

Basic Adobe Illustrator CC guide for scientists

Original version [blogged about](#) and [published](#) 8/21/2019 by [Connie Jiang](#) during PhD studies at the University of Pennsylvania; Personal edit last updated/modified 9/20/2023.

[Introduction to this guide](#)

[Goals of this document](#)

[Why Illustrator...](#)

[Over figure-scripting?](#)

[Over other Adobe softwares like Photoshop or InDesign?](#)

[Over PowerPoint?](#)

[How to's:](#)

[How do I find my document formatting settings?](#)

[Artboards](#)

[Color profile](#)

[Raster effects](#)

[Tools and panels in Illustrator: a quick introduction](#)

[What are layers, and why will I grow to love them?](#)

[Cool, you've convinced me. How do I add layers?](#)

[Things you might want to include on a locked background layer](#)

[Margin guides](#)

[Boxes \(as for posters\)](#)

[How do I move objects between layers?](#)

[I want to import this graph/image/object into Illustrator: what should I know?](#)

[A couple guidelines/recs for exporting graphs from R/MATLAB to Illustrator](#)

[What types of files can Illustrator import and what should I know about them?](#)

[Directly editable files:](#)

[Files that you can really only edit with work and loss of some structure](#)

[What are some tricks and tips for aligning figures?](#)

[Align and Distribute](#)

[How do I "paste in place"?](#)

[Some general alignment guidelines](#)

[How do I change my arrow key increment from the default?](#)

[Vector graphics: drawing, making, editing](#)

[About paths](#)

[Anchor points: 2 types](#)

[Selection tools in Illustrator: how should I click on \(part of\) my object of interest?](#)

["Selection tool" : keyboard shortcut "v"](#)

["Direct Selection tool" : keyboard shortcut "a"](#)

[Other selection tools](#)

[How do I set stroke weight?](#)

[I have made axes or some other object with right angles but now it looks like there is a gap at the corner: how can I fix this?](#)

[I added a line segment but I want it to be dashed/dotted: what do I do?](#)

[I added a line segment but I want an arrow: what now?](#)

[My arrowhead by default is ridiculously big when I use my desired stroke weight. How do I change it?](#)

[Some notes on transform tools in Illustrator](#)

[Scale](#)

[Rotation](#)

[Reflection](#)

[Moving](#)

[I have TOO MANY POINTS and it is killing my Illustrator: HELP.](#)

[I have a line art drawing that I want to vectorize! How can I do this?](#)

[Type/text](#)

[What font am I using? How do I change it?](#)

[Point type versus area/paragraph type: what's the difference?](#)

[Point type:](#)

[Area type:](#)

[How do I superscript or subscript?](#)

[How do I change the formatting of my text, ex. for figure captions?](#)

[For some reason, I want to add bullet points/numbering in Illustrator](#)

[For some reason, I want to create a table in Illustrator](#)

[A *very* brief overview of colors](#)

[How do I edit colors?](#)

[I want to match the color of an image I have already: how do I do that?](#)

[I want to recolor/edit everything that is of one color/attribute: how?](#)

[Illustrator soft-proofing tools for simulating how images will appear to others](#)

[Using these tools to simulate how images will look to people with color blindness](#)

[Images](#)

[Some thoughts on cropping and masking](#)

[How do I add a scale bar?](#)

[How do I resize groups of images?](#)

[Set W and H numerically when importing sets of similar images](#)

[Resize images as a group](#)

[Linked versus embedded images](#)

[Linked images](#)

[Embedded images](#)

[How can I tell whether my images are linked or embedded?](#)

[I've changed the original image file: how can I update my linked image?](#)

[How do I embed a linked image?](#)

[How do I relink an embedded image?](#)

[I want to do something specific in Illustrator and someone has written a script for it: how can I use it?](#)

[I'm done with my figures and now I'm preparing to submit them to a journal: what formatting should I do?](#)

[Suggested final checklist for figures created in Illustrator](#)

[Works Consulted](#)

[Some additional links that may be helpful](#)

[Some resources for figure design](#)

[Speaking of colors...](#)

Introduction to this guide

Goals of this document

[Adobe Illustrator](#) is an extremely powerful tool for scientific figure creation but can cause significant cognitive burden for someone just starting out. This is meant to be a fairly cursory beginner's guide to the pieces of Illustrator that are most likely required to construct a scientific figure and serve as exposure to the Adobe “lingo” that will facilitate more specific/individual queries. Additionally, in the [How to's](#) section I have addressed what I feel to be some frequently asked questions based on my own experience.

Disclaimers:

- While this document will hopefully impart the tools and language to approach Illustrator for scientific figure-making, it makes no claims or recommendations on aesthetic or design guidance. I have, however, linked some of my personal fave data visualization/design resources at the [end of this document](#) if you are curious.
- Illustrator is very expensive, and not everyone has access to it for scientific figure design. Numerous people have recommended free ([Gimp](#), [Inkscape](#)) or less expensive ([Affinity Designer](#)) alternatives; while this document does not comment specifically on those, many of the general concepts transfer, and some of the specific keyboard shortcuts even work with the equivalent tools in Inkscape.

Why Illustrator...

Over figure-scripting?

It can be troublesome to fully script figures, and hardcoding everything can make it anything from slightly irritating to extremely difficult to make requested edits. It can be great to have scripts for parts of image/data processing like image contrasting and [cropping](#), especially to maintain consistency across many images, but I prefer to use Illustrator for things like:

- Resizing images/figures
- Adding scale bars
- Easily modifying colors and rearranging panels
- Easy aesthetic adjustments (i.e. alignment, compiling micrographs with schematics)

Over other Adobe softwares like Photoshop or InDesign?

[Here's](#) a nice comparison of when to use which Adobe design software (i.e. Photoshop vs Illustrator vs InDesign). Figure design needs often (though not always) fall solidly into the Illustrator camp: single page layouts that combine raster images with punchy vector graphics and a small amount of text.

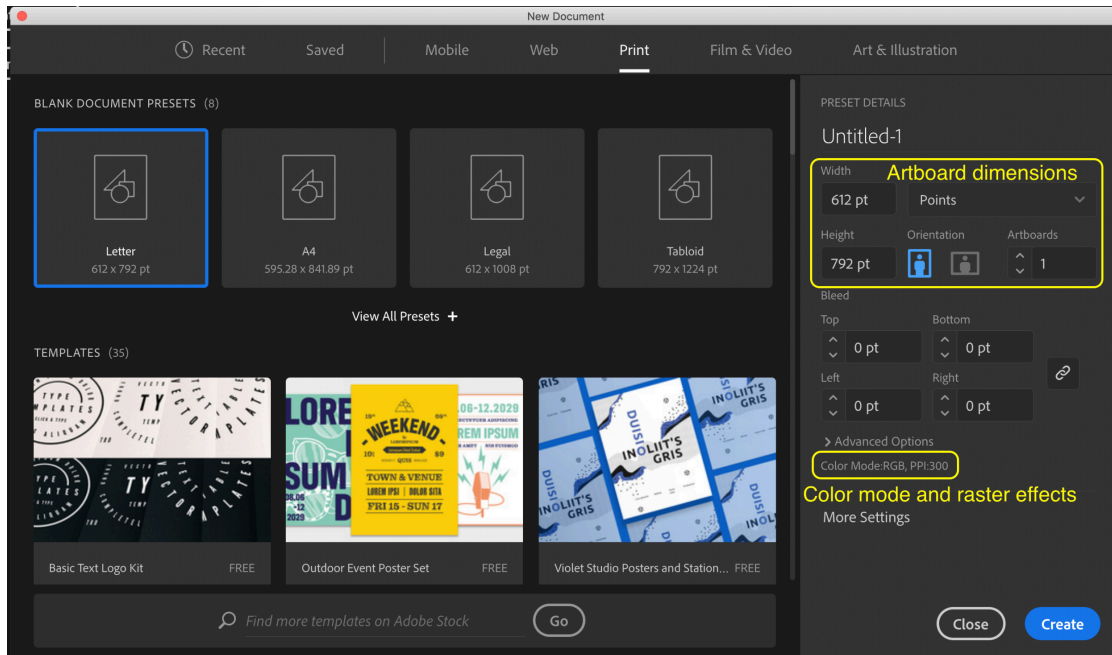
Over PowerPoint?

PowerPoint is largely designed to create presentations for screen resolution rather than print, leading to decreased resolution for most figures. This is also why it sucks to attempt to convert a PowerPoint figure to an Illustrator (or other) figure—the resolution of the initial image is generally lost. On the other hand, Illustrator is designed to create vector graphics which, [as discussed more below](#), have essentially infinite resolution (whether used for tiny favicons or blown up to billboard proportions). Additionally, Illustrator is much more flexible and powerful than PowerPoint (more editing capabilities and control).

How to's:

How do I find my document formatting settings?

Every time you start a new document in Illustrator, you should be able to find this information, i.e.



These are the defaults you should be using:

- Letter size artboard, configured in points
- Color mode RGB (not CMYK)
- Raster effects resolution high, i.e. 300ppi

But let's say you're in a document and you can't remember how it's configured: what do you do?

Artboards

On your main screen, click on the button marked "Document Setup" in the Control panel. Click on the button marked "Edit Artboards". Looking back to where the "Document Setup" button was you should now notice width (W) and height (H) measurements. Default 8.5 x 11-inch measurements are 612 x 792 pt. To exit this screen, click on any tool or use a keyboard shortcut (ex. "v" gives you the Selection tool, i.e. the filled-in arrow).

This is also where you can add additional artboards—for instance, if you're trying to create multiple figures in one document (see for example genericpaperfigures.ai in [sample_illustrator folder](#)). While this can make your ultimate document unwieldy if you're handling a lot of information (ex. many embedded non-rasterized data-heavy plots), it can also be particularly nice when you're shifting the order of your figures/subfigures around (during which time it also may be better to keep your plots [linked rather than embedded](#)).

Additionally, if you want to create a copy of the same artboard (ex. You have already set up positioning of "Figure #" and other titles on an otherwise blank artboard), hold down the "alt" or "option" key while clicking on/dragging an existing artboard to create a duplicate. Make sure that "Move artwork with Artboard" is selected in the "Properties" panel if you want to copy your artwork (ex. titles). See more on [panels](#) below.

Color profile

Go to “File” and hover over “Document Color Mode”. You should see a checkmark next to RGB.

Raster effects

Go to “Effect” → “Document Raster Effects Settings”. Check that your resolution is toggled to “High (300ppi)”.

Tools and panels in Illustrator: a quick introduction

I tend to work in the Essentials workspace (look to the top right of your screen), but depending on your needs you can peruse the other available defaults.

By default, Illustrator loads a control panel at the top and toolbar to the left of your workspace:

- Control panel/options bar: located by default at the top of your workspace
 - Has things like object/stroke color, stroke width, opacity, shortcuts to Document Setup and Preferences
 - Changes depending on what is selected (for easy access to relevant tools): ex. if a shape is selected, panel will also include alignment and transformation tools, whereas if a text box is selected, panel will additionally include character styles and paragraph tools.
- Illustrator toolbar: located by default to the left of your workspace
 - Suffice it to say that there are many tools here that you may not use as well as some hidden tools that you may want to use and have to find. I address commonly used tools where relevant in this document (ex. [Selection tools](#)). If you are looking for a tool but cannot find it in the default toolbar, click on the 3 dots on the bottom of the panel to bring up an “All tools” list, and drag your desired tool where you would like it to sit for easy access. You can also hover over the tools in this list to find where Illustrator stores them by default and find each tool’s keyboard shortcut.
 - To toggle between a double versus single column of tools, click the double arrow in the top left corner of this panel

Additional panels to the right of the workspace are meant to provide additional functionality and are somewhat more modular. These panels can be grouped, stacked, or docked (click and drag them until you are satisfied).

The following panels are what I find the most useful and are referenced elsewhere in this document:

- Properties
- [Colors and/or Swatches](#)
- [Layers](#)
- [Align](#)
- [Transform](#)
- Stroke
- [Magic Wand](#)

To peruse and add additional panels to your workspace, simply go to “Window” and click on your desired panel (panels that are already loaded will have a check mark to the left).

