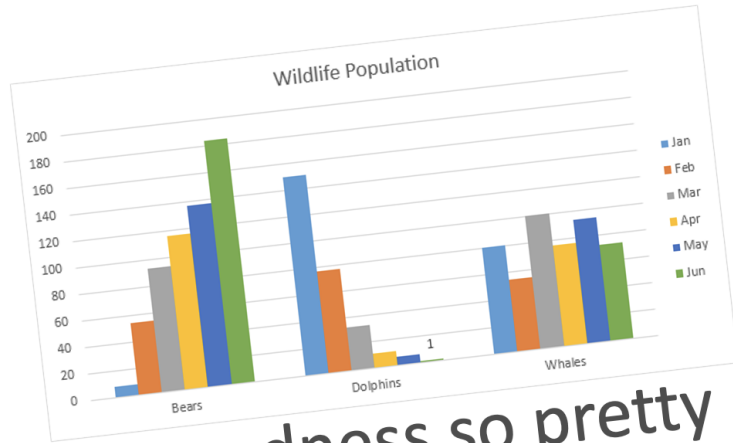# Graphic design, CRAP, and `theme()`

Why even care about design?

omgoodness so pretty

I don't need to waste time with design. My data and findings will speak for themselves.

How great is Times New Roman, amirite?

Everyone uses Comic Sans, so it must be good

Plus, Avatar uses Papyrus as the subtitle font, so it's definitely great

Principles of design

There are thousands of books and centuries of debate and theory about what makes good design.

The easiest
and most memorable distillation
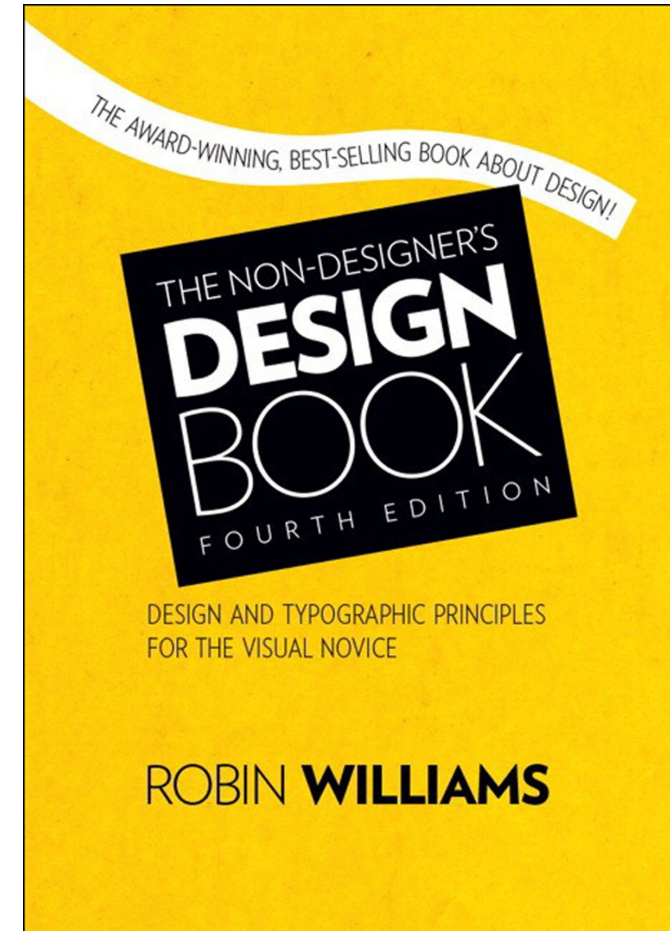of these principles is **CRAP**.

CRAP

Use these principles as a checklist when creating and critiquing designed objects:

Contrast

Repetition

Alignment

Proximity

Buy this book and your life will change forever.

Contrast

If two items are not exactly the same, make them different. Really different.

Don't be a wimp.

Typographic contrast: Family

Use contrasting type families

Serif + Sans serif   *Script* + Serif   **Slab** + Sans serif   etc.

Serif	Sphinx of black quartz, judge my vow
Sans serif	Sphinx of black quartz, judge my vow
Slab serif	**Sphinx of black quartz, judge my vow**
Script	*Sphinx of black quartz, judge my vow*
Monospaced	Sphinx of black quartz, judge my vow

Typographic constrast: Family

Add contrast in family

Here's a heading

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

Here's a heading

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

Typographic contrast: Weight

Use contrasting weights in same type family

Bold + Regular	Regular **+** Extra light	**Black +** Light	etc.
Extra light	Sphinx of black quartz, judge my vow		
Light	Sphinx of black quartz, judge my vow		
Regular	Sphinx of black quartz, judge my vow		
Semi bold	**Sphinx of black quartz, judge my vow**		
Bold	**Sphinx of black quartz, judge my vow**		
Black	**Sphinx of black quartz, judge my vow**		

