| **Praat handout #3** | **The Sound window: waveforms, spectrograms** |

Praat allows us to study the acoustic characteristics of a sound file by viewing and measuring the sound file's waveform and spectrogram. This handout shows you how to display the waveform and spectrogram for a sound file, how to turn on the formant tracker, pitch tracker, and pulse tracker, and how to copy and paste a waveform/ spectrogram image into your word processor.

> The Praat software is frequently updated by its authors. The changes are usually small, but if you are using this handout with a different version of Praat from the one listed below, you may find that some of the functions and features look or act slightly differently from the way they are described here.
> *These instructions were updated for Praat version 6.2.15 on August 16, 2022.*

3.1   Opening a Sound window to view a waveform and spectrogram

(1)   Read a sound file into the Praat Objects window. (See Praat handout #2.)

(2)   Click on the file name in the List of Objects in the Objects window. The file name should now be highlighted.

(3)   On the right side of the Objects window, click on the `View & Edit` button.

(4)   A new window (called `Sound XXX`, where *XXX* is the filename) will open, like this.
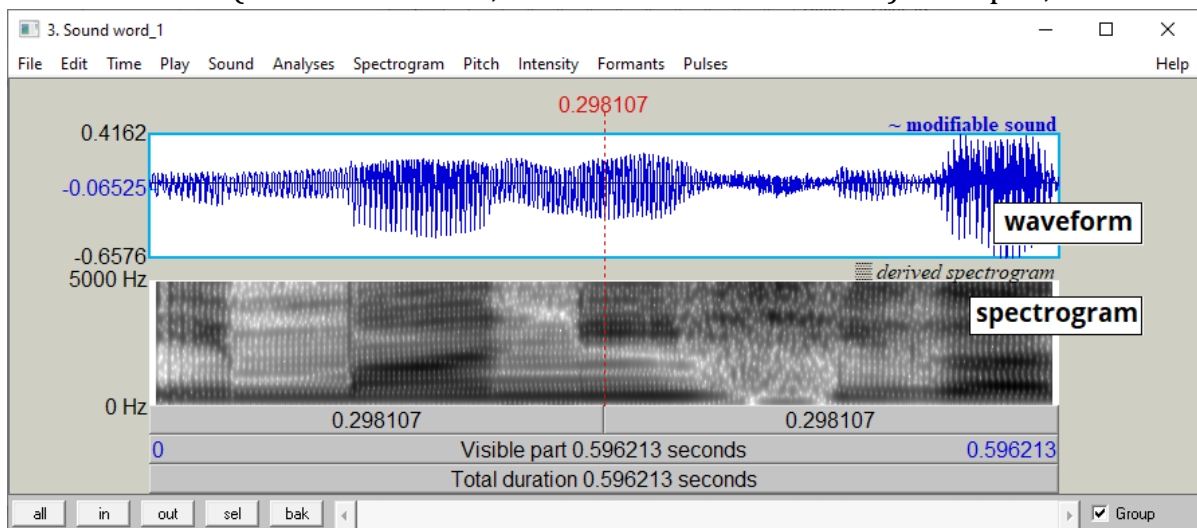
- The top display shows a **waveform**. A waveform tracks changes in air pressure over time as a sound is produced.

- The bottom display shows a **spectrogram**. A spectrogram provides information about the acoustic components of a sound. (We will learn about these acoustic components in more detail throughout the semester.)

3.2   Cursors, making a selection, and zooming in and out

- If you click with the mouse in the waveform or spectrogram, a vertical line will appear (there may be a horizontal one too). This vertical line is a **cursor**.
- If you click, drag, and release the mouse, you will place two cursors and demarcate a **selection**. The selection will be highlighted in a different color on the waveform.
- The small buttons at the bottom of the Sound window labeled `all`, `in`, `out`, `sel`, `bak` let you **zoom in and out** on the waveform and spectrogram. The `all` button shows the whole sound file at once. The `sel` button zooms in enough to make the selected portion of the sound fill the whole window.

