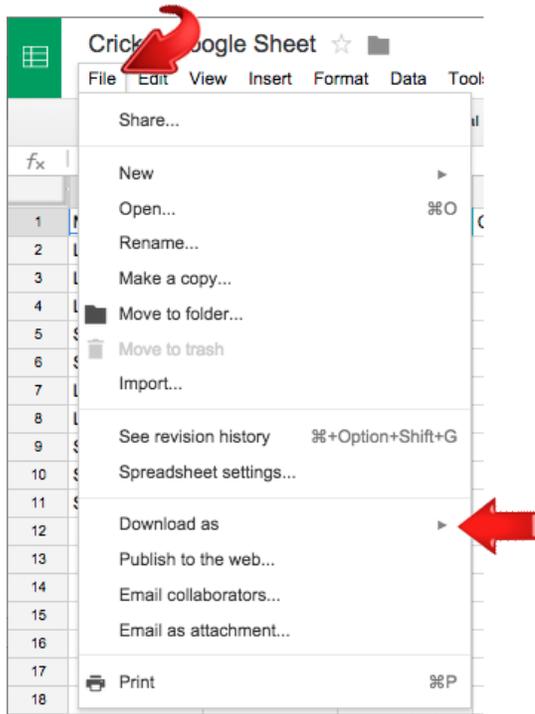
Select "Download as" to create an Excel or OpenDocument file. If you would like to use Google Sheets, open Google Sheets, Click on Import, and upload the downloaded file.
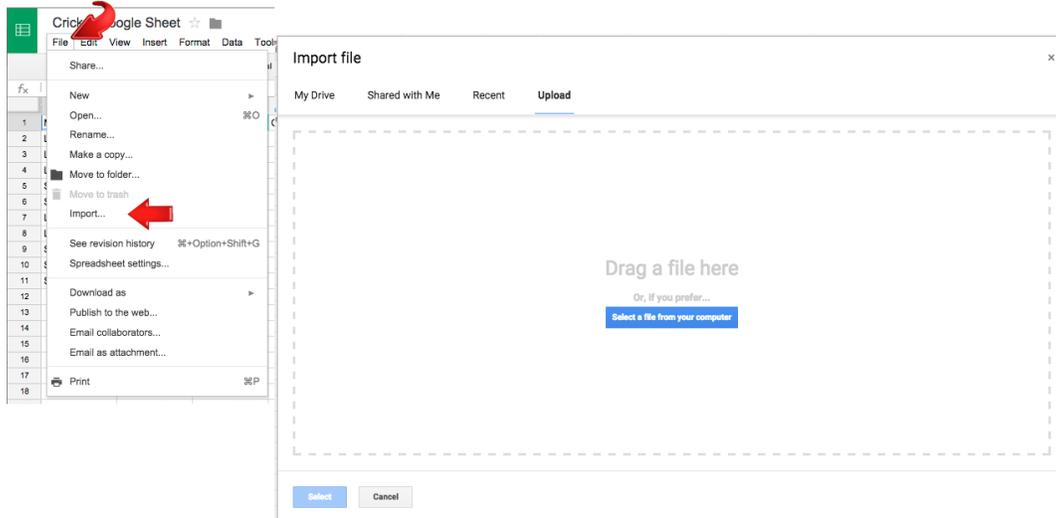
Open the new spreadsheet and change "Character 1" to the song characteristic chosen by the first group, change "Character 2" to the characteristic chosen by the second group, and so on.

After the students have made their measurements, either share the spreadsheet with them on Google Sheets (click on the blue "share" button) or enter the data they have collected yourself. Distribute the completed spreadsheet to students either virtually or as a hard copy.

II. Audacity Instructions:

The Audacity program (Audacity) should be downloaded on computers to enable precise measurement of song characteristics. This must be done prior to the lesson.

1. Open wave file in Audacity.

2. Be sure that the "I" tool is selected that can be found just below the "Analyze" on the

toolbar.

