Lab 5 Pre-lab: Part A of the "Understanding Eukaryotic Genomes using the Genome Browser" Module

Adapted by Melinda A. Yang, from Modules 1 and 4 of the Understanding Eukaryotic Genomes curriculum from the Genome Education Partnership (original authors: Joyce Stamm, Meg Laakso, Carina Endres Howell, and Leocadia Paliulis).

Pre-lab Assignments:

1. Watch "Intro to Genome Browser" Video: http://tiny.cc/genomebrowser (note that the browser may look a bit different from yours, i.e. green instead of red - there was a recent update changing the layout but not the content of the browser)
2. Complete Part A (note there is an assignment to turn in for step A4) that counts as a Close Reading credit

A. Introduction to the Genome Browser

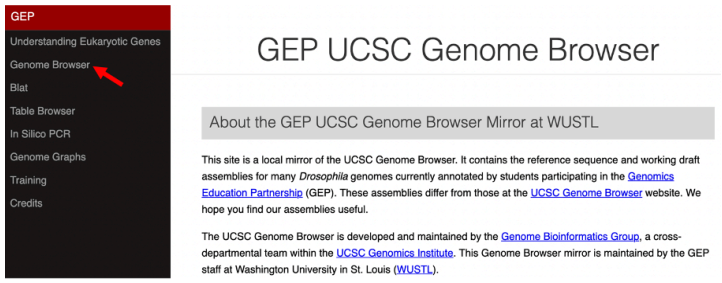
(Learning) Objectives:

- Demonstrate basic skills in using the UCSC Genome Browser to navigate to a genomic region and to control the display settings for different evidence tracks.

Genes encode information that our cells use to carry out their functions. In particular, **protein-coding genes** (contiguous sections of DNA with information for protein structure) provide the cell with the information to make **messenger RNAs (mRNAs)** (another biomolecule similar to DNA that is single-stranded and composed of nucleotides; they carry the information for proteins from the DNA outside of the nucleus to where proteins are synthesized), which are then used to make **proteins** (the biomolecules composed of amino acids that are essential to cellular function and structure). We will use a web-based visualization tool called a **Genome Browser** to explore the structure of a eukaryotic gene and obtain a basic understanding of how this information is stored and used. Later, you will learn more about the details of these biological processes and use the Genome Browser to examine the experimental data that provide evidence for a detailed gene structure.

Instructions

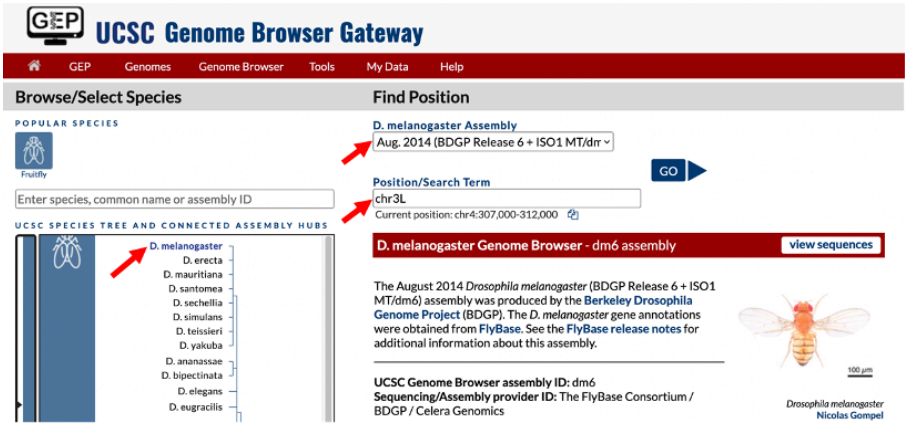
1. Open a web browser and navigate to the custom version of the Genome Browser (https://gander.wustl.edu/). Click on the "Genome Browser" link on the left menu.



Comments

The original Genome Browser (https://genome.ucsc.edu/) was developed by the Genome Bioinformatics Group at the University of California Santa Cruz (UCSC). We are NOT using the above link, but it has a repository of genomes from many more organisms outside of Drosophila.

2. Change the following fields in the "Genome Browser Gateway" section
   - Select “D. melanogaster” under the “REPRESENTED SPECIES” field. This will allow you to view the genome of the insect *Drosophila melanogaster.*
   - Confirm that "Aug. 2014 (BDGP Release 6 + ISO1 MT/dm6)" is in the "Assembly" field. This is the version of the *D. melanogaster* genome that you will view.
   - Enter "**chr3L**" into the "Position/Search Term" text box so that you can view the left (L) arm of chromosome 3 (chr3).
   - Click on the “**GO**” button to view the genome browser.



3. Go to the Appendix (http://tiny.cc/ueg_appendix) and read through a description of what the Genome Browser contains in Appendix 1. Follow the read through section on Display Controls to try matching the screenshot in Figure 1 of Appendix 1.

4. Take a screenshot of your genome browser with the genomic neighborhood and save it in your lab notebook. To do so, follow these directions:
   - Right click somewhere inside the Genome Browser image
   - Select ‘View image’
   - A new tab should open with the image (if not, make sure your browser has pop-ups enabled)
   - Right-click on the image in the new browser tab and click ‘Save Image As…”
   - Save the file, with the name Lab5_*UEG-A_GenomeBrowser_YourName.png*
   - Send this image to me using ‘Assignment Upload’ on BB

5. Take some notes in your notebook on useful steps/tips/links for navigating the browser to help you easily use this browser in the future (you will be using this browser throughout most of the semester).

A **genome assembly** is simply a **genome sequence** produced after chromosomes have been fragmented, those fragments have been sequenced, and the resulting sequences have been put back together. A genome assembly is **updated** when DNA has been sequenced that allows gaps to be filled. It may also be updated when a new assembling algorithm is released. The August 2014 Drosophila melanogaster (BDGP Release 6 + ISO1 MT/dm6) assembly was produced by the Berkeley Drosophila Genome Project (BDGP, https://www.fruitfly.org/).