3.3   Playing a sound file from the Sound window

- There are two or three long, narrow buttons at the bottom of the Sound window that say "Visible part" and "Total duration". Click on these to find out what happens: you should start hearing things. (Press `Esc` to stop the sound from playing.)
- Place a cursor, or select part of the sound, and see how these bottom buttons change.

3.4   Other analysis tools in the Sound window

The menu bar across the top of the Sound window includes the items `Spectrogram`, `Pitch`, `Formants`, and `Pulses`. During this course, you will learn more about what these analysis tools can tell us about the acoustic (and even articulatory) characteristics of speech sounds.

(1)   The **`Spectrogram`** menu has `Show spectrogram` as the first item. This is selected (✓) when you install Praat. If you unselect this item, the spectrogram will disappear.

(2)   The **`Pitch`** menu has `Show pitch` as the first item. If `Show pitch` is selected (✓), a light-blue line with dots appears on the spectrogram. This is a **pitch track**, which estimates the fundamental frequency (perceived as pitch) of the sound over time.

If the pitch tracker is on, the spectrogram looks like this:
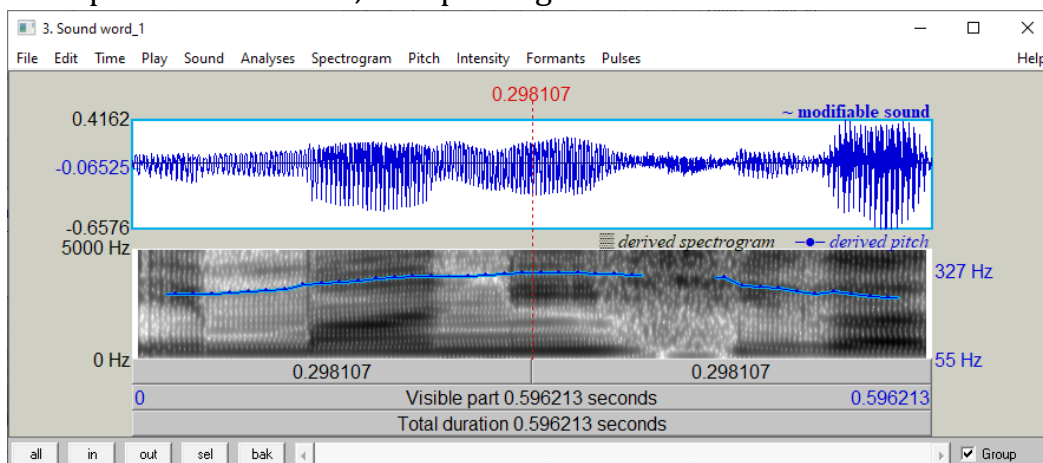
(3)   The **Formants** menu has `Show formants` as the first item. If `Show formants` is
        selected (✓), several lines of red dots will appear on the spectrogram. These are
        produced by the formant tracker, which estimates the value of the first few
        formants (vocal-tract resonance frequencies) of the sound. (We will discuss
        formants in great detail later in this course.)

        If the formant tracker is on, the spectrogram looks like this:
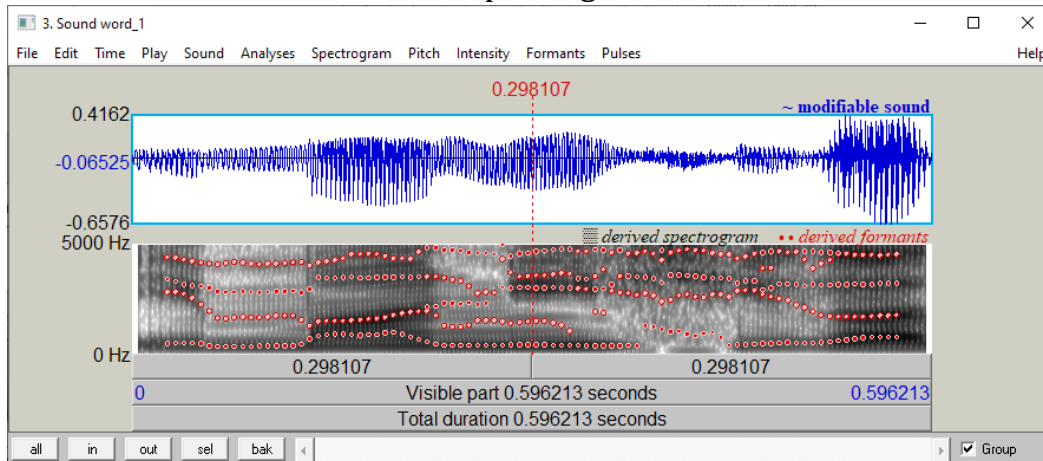
(4)   The **Pulses** menu has `Show pulses` as the first item. If `Show pulses` is selected (✓),
        vertical lines will appear on the waveform. These mark the timepoints where Praat
        has detected a **glottal pulse** (one opening-closing cycle of the vocal folds).