For length measurements (pulse length, chirp length, etc.):

3. Using the mouse to click and drag on the waveform, select a region of continuous blue (continuous singing).
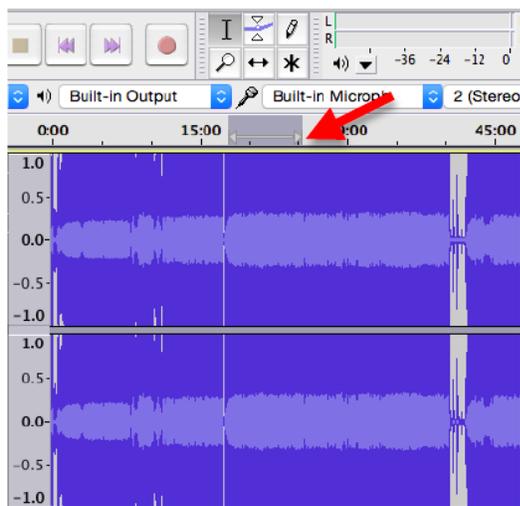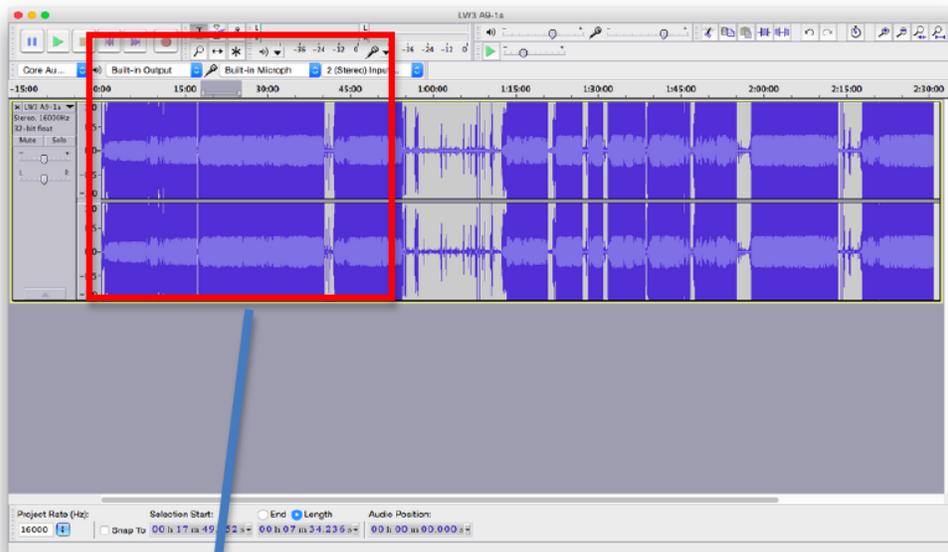
4. Click on the "Zoom In" magnifying glass in the top right corner until you can see the