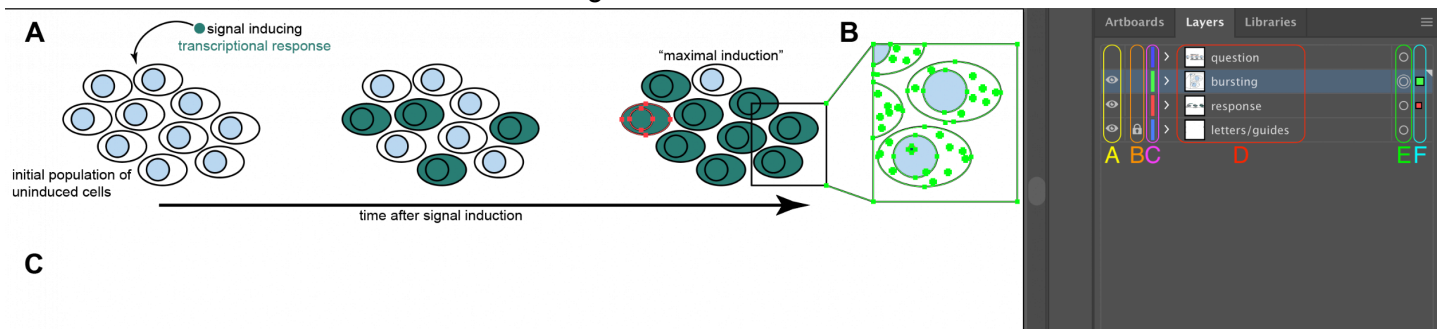
What are layers, and why will I grow to love them?

Sometimes you create complicated things in Illustrator, and selecting specific objects becomes difficult. Layers are one way to manage all of the items that contain your artwork—you can imagine that they are something

like very flexible clear folders. Artwork can be moved between layers, and layers containing artwork can be reshuffled to change artwork stacking. Layers can be merged and can even contain sublayers. A real-life example of why layers might be useful is in reconfiguring poster information to meet a new required poster size: if each of your panels is in a different layer, you can easily select that whole panel and stretch/resize it to fit, rather than painstakingly separating pieces of your poster from each other.

The Layers panel has 6 sections:

- A. **Visibility column:** Artwork in this layer is visible when the eye icon is present.
- B. **Edit column:** Artwork in this layer is locked and will not be editable when the lock icon is present.
- C. **Color:** This color (up to 9 unique) is automatically assigned to your layer and will display in the illustration window as bounding box, path, anchor points, and center point of a selected object.
- D. **Small image of layer artwork and layer name** (self-explanatory)
- E. **Target column:** This might be a double or single ring depending on whether effects are being applied, and honestly I never look at this. Clicking this target will select everything on that layer.
- F. **Selection column:** A color box appears when an item on this layer is selected. If everything on the layer is selected, the color box becomes larger.



Note how one layer is hidden (column A) and so no objects from that layer appear (would be under subheading C). One layer is locked (column B)—the “letters/guides” layer containing the subheading letters. The two visible unlocked layers are the green “bursting” and red “response” layers (column C). You can see in the image that the selected cell under subheading A is outlined in red, indicating that it is from the red “response” layer. Similarly, all of the selected objects under subheading B are outlined in green, indicating that they are from the green “bursting” layer. Although objects on two layers are selected, we can only be on one layer (i.e. if we were to, say, paste an object now it would go into a single layer)—that layer is the highlighted one (here it is the green “bursting” layer). The double ring in column E indicates that the green “bursting” layer is targeted. There are squares in both layers with selections in column F: because everything in the green “bursting” layer is selected, the square is larger.

Cool, you’ve convinced me. How do I add layers?

Look to the right side in your Illustrator workspace for the tab/panel labeled “Layers”. Once selected, click on the 3 horizontal lines to the right of the tabs. Click “New Layer...”. You can name your layer in the pop-up (or rename later by double-clicking the Layer name). By default, your layers will be numbered.

Things you might want to include on a locked background layer

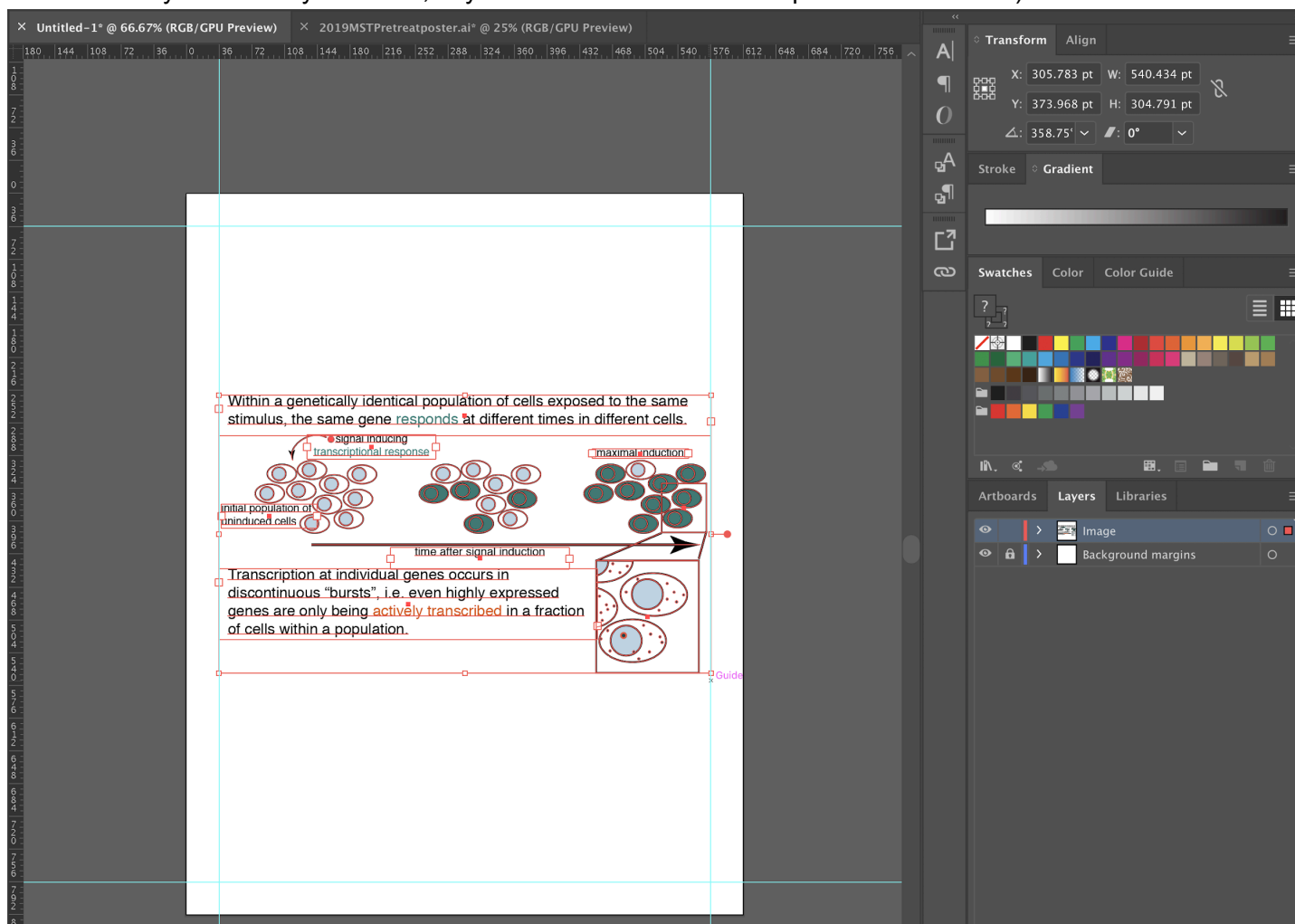
Margin guides

If you like smart guides (light cyan lines that run horizontally and vertically but do not appear in any print copy), this might be an option for you. Start by bringing your ruler into view. You can do this one of two ways:

1. Use the keyboard shortcut “command+r”.
2. Go to “View” → “Rulers” → “Show Rulers”.

Now click on either the top or side ruler and drag out onto your artboard. You can measure these guides against your rulers to create your margins OR WHAT I ADVISE is to while your guide is still selected go to your “Transform” panel and set its relevant X or Y coordinate. (i.e. vertical lines should have X-coordinates of 36

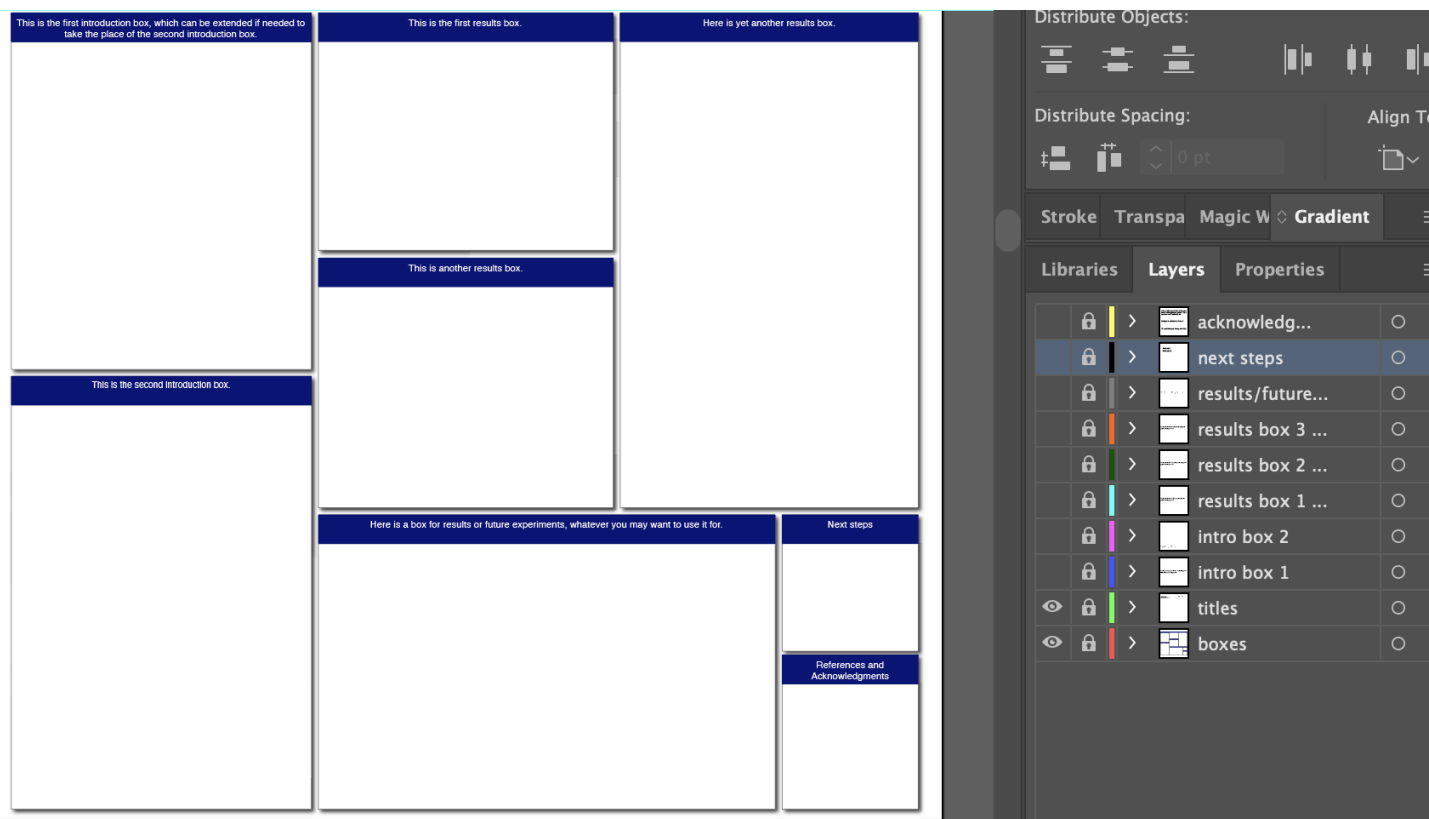
and 576; horizontal lines should have Y-coordinates of 36 and 756). If you choose to have multiple artboards, you can actually keep these margin measurements if you use Artboard Rulers (instead of Global Rulers). Check your ruler type by going to “View” → “Rulers” → “Change to Artboard/Global Rulers” (whichever is not listed is what you currently have set; keyboard shortcut for this is “option+command+r”).



