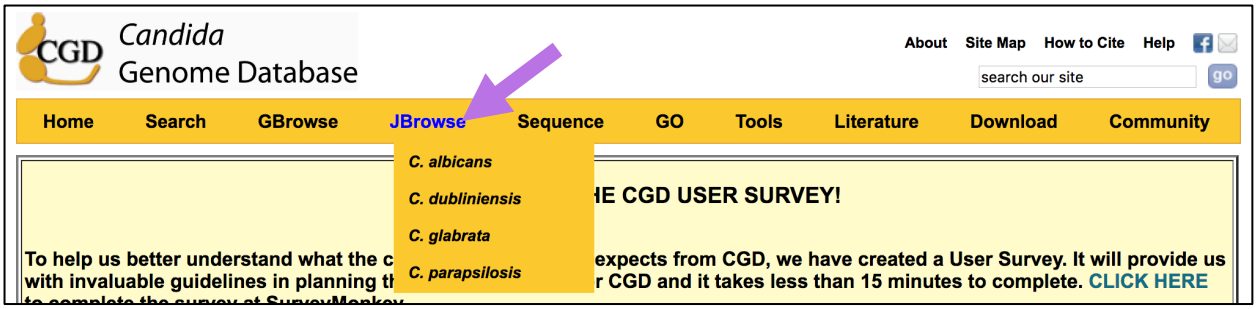
SGD/CGD JBrowse Genome Browser

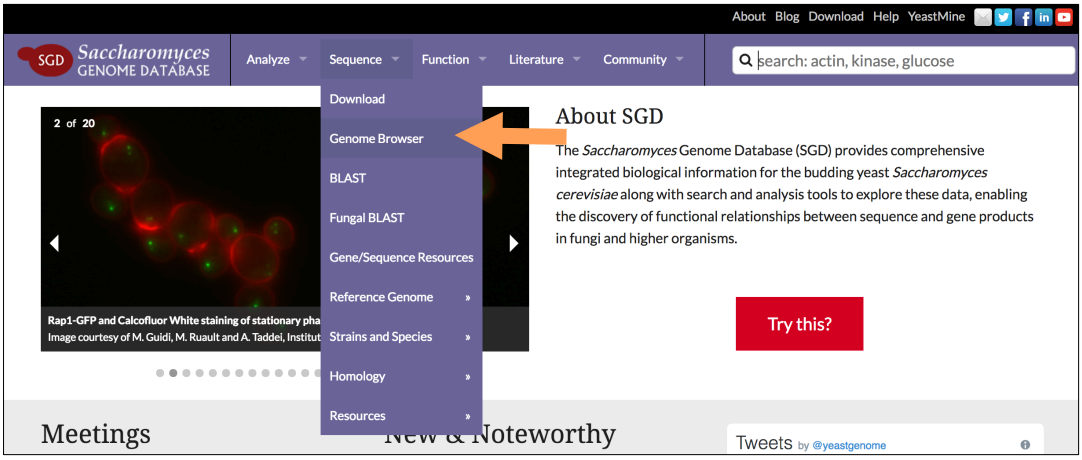
SGD and CGD both provide the genome browsing tool **JBrowse** to enable easy exploration of yeast genomes. JBrowse enables quick scrolling through genomic features and visualization of experimental information from large-scale studies in the form of **data tracks**. In this exercise, we will use JBrowse to visualize the location of genes related to galactose catabolism and use data tracks to visualize how these genes are transcriptionally regulated.