individual chirps of the song.
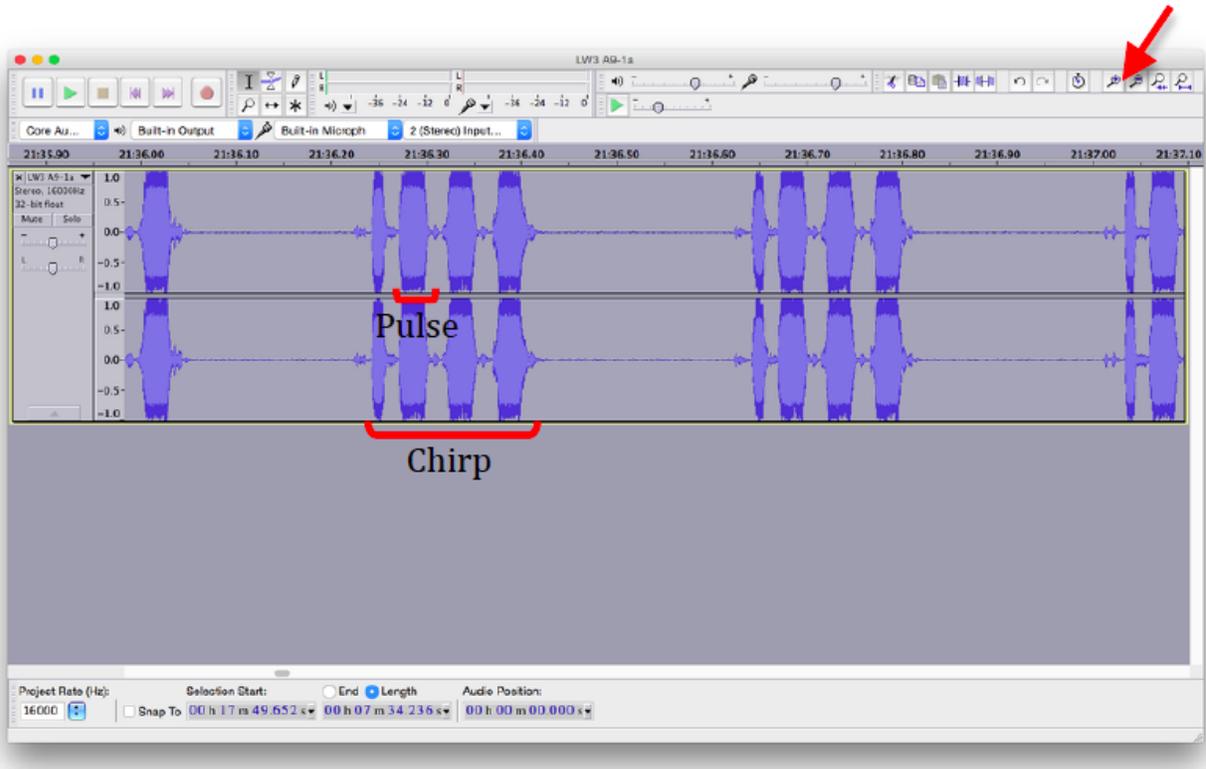
5. For pulse length, select the first pulse of the first complete chirp.
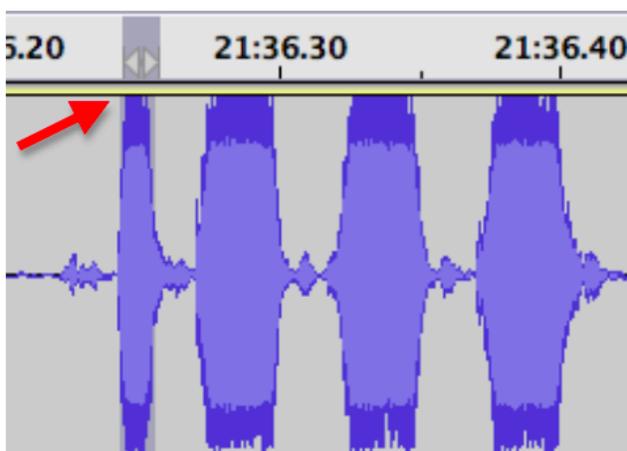
6. Make sure that "Length" is selected at the bottom of the window. The number of

seconds indicated beneath that is the length of the pulse (0.013 sec in this case).
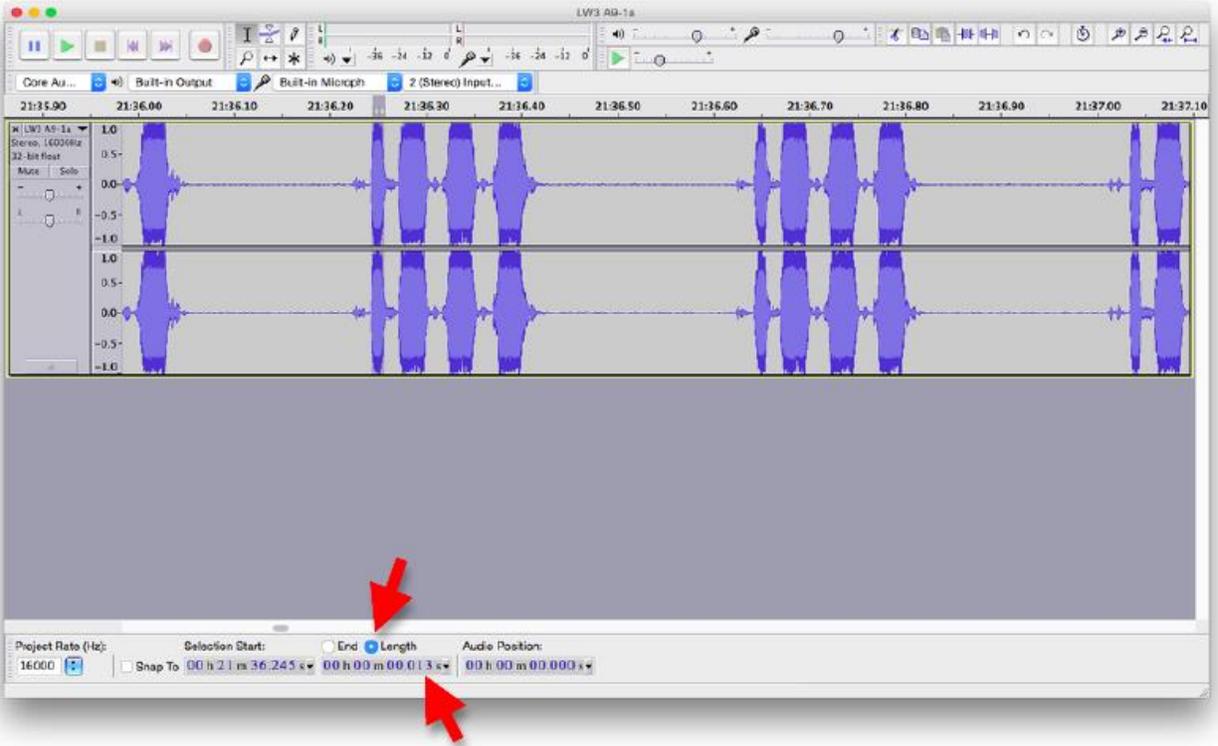
7. Record this number and then repeat the steps above to measure the lengths of the other 3 pulses in the first chirp, recording each number.