Here, even though my margins are locked on the layer called “Background margins”, I can use them to resize my image—the fuchsia “Guide” is evidence that the right side of the figure is aligned to the smart guide, i.e. the margin. EDIT 2021: Illustrator actually has a built-in way of locking guides such that you need not actually store them on a separate locked layer: go to “View” → “Guides” → “Lock Guides” (keyboard shortcut “option+command+;”). I usually keep them locked unless I need to edit them and otherwise store them on the same layer as my figure headings/subheadings/legends). You can see how I use these in the genericpaperfigures.ai file in the [sample illustrator folder](#).

Boxes (as for posters)

It’s my personal preference to have poster boxes on a background layer that I can lock and edit separately from any of the poster contents, i.e.



If you are interested in this poster template, you can actually find it here in the [sample illustrator folder](#). TBH I do this with titles too and then keep box contents in separate layers too, but do what you want! Knock yourself out! Layers are great!

How do I move objects between layers?

Oh no, you've put an object onto the wrong layer! Now what? Using the Selection tool, select all of the objects you wish to move to your new layer. Without deselecting your object of interest, click on the layer you wish to move to. Go to "Object" → "Arrange" → "Send to Current Layer".

I want to import this graph/image/object into Illustrator: what should I know?

A couple guidelines/recs for exporting graphs from R/MATLAB to Illustrator

- ❑ If exporting anything with dots (ex. scatter plot, UMAP, etc.): when you use ggsave, include the statement "useDingbats = F".
 - ❑ Alternatively, install the font Adobe Pi.
 - These dots (now text) can be expanded in Illustrator if you need to edit their object attributes (ex. size): after selecting all the objects in question (you might want to [use special select](#)), go to "Object" → "Expand".
 - Tip from [Lauren](#): Alternatively, (for ggplot2) you can set "shape = 16" in the call to geom_point and the dots will be actual dots (not text). Make sure you still include "useDingbats = F" (thanks [Yogesh](#)!).
- ❑ Tick labels may not export properly (prepare to relabel axes in Illustrator).
- ❑ Check your font size against image size (i.e. sometimes when saving to SVG format from R, I've noticed that the font is vastly larger than it was in the initial image—this may be because the font size is constrained but the image size is much smaller, but I'm honestly not sure).

What types of files can Illustrator import and what should I know about them?

While you can at times drag images into your Illustrator artboard, instruction manuals will typically have you import files by choosing “File” → “Place”. Note that if you select “Link” your Illustrator document will link to the file; deselect “Link” to embed the artwork in the document (more on that [here](#)). Click where you want the image to go in your document. Illustrator can directly edit some types of images.

Directly editable files:

- Adobe Photoshop
 - If the file has layers, you can choose how to convert them.
 - If the file has layer comps, you can choose which version of the image to import.
- Adobe PDF
 - If you choose a file with multiple pages, a dialog box will ask you which page you want to place and how you want to crop the artwork.
 - This will probably come in with a bunch of white boxes/artifacts (any “transparent space” ends up having its own box) that you will have to delete to access specifically the graph/artwork.
 - This can be done manually or potentially [with a script](#) (see [this tweet](#) for an example).
- Encapsulated PostScript (EPS)
 - All objects will be converted to native Illustrator objects, but anything that Illustrator doesn’t recognize will be lost.
 - EPS format does not support transparency, so there may be many white boxes, and what you thought were plain colored vectors may have white areas.
 - If you link instead of embedding EPS images, they will not be color-managed.
- Scalable Vector Graphics (SVG)
 - XML-based vector format that describes images as shapes, paths, text, and filter effects.
 - Usually I try to use this format and edit it directly then copy-paste the area I want into my Illustrator file.

Files that you can really only edit with work and loss of some structure

- Desktop Color Separation (DCS) is a version of standard EPS format but supports only CMYK images. DCS files can be linked but not embedded or opened in Illustrator.
- Bitmap image (GIF, JPEG, WBMP, PNG, TIFF) resolution is determined by the source file. These files will have to be [traced and expanded](#) if you wish to edit them directly—unless they are line art this might make your images wonky.
 - Side note: [Here](#) are some differences between these file formats.

Good general guidelines: Import all graphs and artwork as vectors/directly editable files (SVG, PDF). You can, however, use Illustrator to [convert line art to vector graphics](#) if need be. Import all images (ex. microscopy) as TIFFs.

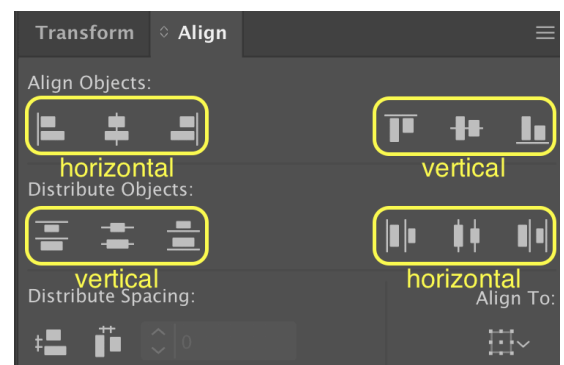
What are some tricks and tips for aligning figures?

Meet your new best friend, the “Align” panel:

Align and Distribute

Alignment: Objects can be aligned with respect to an anchor (which can be 1 or more other objects or the page).

- Horizontal alignment: Use to match left sides, right sides, or centers of objects that are stacked on top of each other.



Can also be used to center object(s) on page (toggle in “Align To” menu in bottom right).

- Vertical alignment: Use to match top or bottom sides or match middles of objects that are next to each other. Can also be used to move object(s) midway down the page.

Distribution: Allows even spacing of objects in horizontal or vertical direction based on some criteria. Will automatically distribute objects between two objects at the extremes.

- Horizontal distribution: Use to evenly space left sides, centers, or right sides, based on the leftmost and rightmost objects. Ex. if using “right-distribute” (far-right button on panel), the rightmost edges of all selected objects will be used to determine distribution bounds.
- Vertical distribution: Use to evenly space bottoms, centers, or tops of objects, based on top and bottom objects.
- “Distribute Spacing” options (bottom left buttons) allow horizontal and vertical distribution not with respect to each other but with uniform gaps between objects.
 - These buttons are very useful if, for instance, [you decide to make the \(questionable\) decision to create a table in Illustrator](#) and need to make sure boxes abut each other.

Align to key objects

- If you want to specifically align object B to object A (instead of aligning them to each other), after selecting objects A and B, click again on object A (WITHOUT holding down “shift”) to designate it as your “key object”. Then select the type of alignment you want to do.

How do I “paste in place”?

Using the typical shortcut for paste “command+v” in Illustrator will send your pasted object anywhere in the artboard. If, instead, you want the pasted object to go to the same place as the initial object (this is useful, for instance, if you want to start a new figure but make sure your titles and captions are in the same place as before), you should instead “paste in place”. You can do this in at least 2 ways:

1. Use the keyboard shortcut “command+shift+v”.
2. Go to “Edit” → “Paste in Place”.

Also of note, you can also use “Paste in Front” (“command+f”) or “Paste in Back” (“command+b”) to designate pasted object arrangement with respect to other objects on the artboard.

Additionally, if you want to paste an object in the same relative location to multiple artboards, check to see that you are using Artboard Rulers (not Global Rulers; review how to do this in the [section on margin guides](#)), then you can copy an object from one artboard, click on the new artboard, and then paste in place. This is particularly useful if you are creating multiple figures within the same document and need to, for instance, copy-paste figure titles into the same relative location.

Some general alignment guidelines

- All related graphs should be the same size and should be both aligned (center and middle) and distributed evenly across their section of the page.
- Numbering on y-axes should be right-aligned and accurately/evenly spaced.
- Axes name labels should (usually) be center-aligned with their pertinent axes
- Try to square off your figures
- Center figure captions to page (i.e. Click on the grid under “Align To” then “Align to Artboard”, and then select the middle horizontal align button).
- Use your best aesthetic judgment.

How do I change my arrow key increment from the default?

By default, the arrow key increment distance is 1 point (1/72 of an inch ~ 0.3528mm). You can change this (I like to make it smaller) by going to “Illustrator” → “Preferences” → “General”. Change your “Keyboard

Increment” preference. In recent versions of Illustrator, you will also need to turn off “snap to pixel” if you do this (else the increment may still default to 1 point). You can do this by clicking this icon  in the top right corner or by going to “View” → “Snap to Pixel”.

An alternate way to make both of these adjustments is to go to the “Properties” panel which contains both “Preferences” including “Keyboard Increment” and “Snap Options”.

Vector graphics: drawing, making, editing

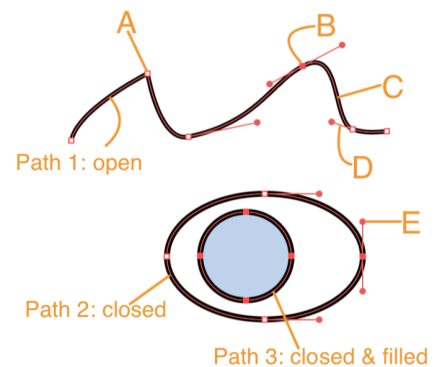
Vector graphics are made up of lines and curves and describe images according to their geometric characteristics. They are resolution-independent and thus are great for things like schematics and logos.

About paths

Essentially every vector graphic is composed of paths, which are made up of one or more straight or curved segments. Each segment is bracketed by anchor points (marked in Illustrator by unfilled or solid small squares). When using the Pen tool , every time you click, you lay down a new anchor point. Paths can be closed (ex. Shapes, Paths 2 and 3 below) or open with distinct endpoints (ex. Line, Path 1 below). The shape of a path can be changed by dragging at any of its components:

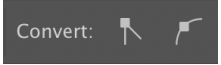
For example:

- A: Unselected (unfilled) corner anchor point
- B: Selected (solid) smooth anchor point
- C: Curved path segment
- D: Direction line: tangent to the curve at the anchor point
 - Angle of line determines slope of curve
 - Length of line determines height/depth of curve
- E: Direction point: use to move/resize direction line



Anchor points: 2 types

1. At a “corner point” (ex. A), the path abruptly changes direction.
 - a. A corner point may have 0, 1, or 2 direction lines, depending on whether it joins 0, 1, or 2 curved segments; these direction lines move independently of one another.
2. At a “smooth point” (ex. B), path segments are connected as a continuous curve (i.e. connects 2 curved segments).
 - a. Each smooth point has 2 direction lines which move as a single straight unit.

Change between point types using the buttons found in the Control panel: . The left button will convert smooth anchor points to corner anchor points, and the right will convert corner to smooth.

Add or subtract anchor points to a path using the “Add Anchor Point tool”  (keyboard shortcut “+”) and the “Subtract Anchor Point tool”  (keyboard shortcut “-”), by default hidden behind the pen tool.

The path outline, made up of multiple connected anchor points, is called a “stroke”, and can be assigned a [weight](#), [dash pattern](#), and a [color](#). Any [color](#) or gradient applied to an open or closed path’s interior area is called a “fill”. Each path also contains a “center point” which corresponds to the center of the object but is not

actually part of the path (and thus cannot be deleted)—you can use this point to select all anchor points on the path, move the entire path without distortion, or align the path with other elements.

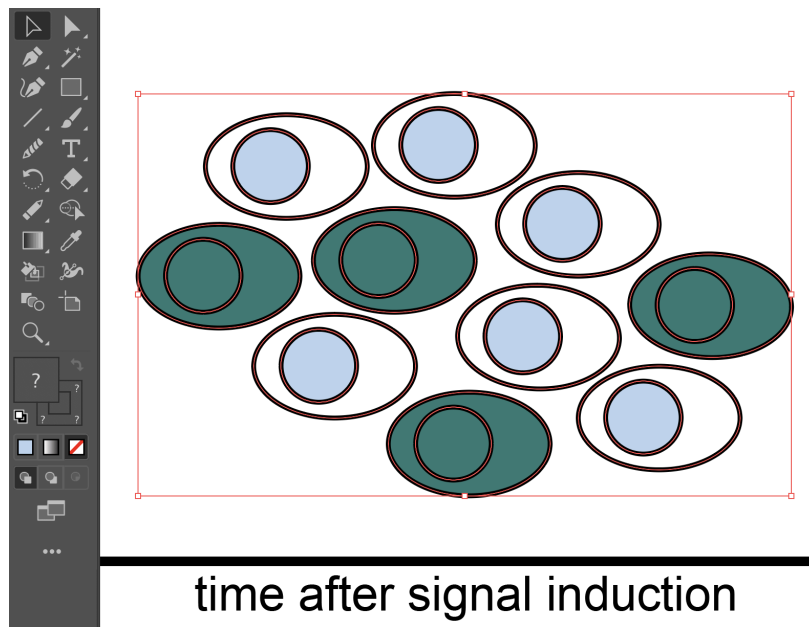
Selection tools in Illustrator: how should I click on (part of) my object of interest?