Typographic constrast: Weight

Add contrast in weight

Here's a heading

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

Here's a heading

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

Size contrast
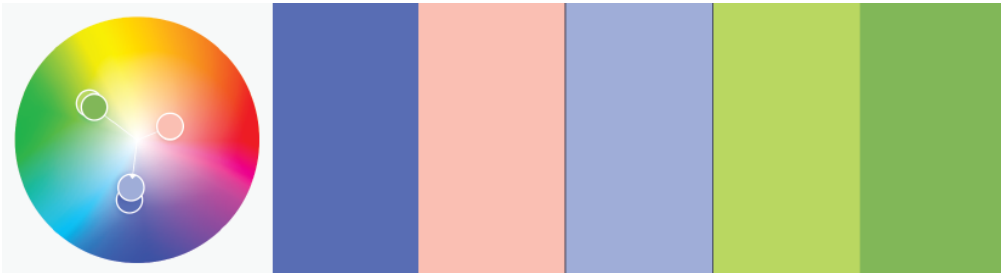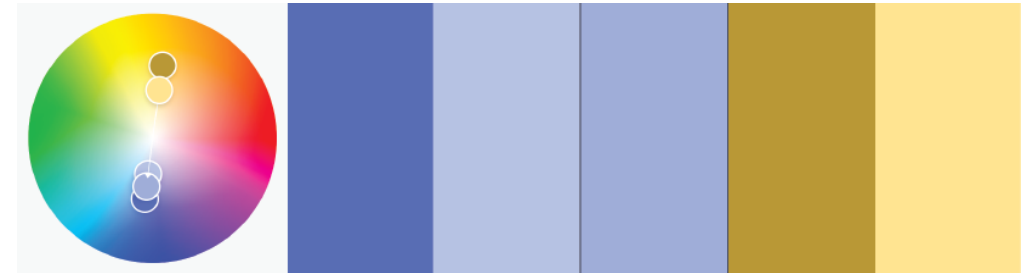
Use contrasting sizes

Huge Big Regular Small Tiny

Color contrast
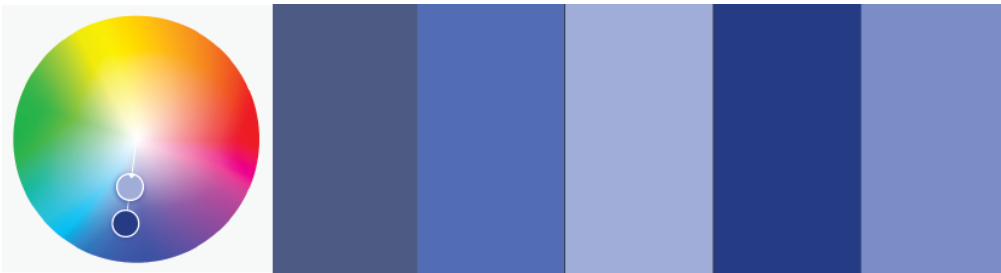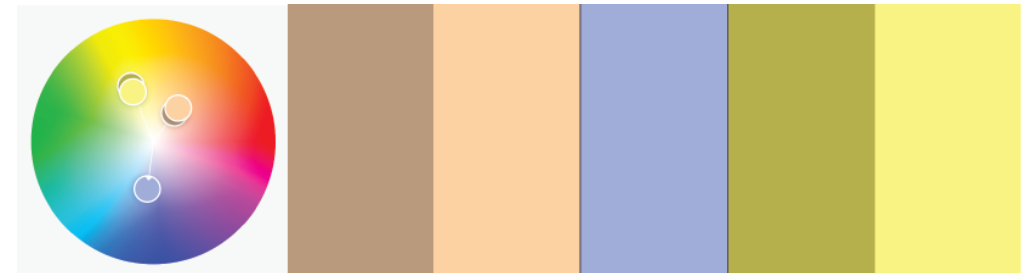
Color theory

color.adobe.com

Triad

Complementary

Monochromatic

Split complementary

Color contrast

Colors extracted from an image at color.adobe.com

Usability and accessibility

Perceptually uniform colors

Values close to each other use similar colors,
and values far from each other use different colors

Colorblind-safe colors

8% of men & 0.05% of women have some form of color blindness

Colors should be distinguishable by people
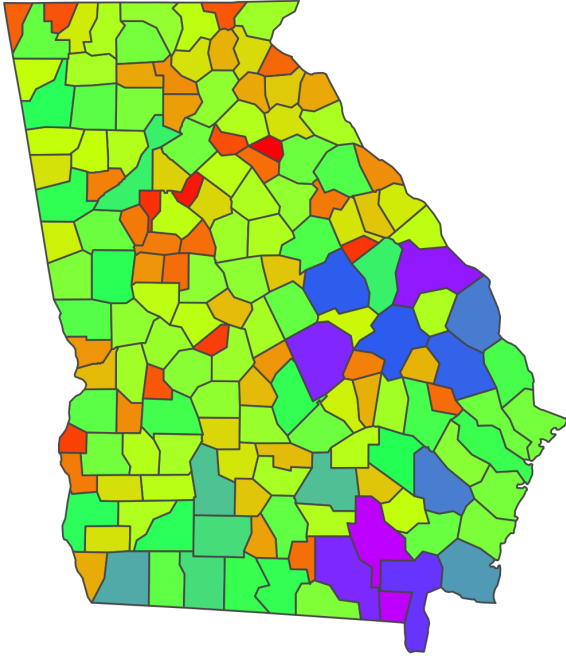with common forms of color blindness