8. Select the whole chirp in order to get the length of the chirp.

For Frequency and Amplitude measurements:

9. Click anywhere on the waveform so that there is nothing selected.

10. Click on "Analyze" and then "Plot Spectrum…"

11. Put your cursor within the highest peak on the plot. The value indicated for "Peak" is the peak frequency of the chirp. The "dB" value is the relative amplitude (relative to the highest value Audacity can safely record) but can be used as a proxy for the amplitude of the song.
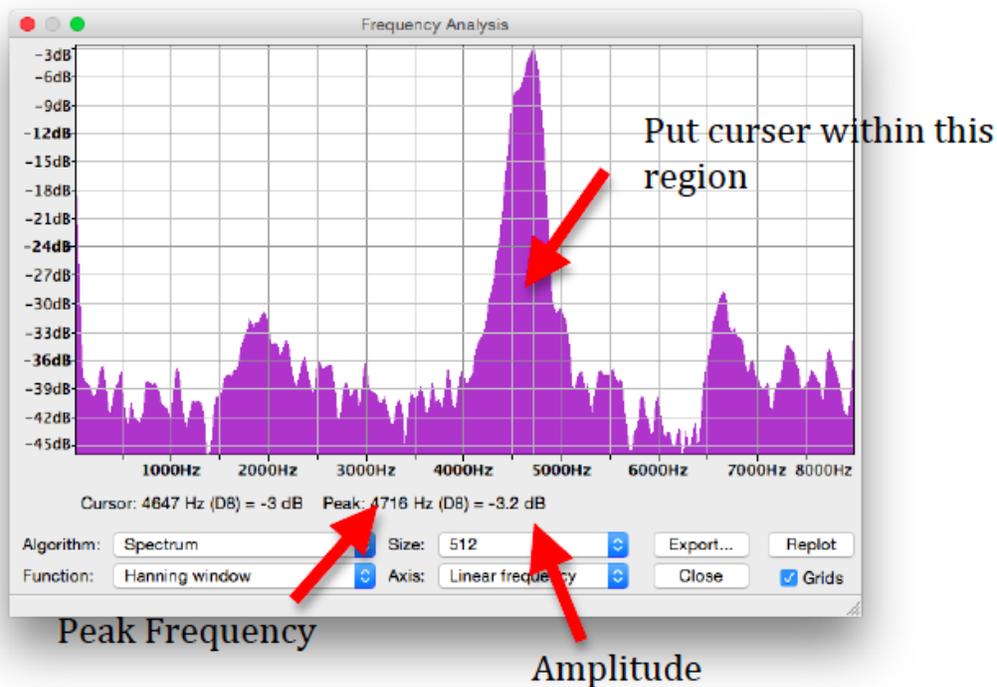
III. How to run Chi-square test on Paired Male Data:

http://www.bozemanscience.com/chi-squared-test/

IV. Material Sources for Constructing Experiment

For discussion on the use of the T maze see: Crnokrak, P. & D. A. Roff. 1995 "Fitness differences associated with calling behaviour in the two wing morphs of male sand crickets, *Gryllus firmus*." Animal Behaviour 50: 1475-1481.

Apparatus (Optional):

For constructing a two-male choice T-maze you will need three plastic buckets of equal sizes with lids, three 1.5'' PVC piping tubes of about 8'' long, PVC tee fitting, some egg crates, and two USB recorders.