“Selection tool” : keyboard shortcut “v”

This is by default the very first toolbar icon and probably should be. When using the Selection tool, you can select entire objects or groups by clicking; i.e., you will activate all anchor points in an object/group at the same time, such that you can move your selection without changing its shape. This is generally the tool to use if you want to move an object, resize a group of objects, etc. You can select objects in 2 main ways:

1. Click on any part of the object or group. Unlike with the Direct Selection tool, it does not matter whether you click within the object, along the path, or at a single anchor point. You can hold “shift” and click to select multiple unrelated objects.
2. Drag a marquee around part or all of the object or group.

When using the Selection tool, you will always see a rectangular bounding box around the selected object(s). For example: all of the “cells” in this frame are grouped, and so by clicking on any one cell using the Selection tool, all of them are selected.

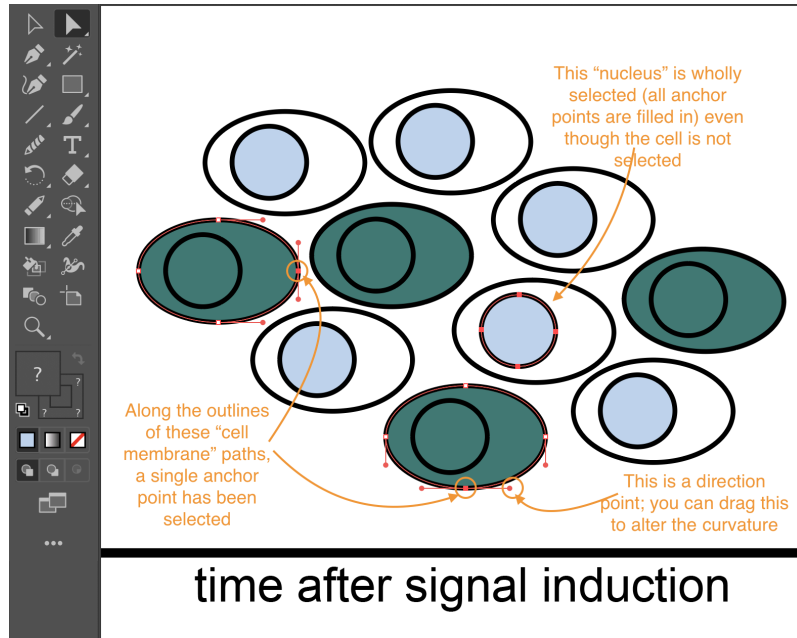


“Direct Selection tool” : keyboard shortcut “a”

Found directly under or to the right of the Selection tool, this white arrow allows for the selection/modification of paths *within* shapes. Use this tool to:

- Select a single object within a group (by clicking in the center of that object). Note that unlike when you are using the Selection tool, the bounding outline is limited to the outline of the object(s) selected.
 - With that object selected, even if you change to using the Selection tool, it will still keep just that one part of the group selected.
 - As with the Selection tool, you can hold “shift” and click on multiple objects or points within a group or draw a marquee around a portion of a group.

- Within a path, modify a specific anchor point or edge. You can selectively move/drag part of an object to distort the initial shape or, if altering a curved path, use direction points to change the degree of curvature at the selected point.



Other selection tools

- Group Selection tool : Hidden in the Direct Selection tool (click and hold down to reveal), this tool adds grouped items as you use it to click objects. I don't use it much but maybe you will like it.
- Magic Wand : Used to select objects with like appearance attributes (ex. Fill and stroke colors). See more [below](#).
- Lasso : Also hidden in the Direct Selection tool, you can use the Lasso to click and drag around anchor points you want to select (useful if drawing a rectangle around them is unfeasible).

How do I set stroke weight?

Draw a line segment or use the Selection tool to select the line that you wish to alter. In the Control panel towards the left after color selections is the stroke weight information. You can choose a stroke weight from the dropdown or enter your preferred stroke weight directly in the box. Generally, use 0.5pt for most lines in figures; the main exception are arrows which can have a larger stroke weight. Alternatively, you can make these edits in the Stroke panel to the right if you have it.

Note that stroke weight will increase proportionally if/when graphic is resized and may have to be readjusted at the end!

I have made axes or some other object with right angles but now it looks like there is a gap at the corner: how can I fix this?

Using the Selection tool, select only the vertical or horizontal line(s): i.e. if you are altering a single graph axis, choose only the X or Y axis. On the right side of your workspace, find the "Stroke" tab/panel. Where there are options for "Cap", select the rightmost option ("Projecting Cap").

I added a line segment but I want it to be dashed/dotted: what do I do?

With the Selection tool, select your line segment. On the right side of your workspace, find the “Stroke” tab/panel. Next to “Dashed Line” is a checkbox: click it. If you want a simple homogenous dashed line, change the first dash value to your desired dash width. Change the gap value to your desired gap width (default = 12pt). Have a field day playing with different patterns you can make this way but actually probably don’t do that for scientific figures it’s prob not the time.

I added a line segment but I want an arrow: what now?

With the Selection tool, select your line segment. On the right side of your workspace, find the “Stroke” tab/panel. If you do not see any options related to “Arrowheads”, click on the 3 horizontal bars to the far right of the panel tabs and select “Show options”. Next to “Arrowheads” you will see the two ends of your line segment delineated. Change the relevant end (you only have 2 choices just guess and change it if wrong) to an arrowhead—personally I like Arrow 3 but choose your fighter.

My arrowhead by default is ridiculously big when I use my desired stroke weight. How do I change it?

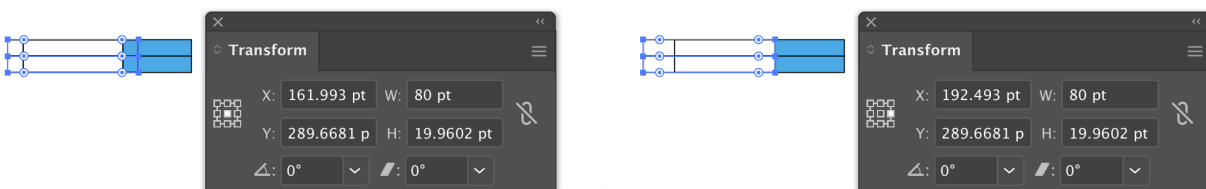
Navigate once again to the Stroke panel (see above for more details) and make sure you can see options related to “Arrowheads”. Under your arrowhead, you should see options for “Scale”. Change this scale amount to like 50% or whatever seems aesthetically preferable. Your arrowhead endpoint will remain the same (line segment is the same length).

Some notes on transform tools in Illustrator

There are many ways to transform artwork in Illustrator; some will be covered in the [section below on resizing groups of images](#). Here is a mishmash of other notes on transforming:

- For any of the below transform tools, you select multiple objects at once, by default the transformation will be applied to all of the objects together around a single reference point. To simultaneously transform multiple objects individually (ex. Let’s say you want to shrink every bar in a graph without affecting the absolute spacing between bars), go to “Object” → “Transform” → “Transform Each” (keyboard shortcut “command+option+shift+D”). A dialog box will pop up allowing you to scale objects, move them horizontally or vertically, and/or rotate them at a specific angle.
- Strokes and effects are by default not scaled along with objects. To scale them, choose “Illustrator” → “Preferences” → “General” → “Scale Strokes & Effects”
- It is sometimes useful to change your reference point (i.e. the part of your object that is anchored to the artboard while the rest of your object transforms). One way to do this is by looking within the transform

dialogue for the reference point locator  (default is object center) and selecting your point of choice. Here is an example: in the left image upon changing the width the object expands outward from the center reference point such that the white and blue boxes are no longer abutting. In the right image, the object expands outward from the right edge reference point, maintaining the border between boxes.



Scale

- Objects can be scaled by a percentage using the Scale dialog box (“Object” → “Transform” → “Scale”).

Rotation

- Objects can be rotated using the bounding box: Using the Selection tool, move the pointer near a bounding box handle until the pointer changes to  and then drag. If you hold “shift” while dragging, it will constrain the rotation to multiples of 45°.
- To rotate around the center point by a specific angle, choose “Object” → “Transform” → “Rotate” or enter an angle in the Transform panel.
- To rotate around a different reference point, select the Rotate tool  and click to reposition the reference point.
- To rotate a copy of the object, select the Rotate tool then hold “option” after you start to drag.

Reflection

- Reflect across any axis using the Reflect tool  (may be hidden initially: follow instructions as for [Magic Wand](#)). Use the Selection or Direct Selection tool to select the object(s) you want to reflect. Click on the Reflect tool. Click any 2 points to define the axis: the selected object should flip over that defined axis. To reflect a copy of that image, hold down “option” before clicking the second point.

Moving

- As mentioned elsewhere in the document, you can move objects by clicking and dragging as well as by setting X and Y coordinates in the Transform panel.
- Moving objects with arrow keys: Default distance is 1pt (1/72 inch ~ 0.3528mm). To change the [Keyboard Increment preference](#), go to “Illustrator” → “Preferences” → “General” or the “Properties” panel.
 - “Shift+arrow” will move the object 10x your Keyboard Increment
- To move an object by a specific distance, choose “Object” → “Transform” → “Move” and enter your desired move distance.
 - You can also use this to specifically move the object pattern rather than the object itself.

I have TOO MANY POINTS and it is killing my Illustrator: HELP.

Sometimes when you have too many points in a graph, it can increase your document size to a point where it slows down your Illustrator. First try saving and quitting, then reopening (sometimes will make it workable). Else, continue with these instructions.

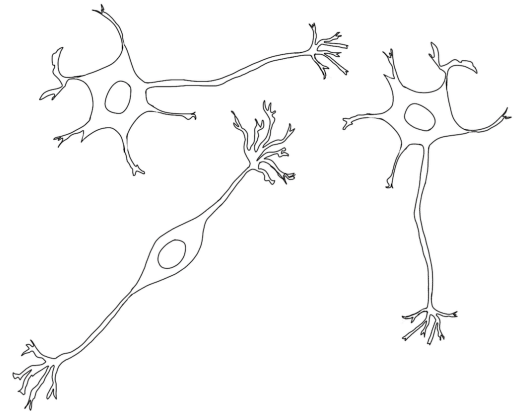
With the Selection tool, select your object that has too many points. Go to “Object” → “Rasterize...”. This will turn that vector object into an uneditable image. Save your document with a new name (ex. Append “raster” to the original name). This document should be much more editable but make sure to double-check the rasterized image to make sure it is what you want it to be before submitting (can always replace with the original object when fewer edits are made before rasterizing again at the very end).