Perceptually uniform colors

rainbow

heat

ggplot default

brewer blues

brewer yellow-green-blue

viridis

magma

Traditional palettes vs. viridis

rainbow

heat

ggplot default

brewer blues

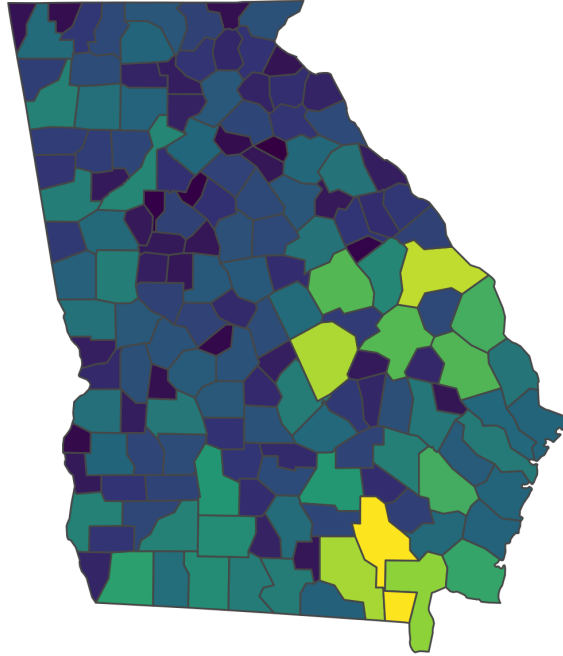brewer yellow-green-blue

viridis

magma

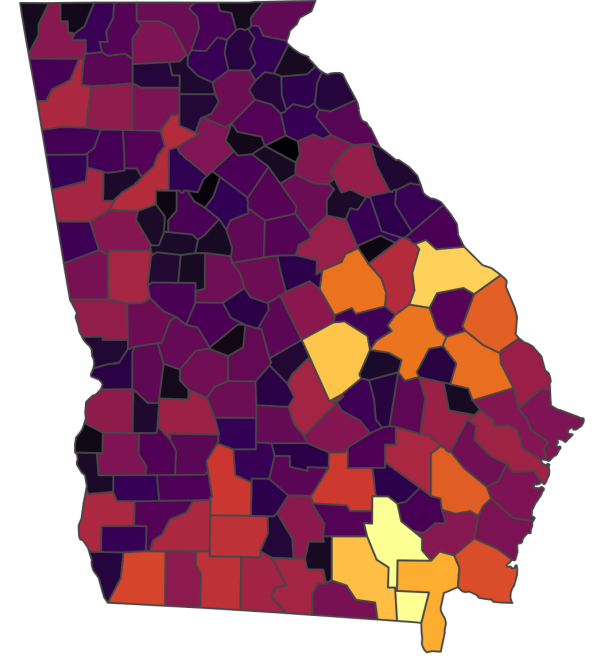Traditional palettes vs. viridis as seen with deuteranopia

Perceptually uniform colors

Georgia counties filled by area, rainbow palette (NOT GOOD)

Georgia counties filled by area, viridis::viridis palette

Georgia counties filled by area, viridis::inferno palette

Repetition

Repeat some aspect
of the design throughout
the entire piece.

Things to repeat

Colors

Fonts

Families, weights, sizes

Graphical elements

Alignments

WE HELP PEOPLE BUILD BETTER FUTURES FOR THEMSELVES

Oxfam provides grants and technical support to local organizations around the world to support long-term solutions that help people grow nutritious food, access land and clean water, and—as one of our programs in Jordan illustrates—obtain decent work and fair wages.

MORE THAN A PIPE DREAM

Water scarcity is a major problem in Jordan. Aging water infrastructure and a rapidly increasing population—the conflict in Syria has driven more than 650,000 Syrians to settle in Jordan—have created a situation where every drop counts.

Currently, more than 40 percent of Jordan's water leaks out of broken pipes, so knowing how to fix them is critical. When Oxfam and its partners started a program in northern Jordan to improve the water sector, we made training plumbers—particularly women—a priority.

Funding from the Canadian government helped us equip more than 400 women with basic plumbing skills not only to fix leaks in their homes but to acquire enough plumbing know-how to enter the labor market.

Mariam Tawfeeq Matlaq, 44, picked up a wrench five years ago and started her own business north of Amman soon after. "As soon as I received the training to be a plumber, I had a dream to open a shop," she says, though it wasn't easy to get off the ground. "There are negative perceptions of a woman plumbing in my community. The competition between me and the male plumbers can be difficult."

Still, she says, "I've proved it to people, my community, and the world around me that women can do anything, whether it is conventional or not."

Matlaq has trained many women and recommends them for jobs when she can.

"Women here want to work," she says. "We want opportunities, but often there aren't any for us. We need support from organizations to keep growing these opportunities."

ABOVE, TOP: Mariam Tawfeeq Matlaq fixes the water tank on her rooftop in Zarqa, north of Amman, Jordan, after receiving training from Oxfam on basic plumbing skills. Now she's training other women to become plumbers.

ABOVE, BOTTOM: Matlaq opened her hardware store a year ago in Zarqa and employs several male plumbers who work across the city.

OPPOSITE: "I have been a plumber for five years now. I like it a lot—I especially like the challenges I face," Matlaq says.

PHOTOS: *Abbie Trayler-Smith/Oxfam*

WE SAVE LIVES IN DISASTERS AND CONFLICTS

We work with local organizations to provide assistance during conflicts and disasters, but we also partner with community and national advocates to change the conditions that create them. That's the case in Central America and Mexico, where Oxfam has worked for many decades.

LITTLE CHOICE BUT TO LEAVE

Last fall, Nelson Chavez left his home in El Salvador because he couldn't make enough money to support his family. He worked for a honey producer, bottling honey and selling it from his home. But his income only covered half of what his family needs.

Chavez was one of thousands of people fleeing El Salvador, Guatemala, Honduras, and Mexico to look for a better life in the United States. "What we have in common is the necessity to migrate," he said. "The majority of us do hard work like construction and farm labor, and we are poor. We live on what we make each day."