Links for possible sources for purchase:

Buckets (Anything similar will do, as long as it is plastic):

http://www.homedepot.com/p/DMI-Universal-Replacement-Pail-with-Lid-in-White-802-1210-1900/203418953

PVC Piping:

http://www.homedepot.com/p/JM-eagle-1-1-2-in-x-10-ft-PVC-Sch-40-DWV-Plain-End-Pipe-1727/203308693

PVC Tee:

http://www.homedepot.com/p/Charlotte-Pipe-1-1-2-in-PVC-Sch-40-S-x-S-x-S-Tee-PVC024001400HD/203812203

USB Recorders (Order well in advance, shipping is slow). Quality control is not high. The ones advertised on the US sites are the same but much more expensive:

http://www.amazon.com/amzdeal%C2%AE-Drive-Digital-Audio-Recorder/dp/B006R3231I/ref=sr_1_1?ie=UTF8&qid=1437692014&sr=8-1&keywords=flashdrive+recorders

V. General Instructions:

1. You will need an auger or hole cutter to drill a hole into each of the buckets about 2-3 inches above the base. The holes should be just big enough to fit the PVC pipes.

2. Put the three PVC pipes into the tee so that you have a T-shaped pipe.

3. Insert the pipe ends into the holes in the buckets so that the three buckets are connected by a T-shaped tunnel.
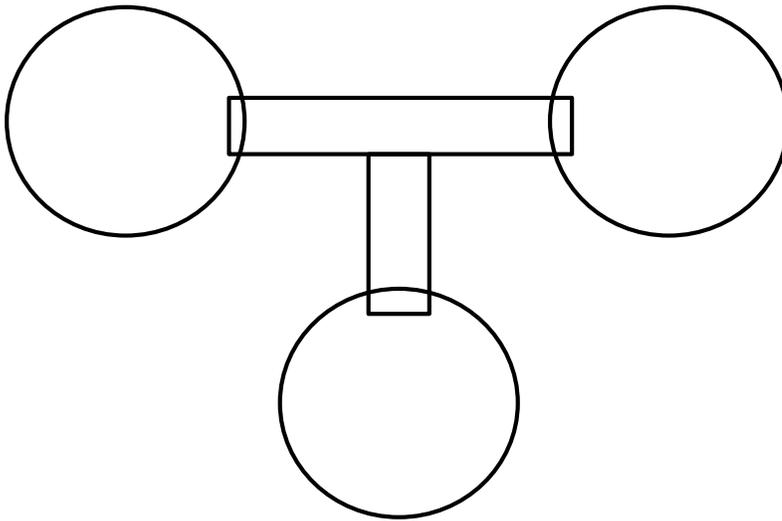
4. Cut the egg carton into a 2x3 rectangle to use as a ramp for the female cricket to use to get up to the pipes.

Egg Carton
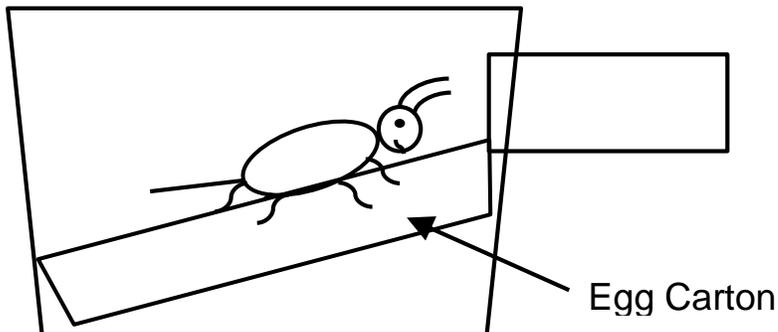
5. Speakers can be used to play male songs in the other two buckets, or live males can be used.

VI. How to tell the difference between a male and a female cricket:

https://www.youtube.com/watch?v=q1YtUN96aeM

VII. Link to Scoring Rubric

http://idea.ucr.edu/documents/flash/champs_chirps_and_twerps/Scoring_Rubric_1.pdf

VIII. Link to document on AP Standards

http://idea.ucr.edu/documents/flash/champs_chirps_and_twerps/AP_Standards_1.pdf

IX. Link to document on supporting NGSS and Common Core

http://idea.ucr.edu/documents/flash/champs_chirps_and_twerps/Supporting_NGSS_and_Common_Core_1.pdf