Notably, [Ben](#) noticed that this may also occur if you saved a plot from R as a PDF without [Lauren](#)’s tip (see her suggestion in [this section](#), which will save you from having to do the following) wherein each geom_point is composed of a point and a doughnut outline (of the same color) around that point that look as though they are a single larger point but are indeed two separate elements. In this case, it may help if you select one of these doughnut points, [select all objects with the same stroke weight](#), and delete them. Following this, select all the

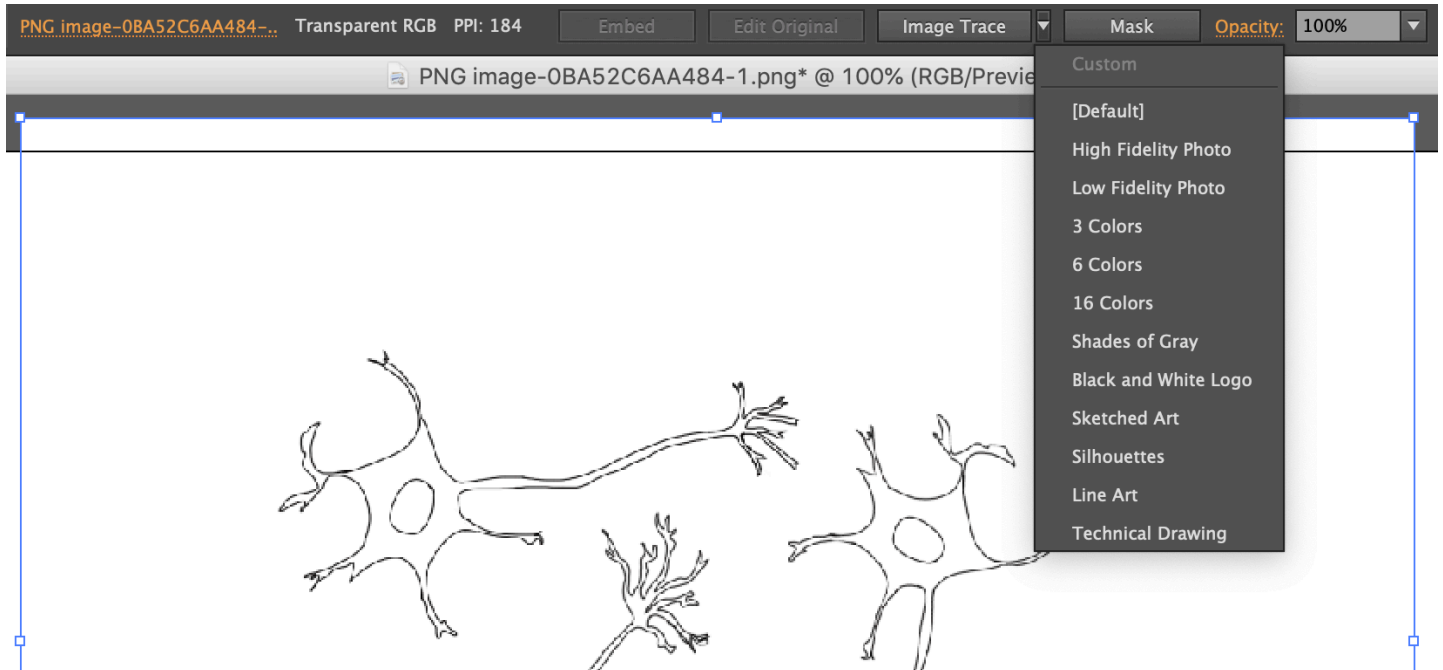
remaining points (can try to do this using fill color or some other method) and click “Expand” in the top banner (as they may be loaded as “text” objects which will not respond properly to any attempted transformations).

I have a line art drawing that I want to vectorize! How can I do this?

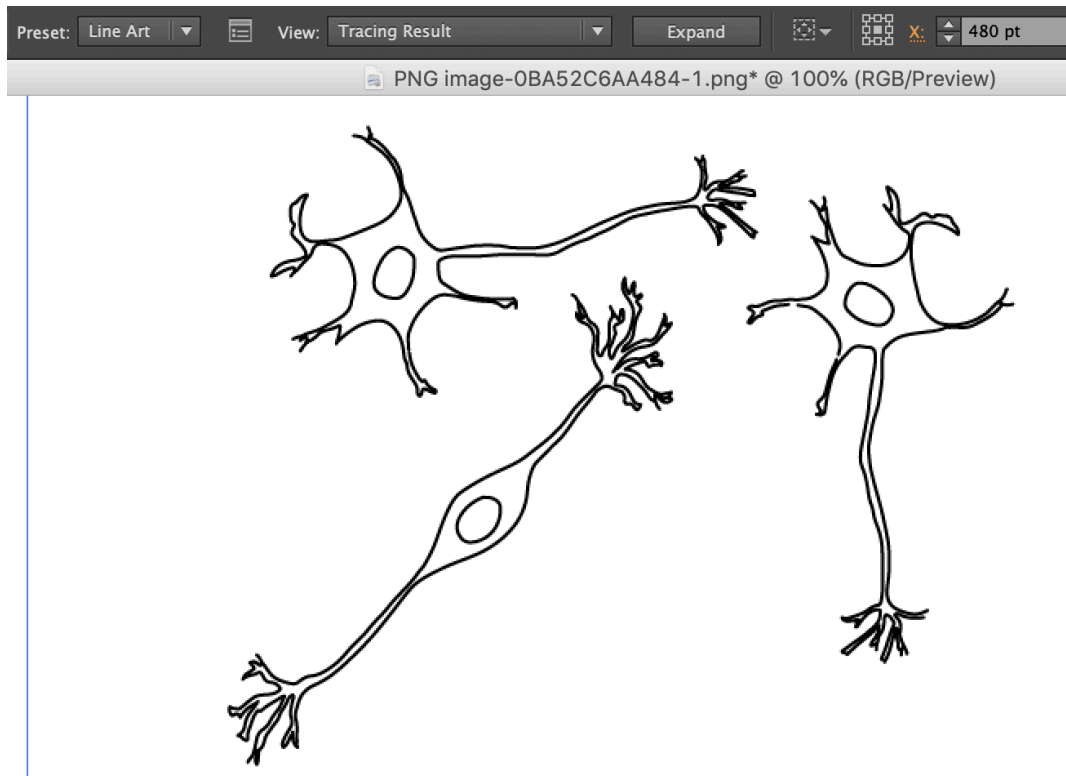
While there are many ways you can use Illustrator to draw, it may never be as intuitive as drawing with pen on paper or stylus on tablet. Let’s say you sketch out a cell or other object that you want to incorporate into your Illustrator schematic. For instance, here to the right are some cells that I drew using a tablet, saved in PNG form.



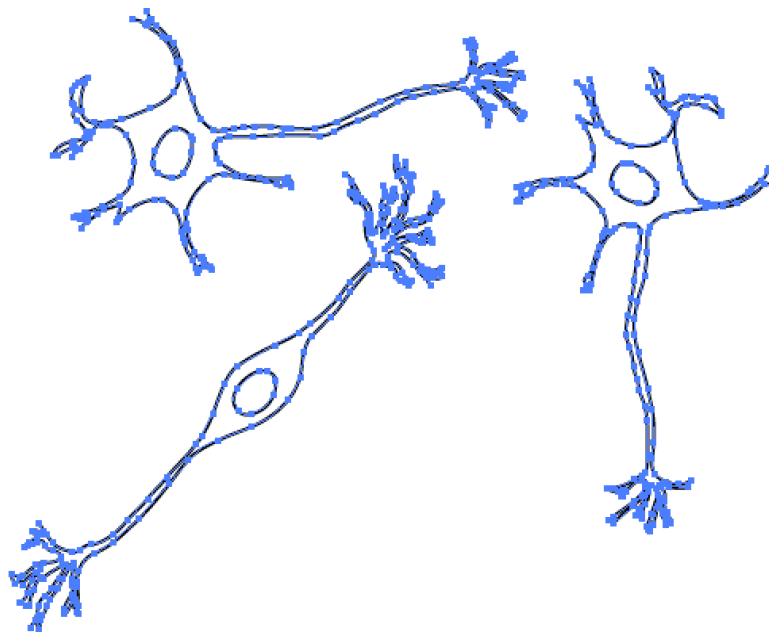
How can I make them vector images, with editable stroke weights and color fill? Begin by either placing your image in an already open Illustrator file or by right-clicking the PNG (or JPEG or what have you) and selecting Illustrator from the “Open with” dialogue. Feel free to transform your image to a size that makes sense for your artboard. Using the Selection tool, click on your image. In the Control panel, you will see a button that says Image Trace with an arrow to its right: click on that arrow to reveal your trace options.



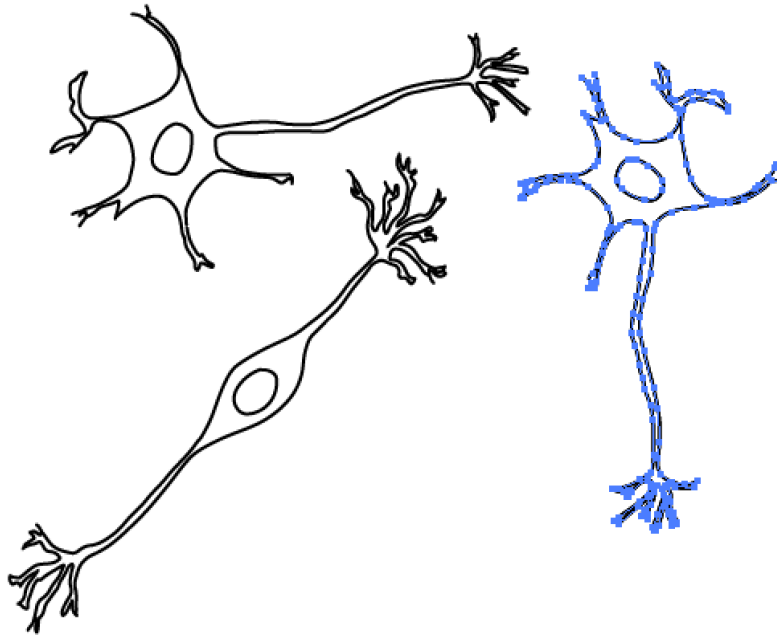
If you have a more complex image that you wish to vectorize (for example one that you have pre-colored) you can try using the “16 Colors” option. Else for something like the sketch I’ve shown here, the “Line Art” option is the cleanest. Once your image is traced (note here how the lines became darker and clearer, and gaps appeared), click the “Expand” button in the Control panel to convert your traced object into paths.



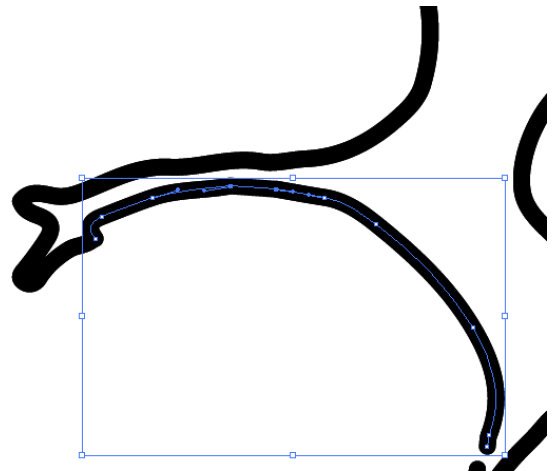
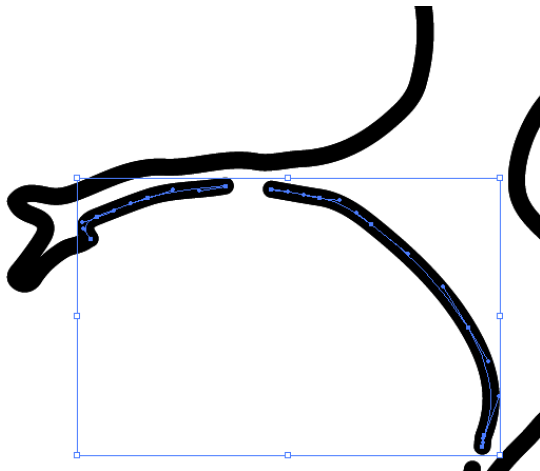
Now the expanded image should be fully vectorized (fully composed of paths as described above).



By default, this entire drawing is grouped as a single object. One way to separate, say, a single one of these cells (i.e. part of the drawing) for editing is to use either the Direct Select or Lasso tool to select the desired portion and then copy-paste: the resulting paths within your selection will all ungroup. For example, I am now able to use the Selection tool on just the rightmost cell, but unless I group the nucleus to the cell body, those paths will move separately from each other. Moreover, since there are gaps in the cell outline, all those pieces will also separate unless you patch them first.



If you plan to try and color fill your objects at some point, this is a good time to go through and close any gaps. Use the Direct Selection tool to select two adjacent separate points on either side of the gap (see left image) and use the keyboard “command+j” to join your two anchor points (see right image).



Type/text

Before you begin, note that Adobe Illustrator’s default font is Myriad Pro. If you are not a fan, go [here](#) to see how to change your default font.

What font am I using? How do I change it?

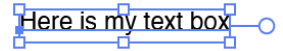
Using the Selection tool, click on the relevant text on your screen. You will see that on the Control panel, “Character” appears: click on it to bring up the Character panel. You can use the dropdown menus to change fonts and sizes, and even distort your font by stretching/squeezing letters, altering kerning, setting type leading, etc.

- These distortion parameters are useful for saving your labels if you have them in point type (see next section) and accidentally stretch them. Reset your horizontal and vertical aspect ratios to 100%.

Point type versus area/paragraph type: what's the difference?

Point type:

If you select the Type tool (or keyboard shortcut “t”) and click on your artboard, you are entering “point type”. Point type is a horizontal or vertical line of text that will begin upon your click and expand as you add characters; it will not text-wrap. If you try to edit this text by stretching the edges of the text box, the characters will distort (see above for how to fix this distortion). Point type can be rotated to track along a given shape/curve.



- Use point type for adding a few words to figures (ex. Labels, short titles).

