

BIOINF 500: Illustrator Tutorial

Github Repo: https://github.com/welch-lab/illustrator_tutorial

Goal and Getting Started

The goal of this tutorial is to give students hands-on experience in creating a scientific figure shown below. To get started, open Adobe Illustrator and press “**Create New...**” on the left panel. Select an “A4” canvas in **Landscape** orientation.

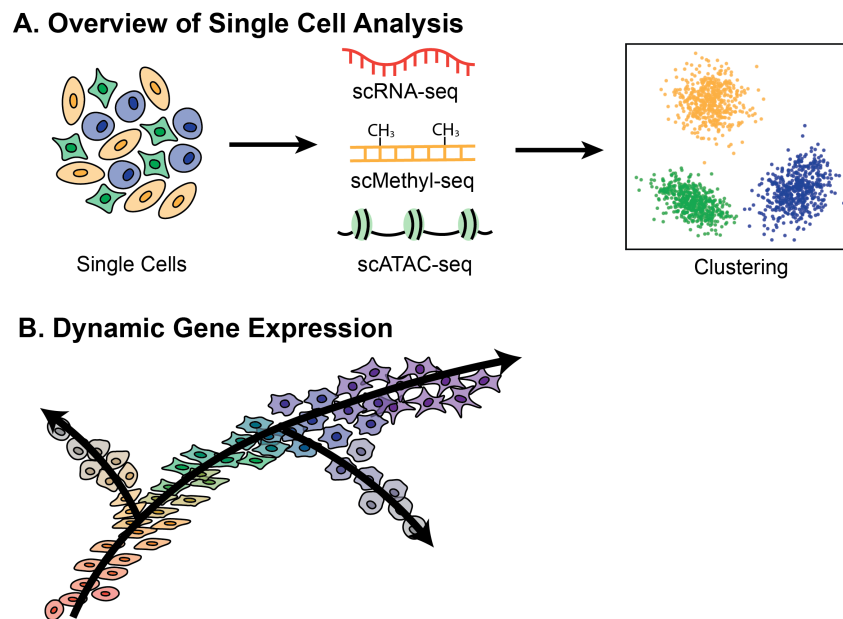
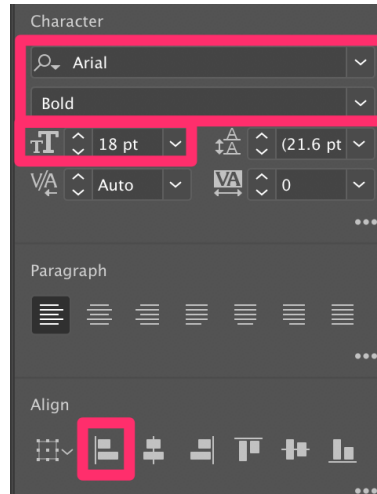


Figure 1. Final Illustrator product.

Text & Aligning

Tip: Using sans serif font (e.g. Arial) may make the figure look cleaner. Serif fonts (e.g. Times New Roman) work better in text documents.

1. Press the “**Type Tool**” (T) and type “A. Overview of Single Cell Analysis”. Press again and type “B. Dynamic Gene Expression” below.
2. Use the “**Selection Tool**” (V, black arrow) to select both text, and press “**Properties**” on the right.
 - a. Change the font to “Arial”, font style to “Bold”, and font size to 18.
3. With both text objects still selected, align to “Horizontal Left”.

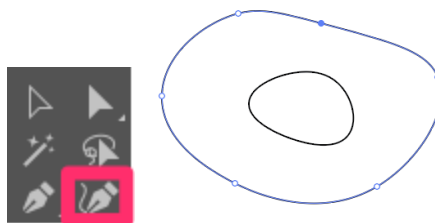


4. Use the “**Type Tool**” to again to write “Single Cells”, “scRNA-seq”, “scMethyl-seq”, “scATAC-seq”, and “Clustering”.
5. Select the above text objects and change their property to: Arial, Regular, 14 pt.
6. Align “Single Cells”, “scATAC-seq”, and “Clustering” using **Vertical Align Bottom**.
7. Align “scRNA-seq”, “scMethyl-seq”, and “scATAC-seq” using **Horizontal Align Center**.

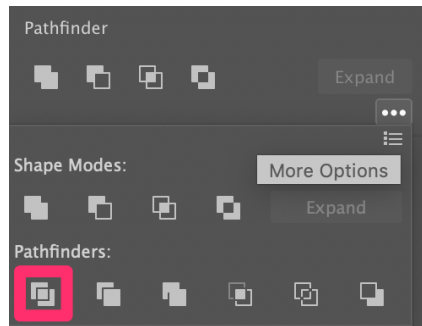
Drawing Cells

Tip: Using “Pathfinder” options in “Properties” enables union and intersection of simple objects, making it easier to create complex geometrical structures (such as a stylized neuron).

8. Select the “**Curvature Tool**” and draw three different cell shapes (roughly spherical, elliptical, and star-like).
 - a. Note: Use a black stroke with transparent fill.