Accessing JBrowse

- You can access CGD's JBrowse genome browser in the following locations:
    - From the home page (www.candidagenome.org) toolbar menu for **JBrowse.**



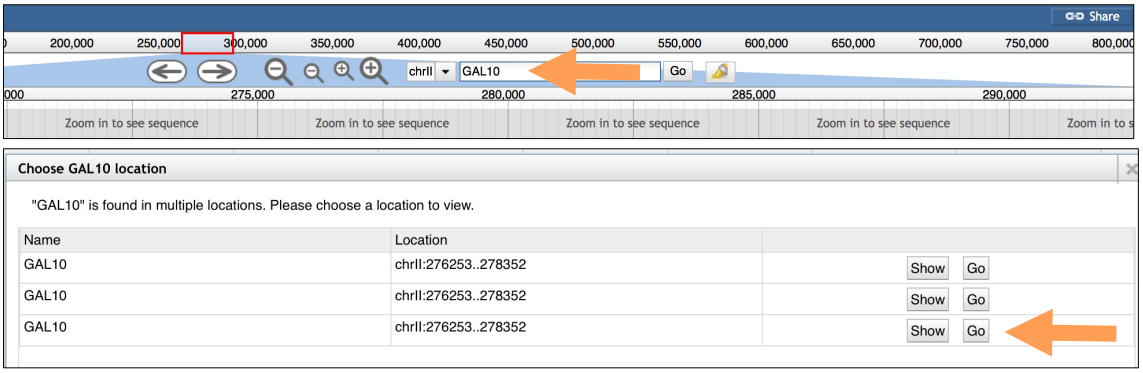
    - From any Locus Summary page, by clicking on the JBrowse image link in the Basic Information section.
    - CGD JBrowse provides *C. albicans, dubliniensis, glabrata,* and *parapsilosis*.
- You can access the SGD's JBrowse genome browser in the following locations:
    - From the home page (www.yeastgenome.org), by opening the Sequence menu in the top purple toolbar and selecting **Genome Browser.**
    - From any Locus Summary page, by selecting **View in JBrowse** under Sequence
    - Or by following this link: https://browse.yeastgenome.org



Analyzing transcriptional regulation of galactose catabolism

Using SGD's JBrowse genome browser, analyze the transcriptional regulation of **GAL10**.

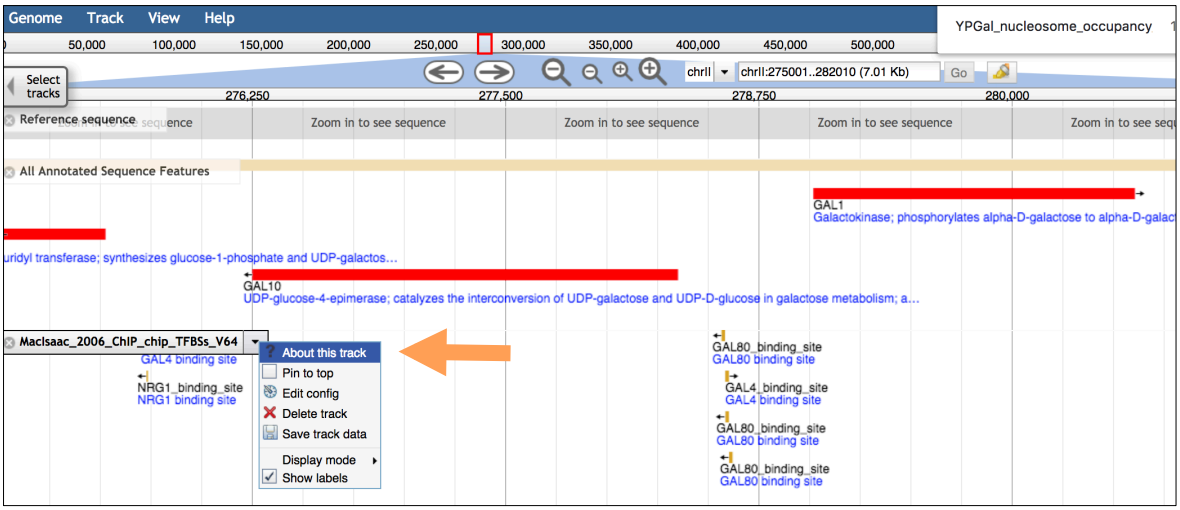
- In the JBrowse window, enter **GAL10** into the search box in the navigation bar on top and press **Go**. Multiple results will be listed, but all refer to the same gene.