Oxfam and its partners provided immediate help to Chavez and others in Guatemala with food packages, portable toilets, drinking water, vitamins and rehydration drinks, canopies, and hygiene kits—which included information about how to report acts of violence and human trafficking. In Mexico, we distributed water, thermoses, pots of Vaseline for sore feet, and oral rehydration salts.

But we also provided financial support to local migrants' rights organizations and shelter networks, and called on the governments of Guatemala, Mexico, and the US to protect and guarantee the rights of asylum-seekers and ensure that children aren't separated from their families.

Oxfam President and CEO Abby Maxman visited Tijuana, Mexico, in January to meet with migrants, asylum-seekers, and partner organizations. "The migrants I met in Tijuana are no different than the people who first built our country and what generations of Americans have done: arrive with aspirations to build a better life," she said. "We should live up to our legacy as a welcoming nation that was built on the hard work of immigrants, rather than demonize and criminalize them."

ABOVE, TOP: Nelson Chavez, from El Salvador, left his home and walked to the Guatemala-Mexico border. "There are almost no opportunities to work in my country." *Elizabeth Stevens/Oxfam*

ABOVE, BOTTOM: Oxfam staff Alejandro Orozco and Sherry Toc deliver an inflatable mattress to a man arriving at a shelter in Tecún Umán, Guatemala. *Alyssa Eisenstein/Oxfam*

OPPOSITE: People from La Trinidad, Guatemala, evacuate their community after the eruption of Fuego volcano last June. Oxfam helped those who were displaced. *James Rodríguez/Panos for Oxfam America*
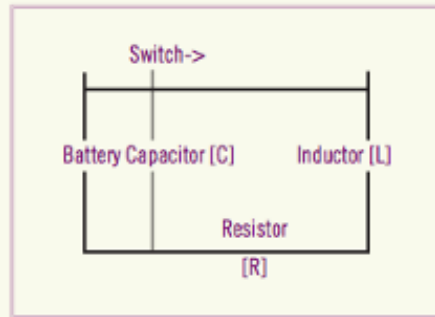
Alignment

Every item should have a visual connection with something else on the page.

Alignment

Bad alignment
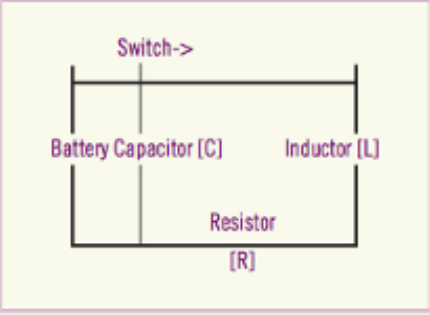

Good alignment—everything is connected to something

Alignment + repetition

Share lines and repeat alignments where possible.
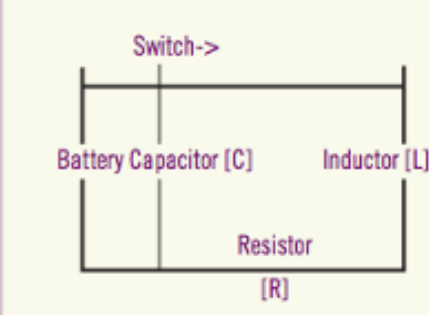
4 vertical alignments; 3 horizontal alignments

1 shared vertical alignment; 2 horizontal alignments

Alignment + contrast

Center + left is super common, but has weak contrast

Mixing left and right alignment provides stronger contrast

Chapter 1

Here's a title

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
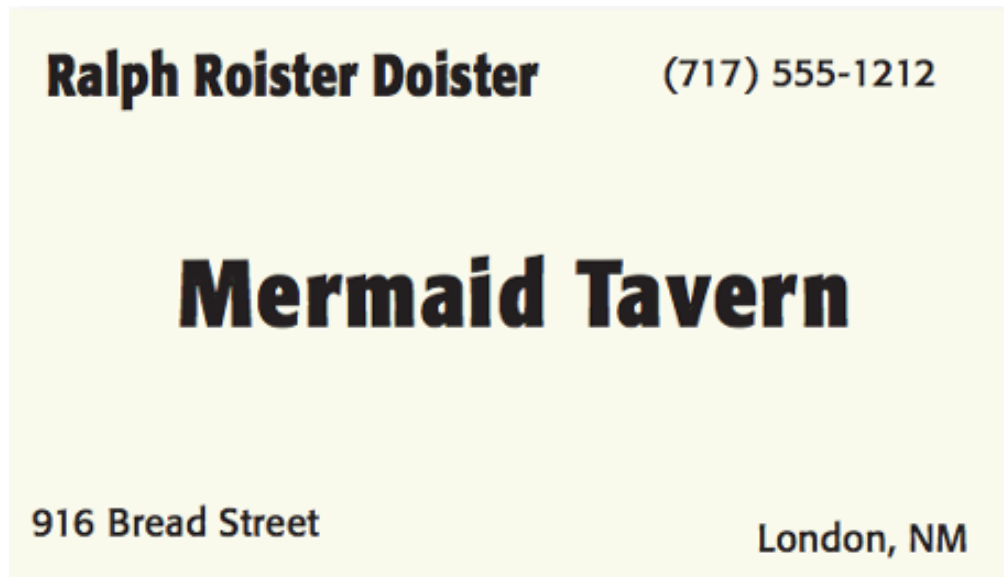
Chapter 1

Here's a title

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

Proximity

Group related items together.