Area type:

If after selecting the Type tool, you click and drag diagonally to define a rectangle, you are entering “area type”, also called “paragraph type”. Area type will use the boundaries of the defined object to control horizontal or vertical flow of characters (cannot be anything except horizontal and vertical—if rotated, the text will remain horizontal or vertical even as the text box moves). When text reaches a boundary, it will automatically wrap to stay inside the defined area. Similarly, resizing the text box will shift the arrangement of the text but will not distort characters.



- Use area type for figure captions.

In Adobe Illustrator CC 2019 or later, you can double-click on the circular handle that appears on the right side of your text box to switch it between point and area type.

How do I superscript or subscript?

Highlight the text you wish to superscript or subscript. Click on “Character” to access the Character panel. At the bottom of this panel you will see buttons for superscript and subscript.

How do I change the formatting of my text, ex. for figure captions?

Use the Selection or Type tools to select the text whose formatting you wish to edit. Click on “Paragraph” to access the Paragraph panel. Here you can control paragraph formatting (ex. Change default left-aligned text to left-justified or full-justified). You can also use the left and right indent dropdowns to control text box side padding.

For some reason, I want to add bullet points/numbering in Illustrator

There is no direct way to do this in Illustrator because it is not a word processing or presentation software. Here is a workaround:

1. Place all of the text you wish to be bulleted or numbered in its own (area) text box.
2. Click “Paragraph” to open the Paragraph panel.
3. Add the font size pt value to the left indent value (first dropdown: see name upon mouseover).
4. Enter the negative value of the font size pt value as the first-line left indent (immediately below left indent value).

You can see an example of this in the “Next steps” box in the blankpostertemplate.ai file in [sample_illustrator folder](#).

For some reason, I want to create a table in Illustrator

Again, there is no direct way to do this in Illustrator because it is not a word processing or presentation software. Here is a very terrible workaround if you must and also are committed to hours of misery:

1. Select the Rectangle tool  or use keyboard shortcut “m”.
2. Click on your canvas and enter your desired full table height and width. Alternatively, click and drag to draw out a rectangle the size of your desired full table
3. Change the fill and stroke colors to match what you want for the cells of your table.
4. With your rectangle still selected, navigate to “Object” → “Path” → “Split Into Grid”. In the dialog box that pops up, enter your desired number of rows and columns.
 - a. If you want to have spacing between your cells, enter this (measured in points) into the space for Gutter—note that this will potentially change the total size of your table whereas otherwise Illustrator will automatically fill in your desired table size.

Since I am apparently someone who is committed to hours of misery and have used this in published figures, there is an example table in the [sample_illustrator folder](#).

A *very* brief overview of colors

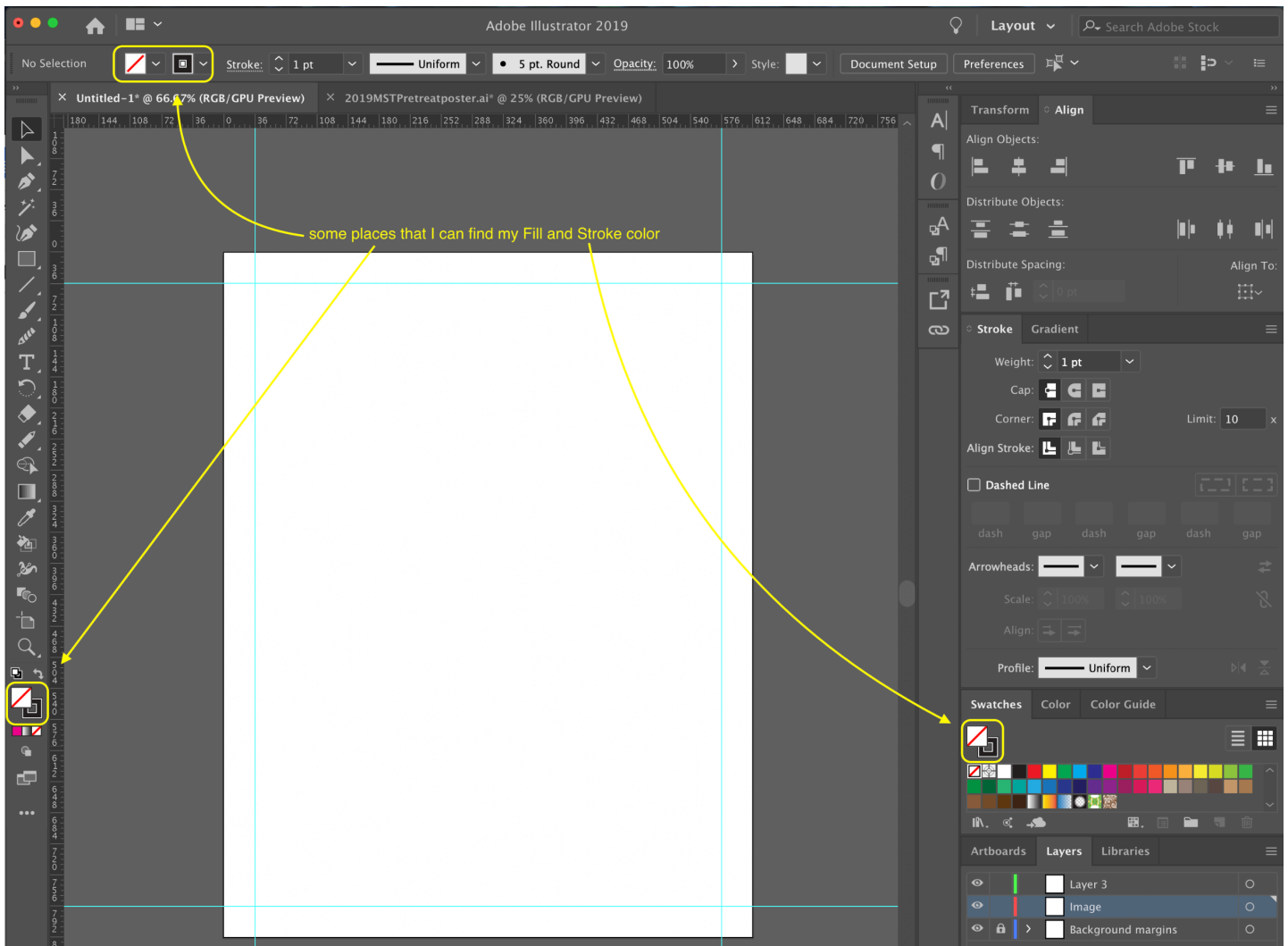
Every object in Illustrator can be assigned a Fill color and a Stroke color (note that lines will only ever display their Stroke color even if a Fill color is assigned). This can be visualized in multiple places on your screen (scroll to see image). I usually toggle colors based on the bottom left squares. Note that whichever one is in front is the editable color. You can toggle between with the keyboard shortcut “x” or by clicking the back square to bring it to the foreground.

These days, journals seem to like RGB mode for colors instead of CMYK. RGB mode is better for screen viewing anyway, since CMYK can’t produce all the colors that RGB can, but anything you intend to print will be more accurately visualized with CMYK (some more details [below](#)).

How do I edit colors?

There are so many ways to do this but here are a few options:

1. Use Swatches: Go to the “Swatches” tab/panel on the right side of your workspace. If the color you want is a swatch here, you can just click on it. You can also load swatches (bottom left of this panel there is a button that looks like a few vertical books: mouseover says “Swatch Libraries menu”) or if you have a color that is not swatched, you can make a swatch by simply clicking that color and dragging it over to your swatches menu.
2. Click on the “Color” tab/panel on the right side of your workspace. You can select any color using RGB values, HEX code, or navigating the RGB spectrum.
3. Double-click on the Stroke or Fill square to get the “Color Picker” menu. This looks a lot like the Color panel but also allows you to narrow your selection to just web-supported colors, use CMYK adjustments, alter hue (H), saturation (S), and brightness (B), and compare your new color to the object’s current color.



I want to match the color of an image I have already: how do I do that?

One way to copy appearance attributes is to use the Eyedropper tool . By default, the Eyedropper tool will copy any and all attributes of a selection (i.e. fill color, stroke color, character, paragraph, etc.). Start by using the Selection or Direct Selection tool to select the object whose attributes (ex. fill color, stroke color, etc.) you want to change. Click on the Eyedropper tool. Move the eyedropper tool to the object whose attributes you want to copy and do one of the following:

1. Click on it: this will sample all appearance attributes and apply them to the selected object.
2. "Shift"+click to sample only the color from a portion of a gradient, pattern, placed image, etc. and apply the color to the fill or stroke (whichever is the top square).
3. Hold "shift+option"+click to add appearance attributes of the new object to the selected object's existing attributes.

Note: the Eyedropper tool can actually also sample RGB colors from outside the document (will become fill vs stroke color depending on which square is in front).

Additionally, you can edit which appearance attributes can be sampled using the Eyedropper tool by double-clicking it and selecting off of the pop-up.

I want to recolor/edit everything that is of one color/attribute: how?

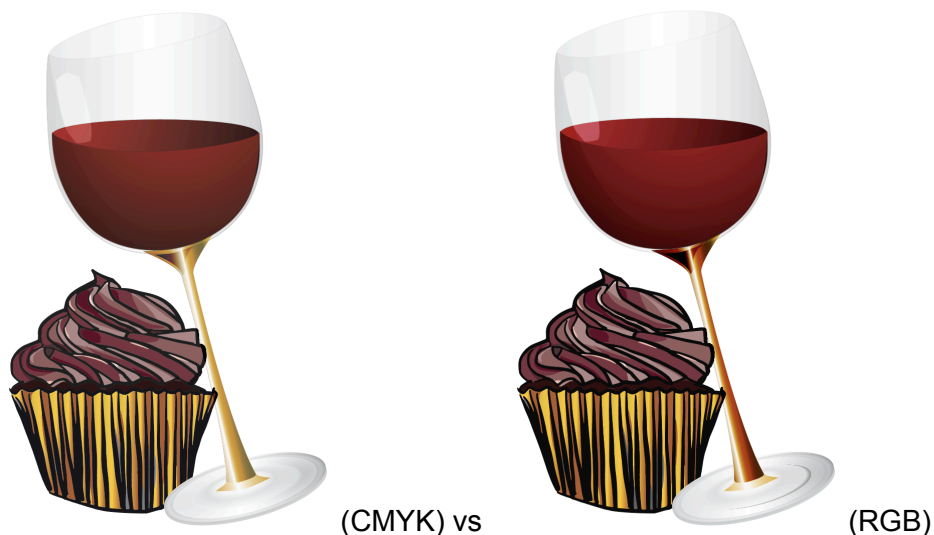
There are a couple ways that you can select everything of a certain type:

1. Use the Selection tool to click on an object that has a feature of interest. Go to “Select” → “Same” → and then choose whichever attribute you’re interested in. This will use the most stringent settings (must be the exact same fill color or stroke color or opacity or etc.). Note also that this may be limited by object “groups” (i.e. you may experience difficulties selecting only a portion of a grouped object).
 - a. Update in AI 2022 (version 26+): Ability to select by text attributes (prior to this you had to run an Illustrator [script](#) to do so, for ex. [here](#)).
2. The Magic Wand  tool is useful for selecting objects of the same or *similar* attributes. What this means is that you can set a tolerance such that if you want to select every object that has a pinkish fill color, you might set a Fill color tolerance of, say, 20. Alternatively, if you only want one very specific shade of pink (and/or you want to avoid editing other objects that are of a similar yet different color), you can set a tolerance of 0. If the Magic Wand panel is not on the right side of your workspace, go to “Window” → “Magic Wand”. If the Magic Wand is not in your toolset, click on the 3 dots on the bottom of the left side toolbar, and drag the Magic Wand into place.

Illustrator soft-proofing tools for simulating how images will appear to others

Soft-proofing features allow you to simulate on your computer monitor how images might appear on other devices (ex. upon printing). For example, since CMYK (common for print design) cannot produce all of the colors that RGB (web design) can, sometimes images look less vibrant or simply different upon switching between color modes (ex. when printing).