- Click on the GAL10 red feature bar to see an overview of GAL10 sequence data. What is the chromosomal location, strand, and sequence of this gene?
- What genes are upstream and downstream of GAL10? Zoom in/out using the magnifying glass icons in the navigation bar, or double-click on an empty spot in the browser. Move the viewing window left/right by using the arrow buttons on the navigation bar, the arrow keys on your keyboard, or by clicking the screen and dragging with your mouse.
- Notice that GAL10 shares its promoter region with the neighboring gene, GAL1, which is located on the opposite strand and transcribed in the opposite direction. Zoom in on the shared promoter by holding down the shift button on your keyboard and dragging over the region with your mouse.
- What transcription factors bind to the GAL1-10 promoter? Add a track with transcription factor binding data to the browser window:
    - Press the **Select tracks** button in the upper left corner. 

    - On the left side of the menu, click on **transcription** (under **Category**).
    - In the list of tracks, check the box next to the track that has **MacIssac** in the **"**First author" column and **TF_ ChIP_ChIP** in Track column (you can sort each column by clicking on its header). Click on "**Back to browser"** in the upper left corner.

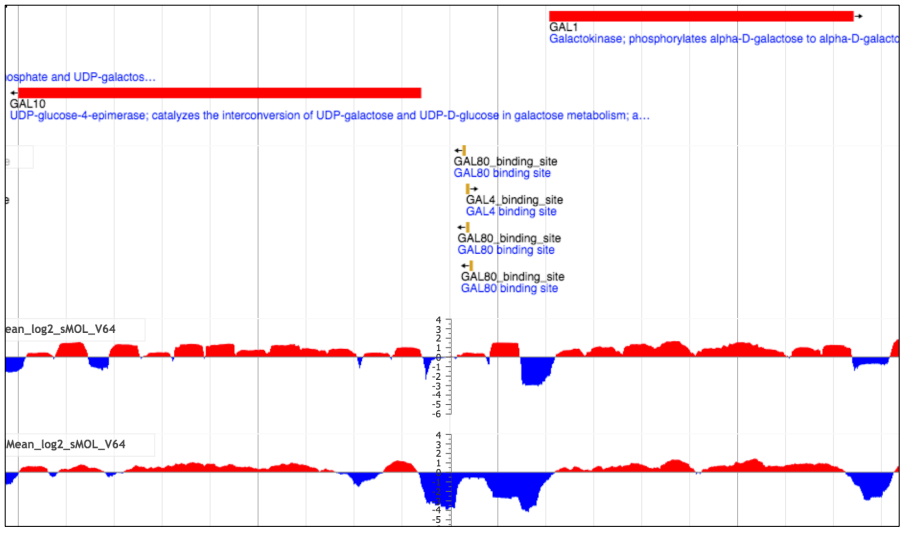
- In the main browser window, a new data track for the MacIsaac dataset will be shown. Click on the binding sites for **GAL4** or **GAL80** for more information about the sites. To learn more about the track itself (techniques, experimental design, reference), hover your mouse cursor over the track name and select **About this track** from the pull-down menu.



- What is the nucleosome occupancy around the GAL1-10 promoter and how does it change during growth on galactose? Add tracks with nucleosome occupancy data:
  - Click on **Select tracks** button again and then **Clear All Filters**
  - Under Category, select **chromatin organization** and filter tracks by typing **nucleosome** in "Contains text" search box

- Check the boxes next to First author: **Kaplan**, Track: **YPD_nucleosome_occupancy_map_dMean_log2_sMOL** and **YPGal_nucleosome_occupancy_map_dMean_log2_sMOL**. Exit the tracks tab.

- Look for differences in nucleosome occupancy between the galactose condition and the YPD condition. Given that GAL1 and GAL10 function in galactose catabolism, do the nucleosome occupancy tracks suggest something about the regulation of GAL1 and GAL10?



To save the current display, or to share it with colleagues, simply copy and save the browser URL.