        If the pulse tracker is on, the waveform looks like this:
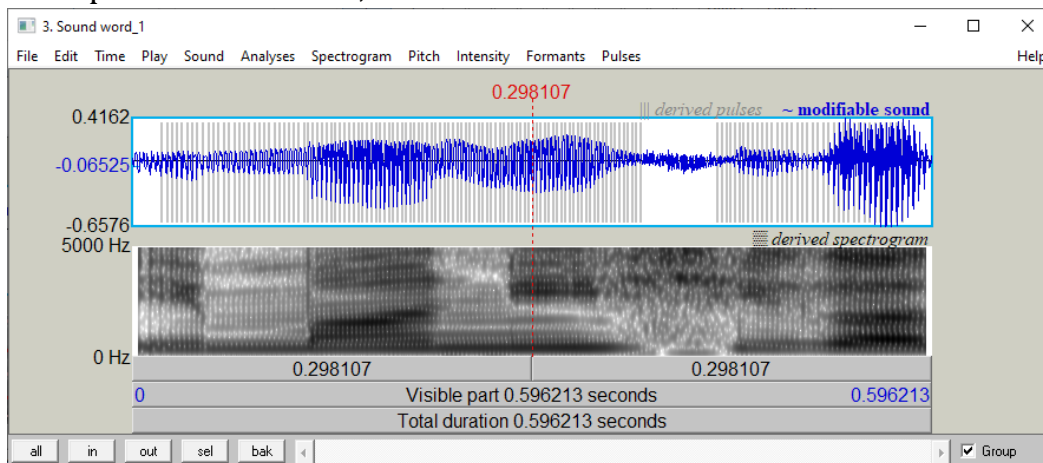
3.5 Copying and pasting an image from Praat: Screenshots

The Praat Picture window allows you to do sophisticated things with Praat images.
However, for this course, we can generally rely on the much simpler method of making
screenshot images.

- Making a screenshot takes what you can see on the screen and turns it into an image
  that can be pasted into another program, like a Paint program or a word processor.

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- The following instructions are for Windows computers. (Mac users, please do a Web search with the keywords *macintosh screenshot* and try some of the helpful pages that turn up.)

(1) If you press the key on your keyboard that says something like `Print Screen` or `PrtScr`, this **copies the entire view** showing on the screen, allowing you to paste it into another program.

(2) More convenient than copying the entire view is **copying only one window** (i.e., the Sound window showing your waveform and spectrogram). To do this, click on the relevant window to make it the active window, and then use `Alt+Print Screen` to take a screenshot of the active window only.

(3) Now you can **paste** the image directly into a **word-processor document**.

(4) Or, you can **edit** the image and save it as a **graphics file**:

(a) Open your favorite graphics or Paint program.
(b) "Paste" (from the `Edit` menu, or `Ctrl-V`). The screenshot image will appear.
(c) Edit the image as desired and save it as a graphics file (.PNG, .JPG, .GIF, etc.).
(d) This graphics file can be **printed** as-is, or it can be inserted into a **word-processor document**.

(5) As part of a word-processor document, an image can be centered, rotated, enlarged or reduced in size, combined with explanatory text, etc.

- All of the images in this handout are screenshots that were pasted into Microsoft Paint, saved as .PNG files, inserted into a LibreOffice Writer document, and made slightly smaller. The first image was edited in Microsoft Paint to add the labels "waveform" and "spectrogram".