Proximity

Use white space, color, location, contrast, repetition, alignment, etc. to make visually distinct groupings
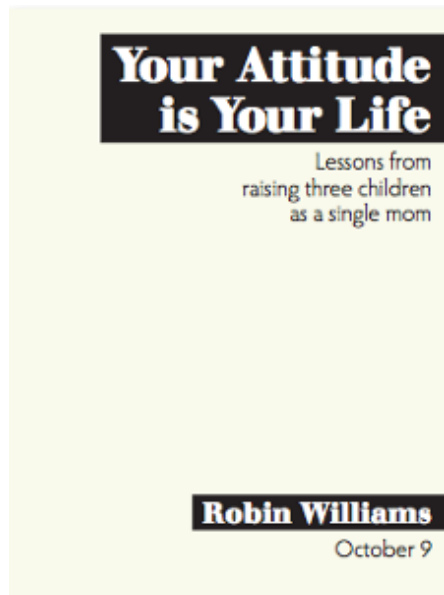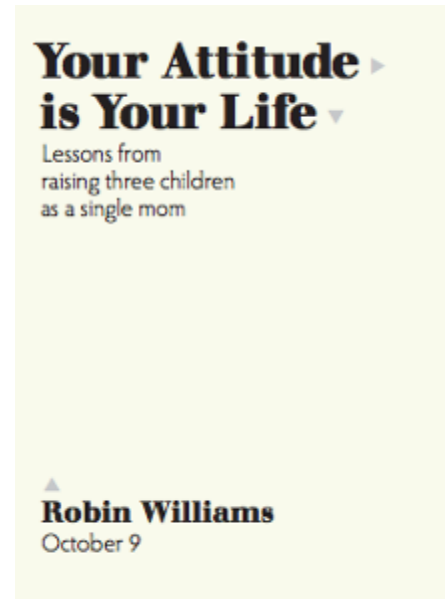

Bad proximity; no logical groupings

Good proximity; information visually grouped
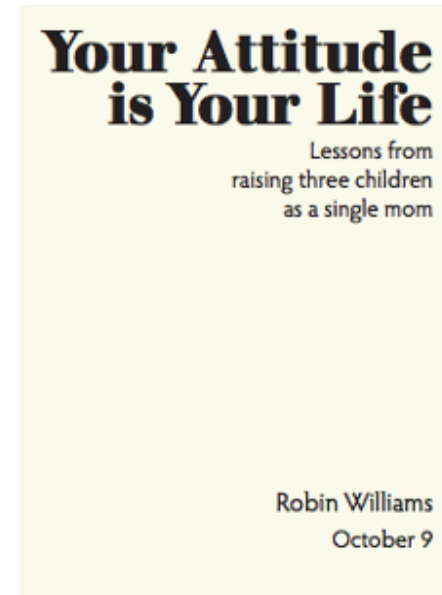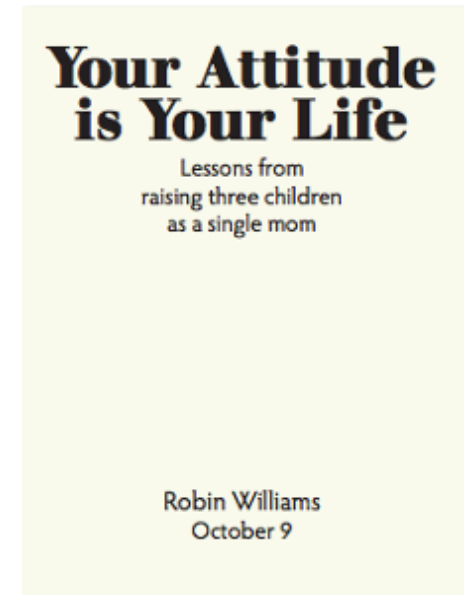
CRAP review

Contrast

Repetition

Alignment

Proximity

Applying CRAP to ggplot

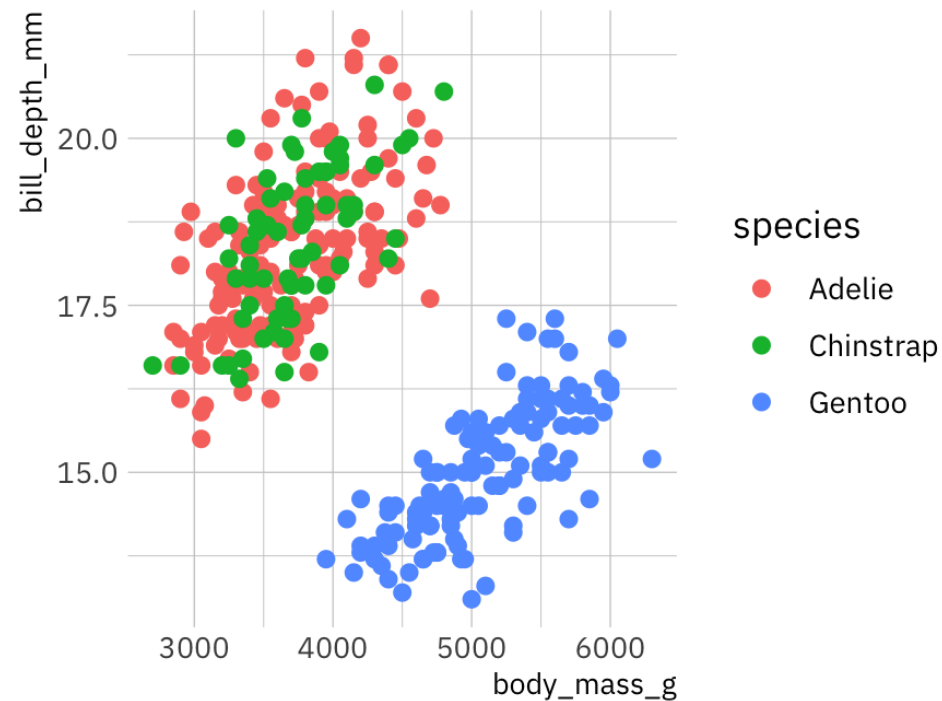We can apply CRAP principles to ggplot plots with `theme()`