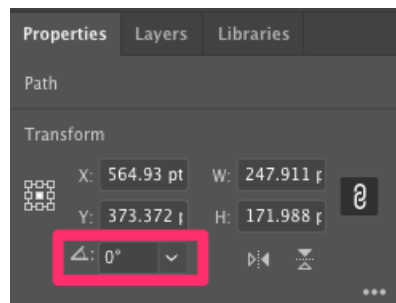


9. Use “**Curvature Tool**” to draw in nuclei in each cell.
10. Select a cell and its nucleus (press “Shift” when clicking on the nucleus).
11. Under “Pathfinder” in “Properties”, click on three dots to expand options, and press “Divide”.



Note that this divides the overall cell into a separate “nucleus” and “cytoplasm” regions!

12. For cell #1, change the fill of the cytoplasm and nucleus to yellow (#FBB040). Change the opacity of the cytoplasm to 70%.
13. For cell #2, change the fill to green (#00A651). Change opacity of cytoplasm to 70%.
14. For cell #3, change the fill to blue (#21409A). Change the opacity of cytoplasm to 70%.
15. Press the “**ALT**” key (Options in Mac) and drag a desired cell to a new location. This will copy the cell into a new position.
16. Repeatedly copy cells 4 times, and adjust their rotation under the Properties tab.



17. Select all cells (**black arrow, V**), right click, and press “**Group**” once finished.

Drawing RNA, DNA, and Histones

mRNA

1. Using the “**Line Segment**” tool, draw a horizontal line. Change the stroke color to red and thickness to 2 pt.
2. To make the line wavy (suggesting floppy, single-stranded RNA), click on the “**Effect**” menu bar → “**Distort & Transform**” → “**Zig-Zag**”.
 - a. Check the “Preview” box.
 - b. Select “Smooth” option under Points.
 - c. Adjust Size and Ridges per segment.

- Using the line segment tool again, draw a “nucleotide” (vertical line segment). Change stroke color to red and thickness to 2 pt. Use “**ALT**”/”**Options**” to click and drag nucleotides along the RNA backbone.

DNA

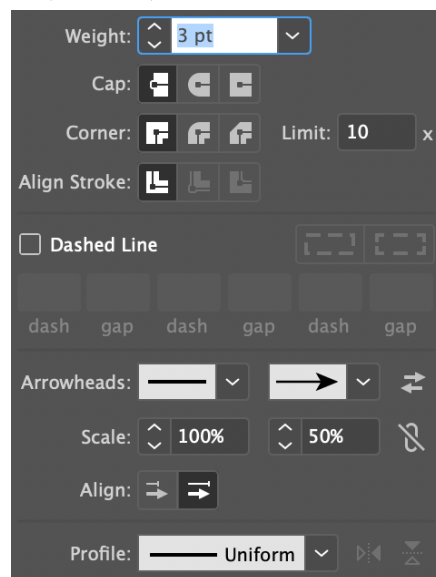
- Draw two parallel horizontal lines, change the stroke color to yellow and thickness to 2 pt. Align as necessary
- Draw a vertical line connecting the horizontal lines, changing the stroke color to yellow and thickness to 2 pt. Use “**ALT**”/”**Options**” to copy nucleotides along the DNA backbone.
- Draw a vertical black line with thickness of 1 pt to connect backbone to methyl group.
- Use “**Type Tool**” to type CH₃, and go to “Properties” → “Characters” → “More Options” to make “3” into a subscript.

Histones

- Use the “**Ellipse**” tool to draw a histone, and change its fill to green.
- Use the “**Pen**” tool to draw a wrapped DNA around the histones.
- Use “**ALT**”/”**Options**” to copy histones two times. Align using the Properties tab as necessary.
- Use the “**Pen**” tool to connect the three histones with DNA.
- Adjust the stroke of DNA with a color of black and thickness of 2 pt.

Arrows

- Use “**Line Segment**” tool to draw a black line with thickness of 3 pt.
- Under Properties, click on the word “Stroke”. This will open up additional options as shown below. Adjust the arrowhead (Arrow 2).



Cluster Plot

1. Go to the Github repo: https://github.com/welch-lab/illustrator_tutorial
2. Click on the green “Clone or Download” button the right, then click “Download ZIP”.
3. Unzip the folder.
4. Open “gaussian.svg” using Adobe Illustrator and copy and paste into the figure.

Bonus: Dynamic Gene Expression

While this figure looks very complicated with subtle differences in cell shapes and colors, in reality, we only drew four cell types to generate this figure!

1. Draw roughly four cells that represent cells transitioning from one shape and size to another.
2. Use the “Blend” tool to create transitioning cells automatically.
3. Curve the path between the cells using either “Pen” tool or by applying the “wave” effect on a line (see section on mRNA).
4. Draw a curved path from one cell type to another using the “Pen” tool.
 - a. Stroke color is black with a thickness of 5 pt.
 - b. See section on “Arrows” to modify the end of the curved line to an arrowhead.