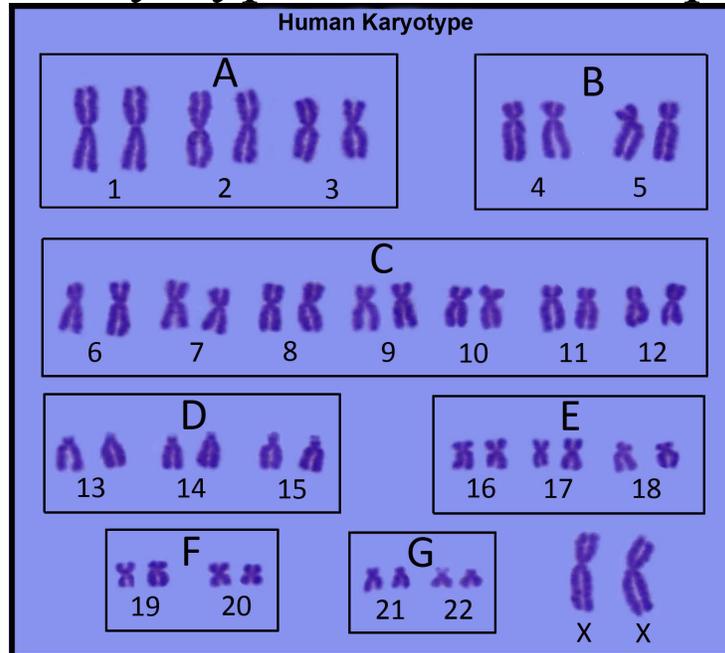


Karyotype with Photoshop



1. Find your chromosome spread file on the computer and open it with Photoshop.
 - Your chromosome spread will become the background layer when Photoshop opens.
2. Start by quickly cutting out each of your chromosomes and pasting them into a new layer. Locate the first chromosome you want to cut out to begin your karyotype.
3. Select the lasso tool from the tools tool bar (may need to right click to find tool that looks like a cowboy lasso which allows you to draw freely).
4. Click where you want to begin to draw the outline of your chromosome and hold down til outline is complete. It will begin to flash. Outline can be very rough, like just a circle, **but should not** include neighboring chromosomes or cut out areas from neighboring chromosomes (otherwise you will have to go through far more editing later).
5. Press the ctrl + X keys to cut the chromosome out.
6. Press ctrl + V to paste it. This chromosome will now appear in a new layer in the center of the image.
7. To make any layer invisible, click on the eye to the left of it (you may want to do this until all chromosomes are cut and pasted into their new layer and the background cleaned up)
8. Click on the background layer and repeat steps 4-7 for each individual chromosome and just let them pile up in the middle. ****YOU NEED TO CLICK ON THE BACKGROUND LAYER BEFORE YOU START LASSOING EVERY TIME****
9. Save your work periodically.

10. Fill in all of the cut out areas in the background,
 - Right click on the stamp tool and choose the clone stamp.
 - Hold down the control button and click on an area of average background that does not contain a lot of cutouts. Then let go of the control button and stamp around to fill in background with chosen area to clone.
 - May need to repeat this process several times to get a nice large area of smooth background.
 - Can change size of stamp with dropdowns in the upper left and can hold down and color instead of just stamping.
11. Now go to the Select Tool (arrow at 45 degree angle in top left of tools) **and make sure “auto-select layer” box is selected at the top left.**
12. Click on all eyes of all layers so all are visible again. Grab all of your chromosomes from the pile in the middle and spread them out. Use the arrow keys for more precise movements.
13. You need to rotate all chromosomes so that arms are up and down with **short arms are up** if not metacentric.
 - To rotate the chromosome, click on the chromosome to be rotated, go to Edit, Transform, Rotate. Click on the open boxes that appear around the chromosome and use the mouse to rotate. Once you have rotated the chromosome to the desired position, press enter to complete the transformation.
14. Don't forget to SAVE your work periodically.
15. Start to pair up your chromosomes using the select tool and clicking and dragging the chromosomes together. May take a bit of rearranging and tweaking rotations to get the pairings right.
16. Arrange your chromosome pairs into the 7 groups as shown in the above diagram and listed below:
17. Can click and drag around both chromosomes in a pair by clicking and dragging a box around them both, and then click and drag them together to move them together.
 - A) Chromosome pairs (1-3) - Large metacentric (first line)
 - B) Chromosome pairs (4+5) - Large submetacentric, all similar (first line)
 - C) Chromosome pairs (6-12) and X chromosome - Medium sized submetacentric (second line)
 - D) Chromosome pairs (13-15) - medium-sized acrocentric (third line)
 - E) Chromosome Pair (16) - short metacentric; Chromosome pairs (17+18) - submetacentric (third line)
 - F) Chromosome pairs (19+20) - Short metacentrics (fourth line)
 - G) Chromosome pairs (21+22) - Short acrocentrics. (fourth line)
 - H) Sex Chromosomes -X chromosome-Medium sized submetacentric and Y chromosome- Short acrocentric. (fourth line)
18. SAVE (do this frequently!)
19. Feel free to label up chromosomes, groups and entire photo (see Step 20).

20. To make labels, use the text box tool, a T on the tool bar.
 - Click and drag to create a text box.
 - Type in number or label, adjusting font and size to personal preference. Create a new text box for each number so that each is in its own layer that can be moved freely.
21. Once you've made all of your labels, click on the select tool, and move them around as needed, using the arrow keys for precision. Remember to label your sex chromosomes with an X.
 - To align the numbers in each row, select all text box layers, go to Layer, Align layers, Top Edge.
 - Repeat for each row of karyotype.
22. When happy with it. Save, and then also save as and use the same name but the word flatten. In this new file, Go to Layer, Flatten Image. Click yes to delete all hidden layers.
23. Go to Save As and choose JPEG from the drop down menu and then email it to Louie (lbierwer@smith.edu), and Lori (lisaunder@smith.edu), and yourself if you want for you next FB status update:). I will make a color printout of each for the contest that will then be given back to you.
24. You're done! Yay for karyotypes!! ☺

If you encounter problems while working...

- Check to see if you have selected the layer you want to work in.
- If you want to move something, the select tool must be selected.
- Your intrepid staff will try to answer any questions that you have!

Keyboard Shortcuts! (ctrl for PC, command for Mac)

- Cut—ctrl or command + X
- Paste—ctrl or command + V
- SAVE (do it!! ☺)—ctrl or command + S
- Undo once—ctrl or command + Z
- Undo multiple—ctrl + alt + Z