`theme()` is exceptionally complex, but smart people have made well-designed themes already

`theme_*()`

Like this!

```r
library(hrbrthemes)

ggplot(penguins, aes(x = body_mass_g,
                     y = bill_depth_mm,
                     color = species)) +
  geom_point(size = 2) +
  theme_ipsum_ps()
```
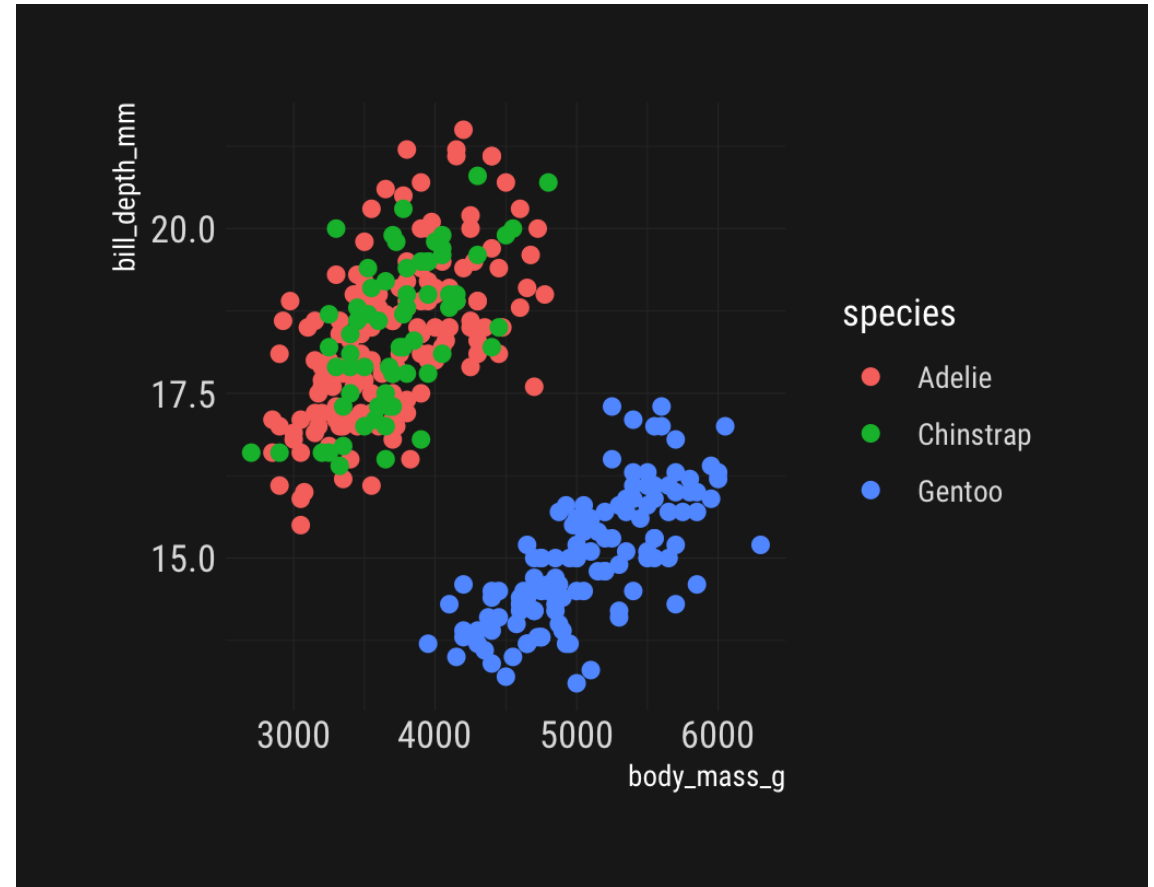
And this!

```
library(hrbrthemes)

ggplot(penguins, aes(x = body_mass_g,
                     y = bill_depth_mm,
                     color = species)) +
  geom_point(size = 2) +
  theme_modern_rc()
```
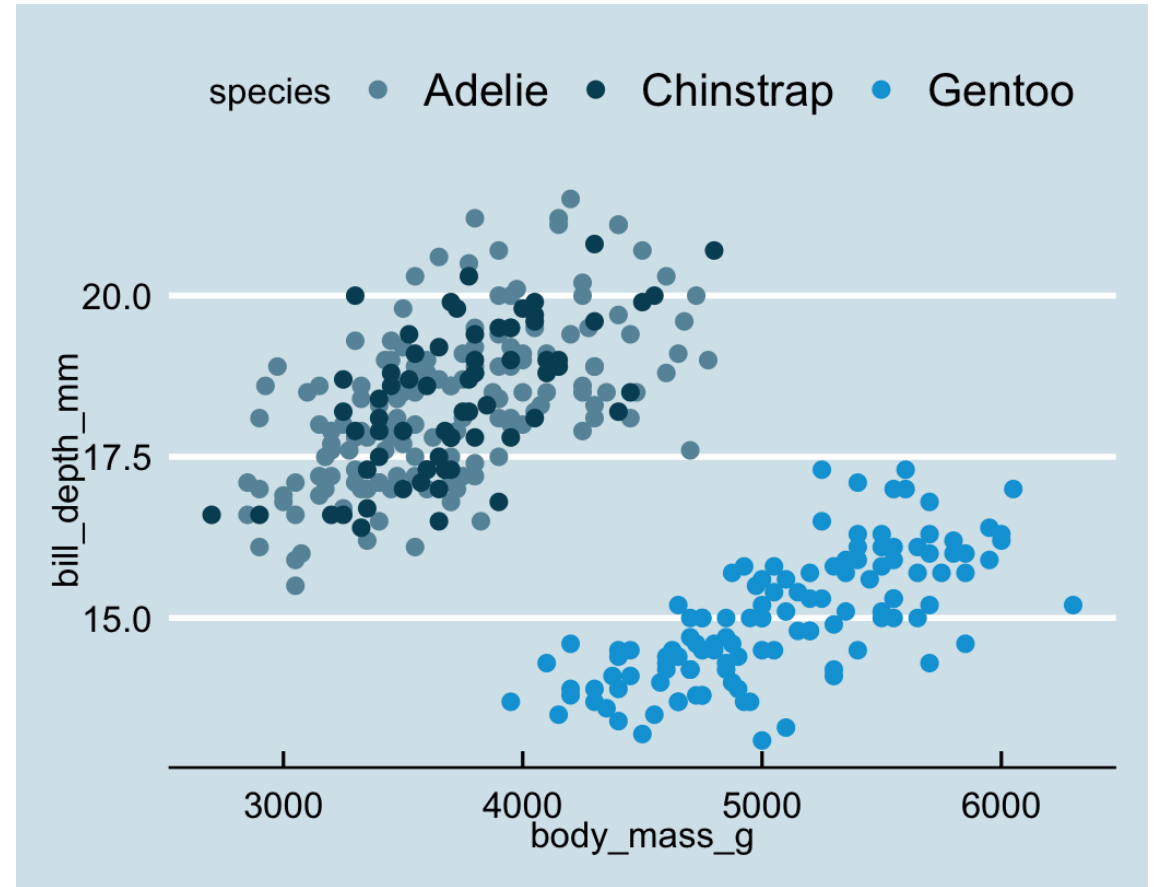
Or this!

```
library(ggthemes)

ggplot(penguins, aes(x = body_mass_g,
                     y = bill_depth_mm,
                     color = species)) +
  geom_point(size = 2) +
  scale_color_economist() +
  theme_economist()
```