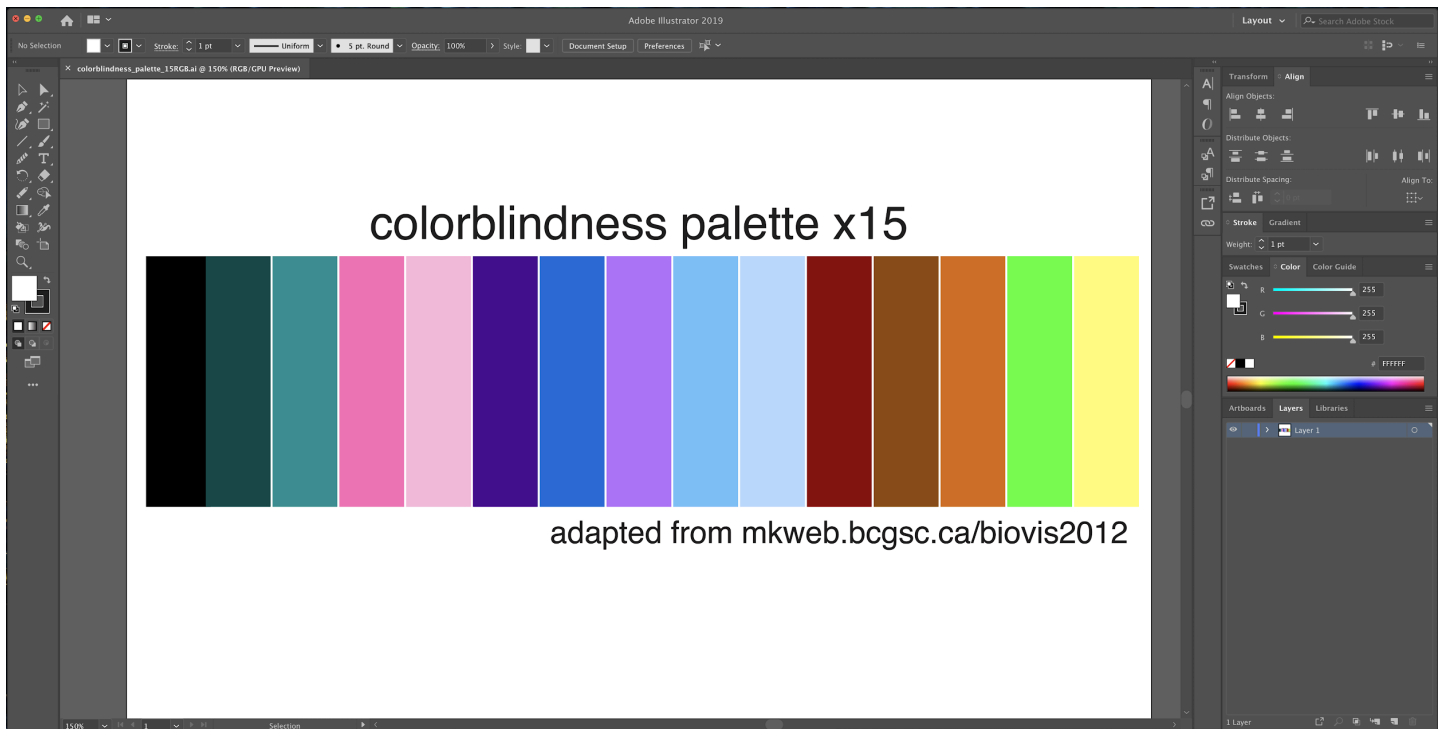
For example, here is the same image in CMYK (left) vs in RGB (right).



To see how an RGB document might look in other profiles, go to “View” → “Proof Setup”, and select your desired option.

Using these tools to simulate how images will look to people with color blindness

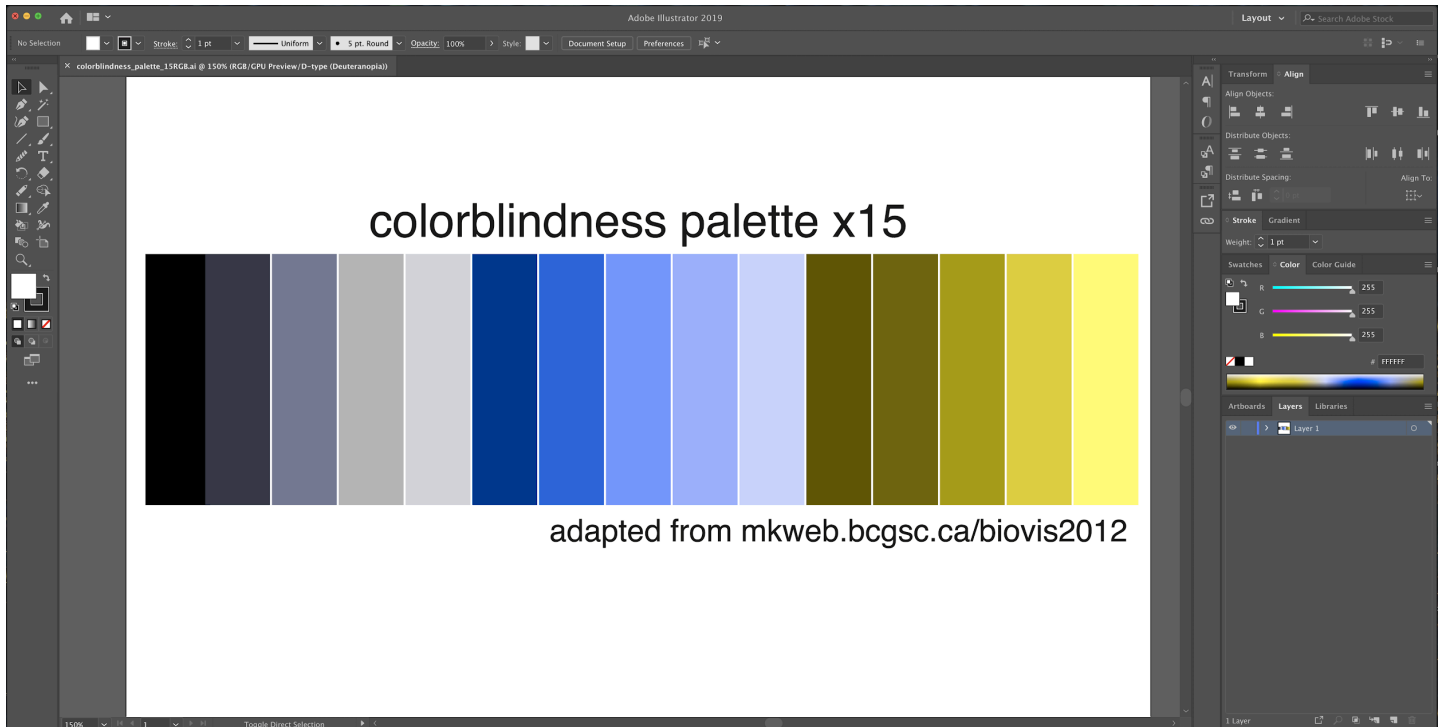
While figure and color design are outside of the scope of this guide, I’d be remiss if I didn’t mention Illustrator’s soft-proofing features that allow for color blindness simulation (thanks [Karun](#) for the suggestion). Here, for instance, is a palette that I adapted from a poster I found by [Krzywinski et al.](#):



Now, if I go to “View” → “Proof Setup” → “Color blindness - Protanopia-type” (blindness to red):



Similarly, “View” → “Proof Setup” → “Color blindness - Deuteranopia-type” (blindness to green) gives:



Images

Some thoughts on cropping and masking

While Illustrator (CC) now has a crop feature, consider whether it is better to do this within Illustrator versus, for example, a script that can be run across multiple images to contrast and/or crop in a reproducible manner. Historically, the closest function Illustrator had to cropping was the clipping mask, which is still useful in certain circumstances (ex. wanting to make a patterned shape)—in this case, you will place the desired shape over the desired image/pattern, select both, then go to “Object” → “Clipping Mask” → “Make” (or keyboard shortcut “command+7”); if you mouse over the object though you can see that the masked image is not actually gone but simply not visible. See this [video](#) (h/t [Naveen](#)) for an example/more details (and excellent demonstration of the Artboard tool!)

How do I add a scale bar?

Use the line segment tool with stroke weight 3pt and stroke color white to draw a horizontal line on your image. Calculate what 5 or 10 microns should be in points, given the #microns/pixel (specific to camera), camera magnification, imaging binning, cropping, and image resizing in Illustrator. In the header menu, click on/under Transform to alter the width (W) of the line segment to correspond to the correct point value for 5 or 10 (or whatever is reasonable) microns. [Here](#) is a helpful blog post from Gal about calculating Image pixel size.

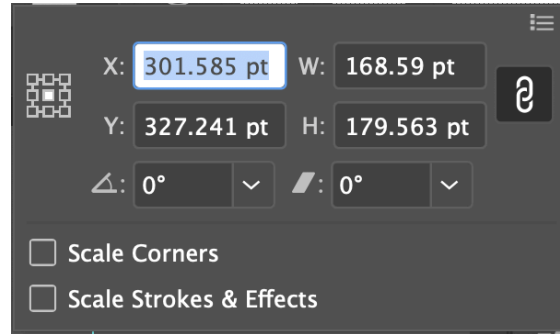
Summary by [Ben](#):
$$\frac{\text{Scale bar points in Illustrator}}{\text{Image width in Illustrator}} = \frac{\text{desired scale bar length (e.g. 10 microns)}}{\text{Total length of image (e.g. pixels/field of view * microns/pixel for your objective)}}$$

How do I resize groups of images?

Set W and H numerically when importing sets of similar images

Import images together by going to “File” → “Place” and then selecting all relevant images. Click “Place” and then click on the artboard where you want each image to go (Illustrator will have you place each image individually). Using the Selection or Direct Selection tools, select all images that should be the same size (hold

“shift” and click to select multiple images, or click and drag across images). Click “Transform” to open the Transform panel:



This icon at the right (chain links) means that all width and height adjustments will be constrained to the same proportions. If you wish to only stretch images in one direction, click on this icon to break the link. You can enter in width and height values here as desired. Note that by default, images will be transformed individually (i.e. spacing between images will not scale with resizing).

Resize images as a group

What if you want to resize a group of images such that they retain their distances to and proportions with each other? This is when grouping objects can come in handy. Using the Selection or Direct Selection tools, select all objects that you wish to transform together (either “shift”+click or click and drag) and group them, either using:

1. Keyboard shortcut “command+g”
2. “Object” → “Group”

*Note that if you group objects from different layers, the resulting group will be placed into the layer of the topmost selected object. Groups can be nested.

Now whenever you use the Selection tool to select any piece of this group, the whole group will be selected—all pieces will move and transform together. To resize proportionally, either:

1. Grab a corner bounding box handle of the group and while holding “shift” down, drag to resize.
2. Go to the Transform panel and alter the width and height of the entire group.

What if I want to edit a piece of a group? Here are some options:

1. Use the Direct Selection tool (white arrow, keyboard shortcut “a”) to select a single object within a group (click within the object) or a single anchor point or edge/path within an object.
2. Using the Selection tool, double-click the group to isolate the group. Click on the object of interest. When finished, exit Isolation Mode by double-clicking anywhere outside the group, pressing “esc” or “command”+click → “Exit Isolation Mode”).
3. Ungroup the objects.

To ungroup, you can either:

1. Keyboard shortcut “command+shift+g”
2. “Object” → “Ungroup”

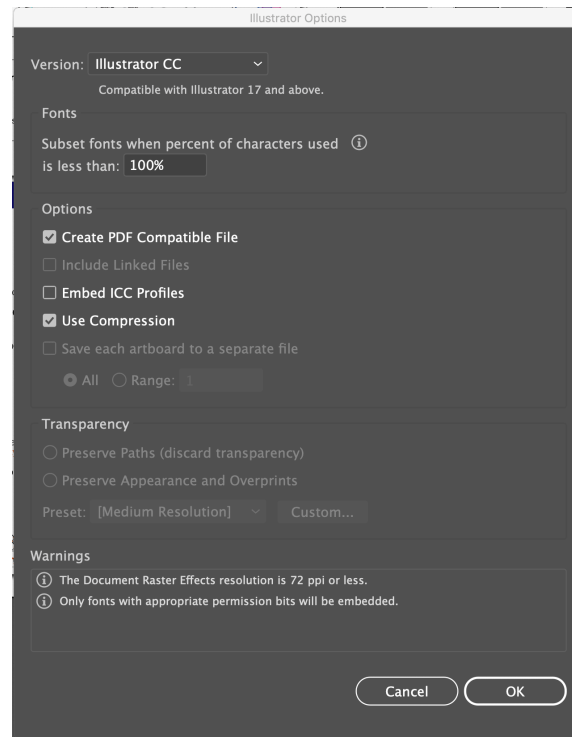
Linked versus embedded images

When you place a graphic in an Illustrator document, a screen-resolution version of the file will be visible and moveable, but it might be linked or embedded.

