

# EFFECTIVE VISUALS

## A PROBLEM SET

### PROBLEM 1

Let's create an H-R diagram for a hypothetical Introduction to Astronomy course. Your audience is non-major undergraduates. Assume your students have no knowledge of astrophysics and an Algebra II-level familiarity with scatter plots.

#### 1A

In a sentence or two, define the point you would like this graphic to make.

#### 1B

Load [the data set](#) into your favorite plotting program. You will need brightness, temperature, and radius.

#### 1C

Create the basic scatter plot. Decide what plotting symbols to use, and what the axis labels should be. Add a title. (Keep everything black and white for now.)

#### 1D

Open a text file and start to draft a caption. It can be just one sentence to start! Add to the text as you work—when you think of something the reader will need to know, put it in the caption so you don't forget. We'll edit later, so for now this can be wordy and misspelled and otherwise what many writers refer to as a "shitty first draft."

#### 1E

Try using larger plotting symbols for the larger stars. Devise a scaling that creates a visual distinction along the main sequence. It doesn't need to accurately depict differences in stellar radii—just give readers a sense of how radius figures in.

#### 1F

Add color. Load the color ramp RdYlBl ([matplotlib](#)) ([colorbrewer](#)). Apply it across the plot symbols to match the temperature axis.

#### 1G

Time to annotate. Add the following labels:

- Hotter stars
- Cooler stars
- More massive stars
- Less massive stars
- Sun
- Anything else you like

(For the sun, you need only point at a star that *could* be the sun. I won't fact-check you.)

#### 1H

Revisit your caption. Sharpen it up. Start with a description of the H-R diagram's main point, then move to any detail or caveat you think your reader needs to know.

*Hint: You do not need to use the words "Hertzsprung" or "Russell" anywhere on this chart!*

#### 1I

Step back from the chart and picture a *specific human* you know, who would fit the knowledge & experience of our hypothetical undergrad. How would they see this chart? Make any adjustments necessary so they would better understand how stars work.

### PROBLEM 2

It's hours before a grant submission deadline, and your collaborator has [sent a figure](#) and immediately boarded a transatlantic flight. You don't have access to the source code, but you can't submit this as-is. Let's fix it.

#### 2A

If you don't have one already, get set up with a vector-graphics manipulation program. Examples are [Adobe Illustrator](#), [Inkscape](#), [Gimp](#), and [Vectr](#). (If you're not sure, pick Inkscape.) Open the raw figure.

#### 2B

Delete all those minor y-axis ticks.

Just keep the long ones.

*Hint: In Inkscape, "Edit paths by nodes (N)" in the left tool panel is your friend.*

#### 2C

Adjust the spectrum to a weight of 2 pt and the axes & ticks to 0.75 pt.

*Hint: In Inkscape, "Select Same" under the Edit menu is powerful. Line weights live in "Fill and Stroke" under Objects menu.*

#### 2D

Change all the text to a serif font.

*Hint: In Inkscape, "Select and transform objects (S)" in the left tool panel works well in combination with shift.*

#### 2E

Re-label the axes to "Relative Intensity" on the y and "Wavelength [Å]" on the x. Get that angstrom symbol right!

*Hint: I copy and paste special characters off Wikipedia pages.*

#### 2F

Draw a borderless yellow rectangle to highlight the H-beta line (4861 Å). It should stretch from ~4840 Å to ~4880 Å and run the whole vertical height. Figure out how to place it behind the rest of the chart elements, so the spectrum is still visible.

*Hint: Commands for raising and lowering layers live under the Objects menu.*

### CHALLENGE PROBLEM

Revisit a figure you've created in the past (for a paper a conference, maybe). Improve its visual style, using techniques you've learned here. Consider adding direct annotations or a splash of color. Or, adapt the figure for an audience of science generalists. Would an environmental-science acquaintance understand your point?