And even this!

```r
library(ggpomological)

ggplot(penguins, aes(x = body_mass_g,
                     y = bill_depth_mm,
                     color = species)) +
  geom_point(size = 2) +
  scale_color_pomological() +
  theme_pomological_fancy()
```
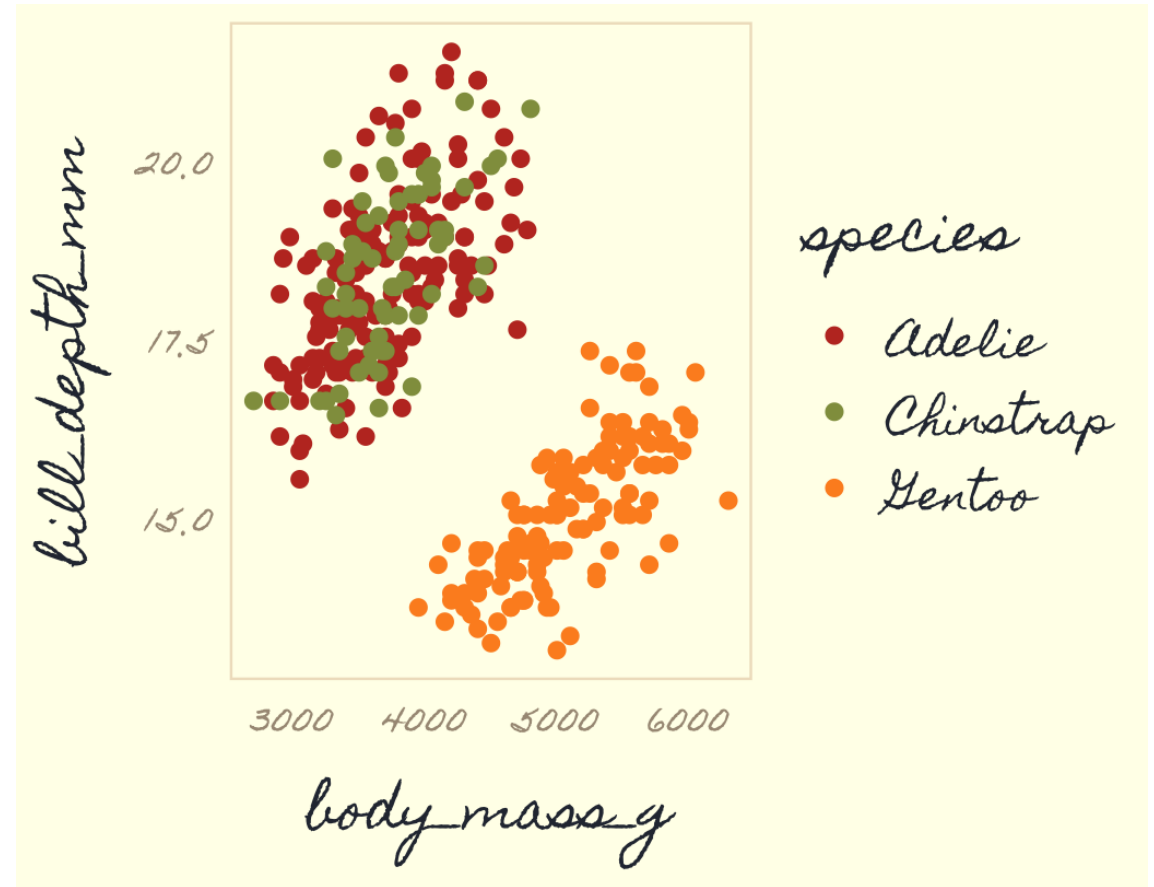
Your turn #1