Linked images

These are connected to but remain **independent** of the document: i.e., they do not factor into the size of the document. These images can be transformed or modified by effects, but individual components cannot be

altered within Illustrator. If the original file is updated, links can be updated as well to better reflect the new version of the image without re-placing it within the document. NOTE that this also means that, if you move the original images (i.e. if the path is no longer the same due to, for example, renaming of the folder or moving images to a new directory), Illustrator will no longer display the images (you must re-link them, i.e. provide the new path, or embed them). These are also not included by default when the document is saved and shared (Illustrator stores the original location of the artwork)—if you would like to include linked files upon saving you must check the box “Include Linked Files.”

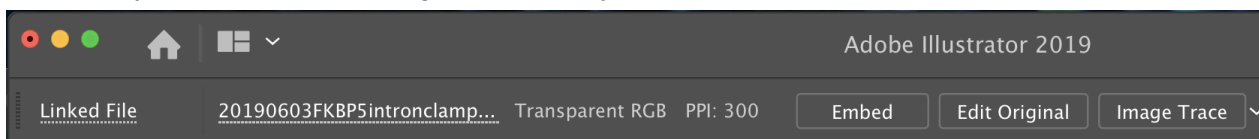


Embedded images

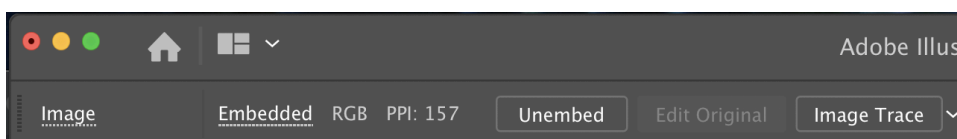
These are copied into the document at full resolution and will increase the document size (and, if large enough, may make Illustrator difficult to work with). The document is self-sufficient but will not update if the original artwork file is changed.

How can I tell whether my images are linked or embedded?

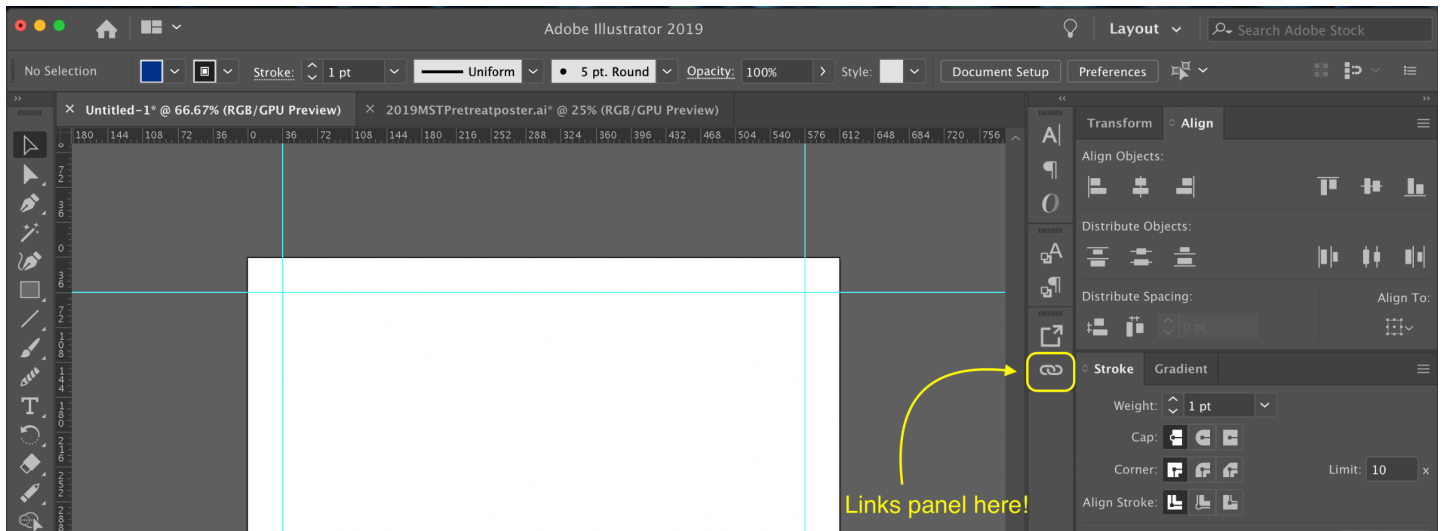
While the image is selected, take a look at your header menu. All the way to the left, does it say “Linked File” followed by the filename or “Image” followed by “Embedded”? For example:



VS



Alternatively, you can also visit the Links panel (will also have more information). By default it is here:



If you can't find it, go to "Window" → "Links", and it should open. All embedded files will have a  symbol to the right of the link thumbnail. To view more information for a file, do one of the following equivalent things:

1. Double-click a link.
2. Click a link, then click the arrow to the bottom left of the panel ("Show Link Info").

Next to "Format:" and the file type of the file, it will say whether the file is linked or embedded. Moreover, the "Color space" and "Location" will only have value for linked files.

I've changed the original image file: how can I update my linked image?

To easily update a linked file, click the "update link" (cycle icon) in the Links panel.

How do I embed a linked image?

Why might you want to embed a linked image?

- You want to share the document with someone who may not have the linked image on their computer.
- This is the final version of your document, and you want it to be standalone.

In the header menu, there is a button called "Embed". Click it.

How do I relink an embedded image?

Why might you want to relink an embedded image?

- Embedding the image makes Illustrator unusable, and you don't want to rasterize it yet.
- You have changed the original image file and would like to update the image.

Here are a couple ways to do this:

1. In the header menu, click the "Unembed" button. This will trigger a pop-up where you can select the original image file to relink to.
2. In the Links panel, click the small chain icon (mouseover "Relink"). This will trigger the same pop-up allowing you to select an image file to link to.

I want to do something specific in Illustrator and someone has written a script for it: how can I use it?

Illustrator has a handful of standard scripts which you can find by going to "File" → "Scripts"; some are listed there and some are under "Other Script". If you would like to add, for example, additional JSX scripts the easiest way is to click and drag your .jsx file from Downloads or wherever it is saved to Illustrator's own scripts folder: once you navigate to the Illustrator program/folder in your Applications directory, go to "Scripting" >

“Sample Scripts” > “JavaScript” and place your file there or in the subdirectories. Then when you go back to Illustrator, you should be able to find it after navigating to “File” → “Scripts” → “Other Script”.

I’m done with my figures and now I’m preparing to submit them to a journal: what formatting should I do?

1. [Embed](#) all linked images.
2. [Rasterize](#) all large images.
3. Save your AI file. If you’ve created multiple artboards (for example, so you can make all your figures in the same document) you have the option of saving each artboard to a separate file. Pertinently, it may help to name your artboards by figure such that the saved “<File name><Artboard name>.ai” is intelligible.
4. Save a copy of the file as a PDF using the following settings:
 - General: uncheck all options—this is what will make the biggest difference in your file size, especially if you have a lot of expanded plots and images (i.e. lots of memory needed to preserve Illustrator editing capabilities).
 - Compression: Change all “Do Not Downsample” to “Bicubic Downsampling to 300ppi for images above 300ppi”. Can also compress using ZIP.
5. Open the PDF in Adobe Pro DC. Go to “File” → “Save As...” (alternatively, “command+shift+s”) and check the box that says “Reduce File Size”.

Suggested final checklist for figures created in Illustrator

- ☐ Check [document formatting](#)
 - ☐ Artboard: letter size (or scaled to figure needs, ex. half-page)
 - Note that for most journal submissions, each figure should be a standard portrait page size (8.5”x11” = 612 x 792 pt): this may need to be changed for final submission
 - ☐ Units: points
 - ☐ Document Color Mode: Recommend RGB (not CMYK) esp for web viewing
 - ☐ Document Raster Effects Settings: High (300ppi)
- ☐ Macro level formatting
 - ☐ Margins: minimum 0.5 inches (like this doc)
 - Note: Can mark this with smart guides or shape on a [locked lower layer](#)
 - ☐ Are images [aligned](#)?
 - ☐ Are my subheading labels conserving negative space (ex. Would it be better to put my subheading letter within one of my images, i.e., white “D” within the image?)
 - ☐ Are my caption and title (ex. “Supplementary Figure ***) in the same location for all of figures that are the same size? Typically these are in the top left, “**Supplementary Figure 3**”, bold in 14pt font. A sample can be found in the Illustrator folder [here](#).
- ☐ Vector graphics (probably anything that is not text and is not a photo)
 - ☐ [Set stroke weight](#) of all axes lines to 0.5 pt. Arrows can have stroke weight up to 2 depending on size (use your aesthetic judgment).
 - ☐ Do [arrowheads](#) look reasonable in size?
 - ☐ Do my graphs have a lot of white space? Can I shrink them? (probably)
 - Streamline graph ticks: i.e., instead of 0, 5, 10, 15, 20, 25, just do 0, 10, 20.
 - ☐ I have multiple graphs of the same type: are they formatted similarly? I.e. are they aligned and styled the same way? Are they the same size/easy to compare?

- Be careful when exporting from MATLAB or R, because tick labels can sometimes change the size of the plot. If you can have MATLAB or R plot them all together, that will often help maintain size.
- ☐ Type/text
 - ☐ Are you using a single sans serif typeface across all figures (ex. Helvetica or something equally legible/reasonable)? Learn how to change Illustrator default font [here](#).
 - ☐ Try to stick to 3 font sizes:
 - 14 pt **bold** for figure subheading letters (A, B, C...)
 - 8 pt for “normal” text (ex. Axis labels) and for figure caption
 - 6 pt for “small” text (ex. Legend labels)
 - Does your font look bizarrely small? Check if it is [superscripted or subscripted](#)
 - ☐ Are your figure legend [text boxes left or full justified](#)?
- ☐ Camera images (ex. microscope photos)
 - ☐ [Scale bars](#) on everything.
 - 5µm or 10µm. Scale bar should be a white line (not rectangle). Use camera pixel size and size of image on Illustrator to help set the length of the line.
 - ☐ Are images aligned and the same size?
 - To do this, you can select them separately and adjust the size by directly typing in the size in the [properties panel](#).
 - ☐ Use TIFFs for best quality.
 - ☐ Are all images [embedded](#) in final file?
 - ☐ Can I understand images without reading the legend?
 - ☐ Use white font on images with black background, black font for images on white background.

Works Consulted

While I have compiled this document, I owe most of my knowledge to trawling the internet for information. Here are some sites (in addition to those cited above) that I consulted for this guide that may also be resources for other things you would like to do. For everything else Google and forums will probably get you mostly there.

- [Adobe Illustrator Learn & Support](#)
- [Dummies.com guide to Illustrator \(includes older versions\)](#)
- [Shutterstock support guides for Illustrator](#)
- [George Ornbo's Illustrator guides](#)

Some additional links that may be helpful

Disclaimer: I have not fully watched/vetted all of these, but they seem helpful for getting started with Illustrator.

- [Illustrator CC Keyboard shortcuts](#) in a nice diagram (Kudos to [Eric](#) for showing me)
- Dansky's [Illustrator Basics in 3 Minutes](#) (and other videos)
- This well-reviewed [Beginners Guide to Illustrator](#) by Gareth David Studio
- [Learn to Draw Anything with Adobe Illustrator CC](#) (gets a bit more graphic-designy but some helpful techniques for if/when you want to make schematics in Illustrator)
- Here is my own [sample illustrator folder](#) for some (very) basic templates

Some resources for figure design

As mentioned [at the beginning](#), this document is meant to help you get started with Illustrator but makes minimal effort to teach anything with regard to “good figure design”. Here are some resources that I personally reach for for data visualization guidance:

- Claus Wilke’s [Fundamentals of Data Visualization](#), which I still cannot believe is freely available
- [Nature Methods Points of View compilation](#)
- Janet Iwasa’s [Visual Communication in Biology • iBiology](#)
- [Ten Simple Rules for Better Figures](#)
- [What to consider when choosing colors for data visualization](#)
- [5 Basic Tips for Illustrating](#): not written for scientific figures, but I think it’s helpful to consider for generation of schematics

Speaking of colors...

[Here](#) are some of my favorite resources for those too.

- [RGB to HEX and HEX to RGB](#): a useful reference especially for when converting between R colors and Illustrator
- [Colour Contrast Check](#) can help you check if there is enough contrast between a background and foreground color