Experiment with different `theme_*()` functions by adding them to the plot

I have already had you load a few theme-specific packages like **ggthemes**, **hrbrthemes**, and **tvthemes**

Start typing `theme_` and you'll get a popup of all the possible themes you can use

Or google "r tvthemes" to find the documentation and examples

05:00

One magic, powerful function

`theme()`

Theme system

Theme elements

Each element in the plot can be targeted

Plot title = `plot.title`

Grid lines = `panel.grid`

Legend background = `legend.background`

Theme functions

Use special functions to manipulate specific elements

Text-based things = `element_text()`

Rectangular things (backgrounds) = `element_rect()`

Line-based things (axis lines, grid lines) = `element_line()`

Disable element completely = `element_blank()`
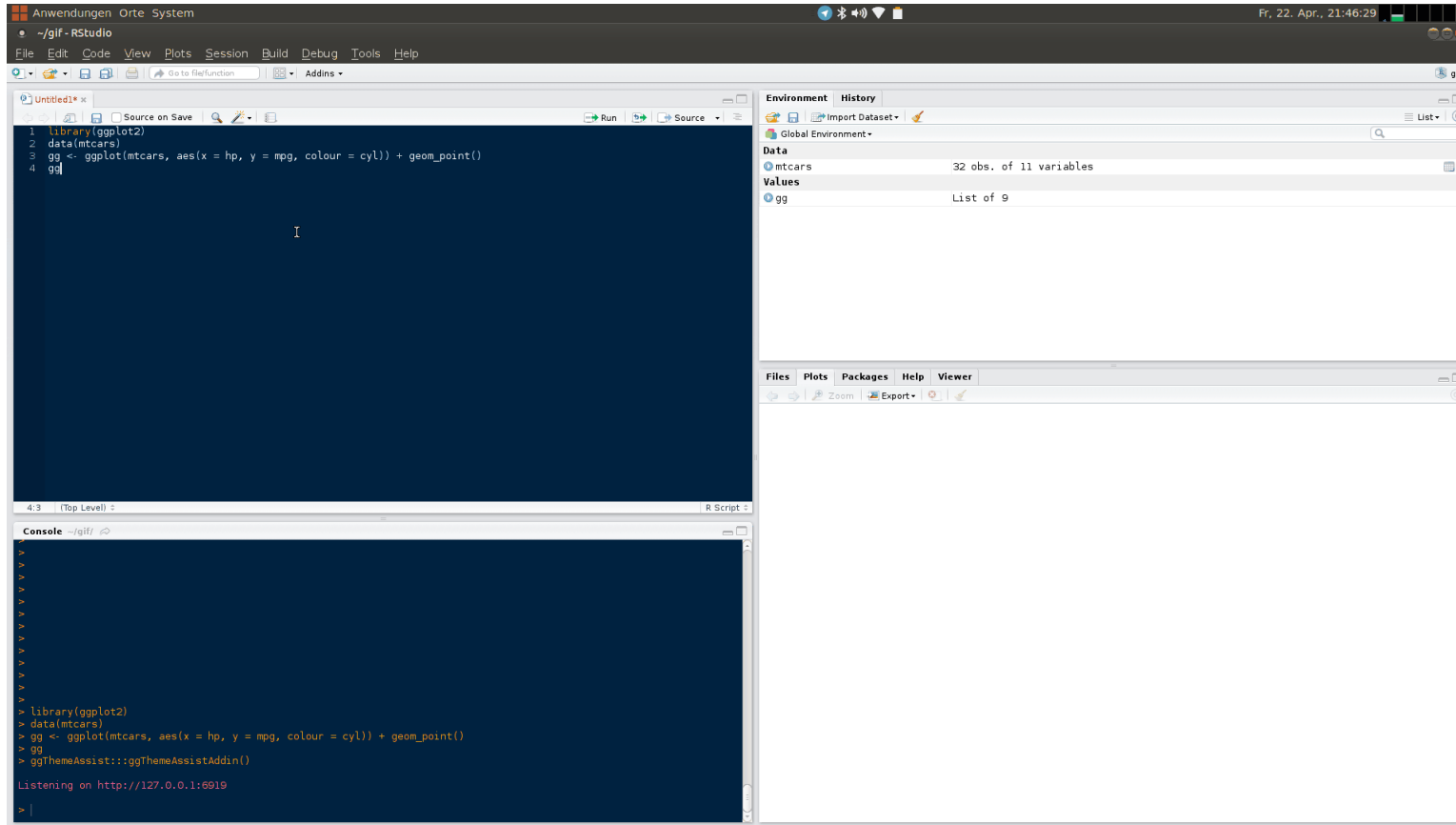
Pre-made themes

The `theme()` function has
94 possible arguments(!!!)

You can get hyper-specific with things like
`axis.ticks.length.x.bottom`

`theme()` can be intimidating!

Use pre-made ones and adjust as needed

ggThemeAssist

ggThemeAssist
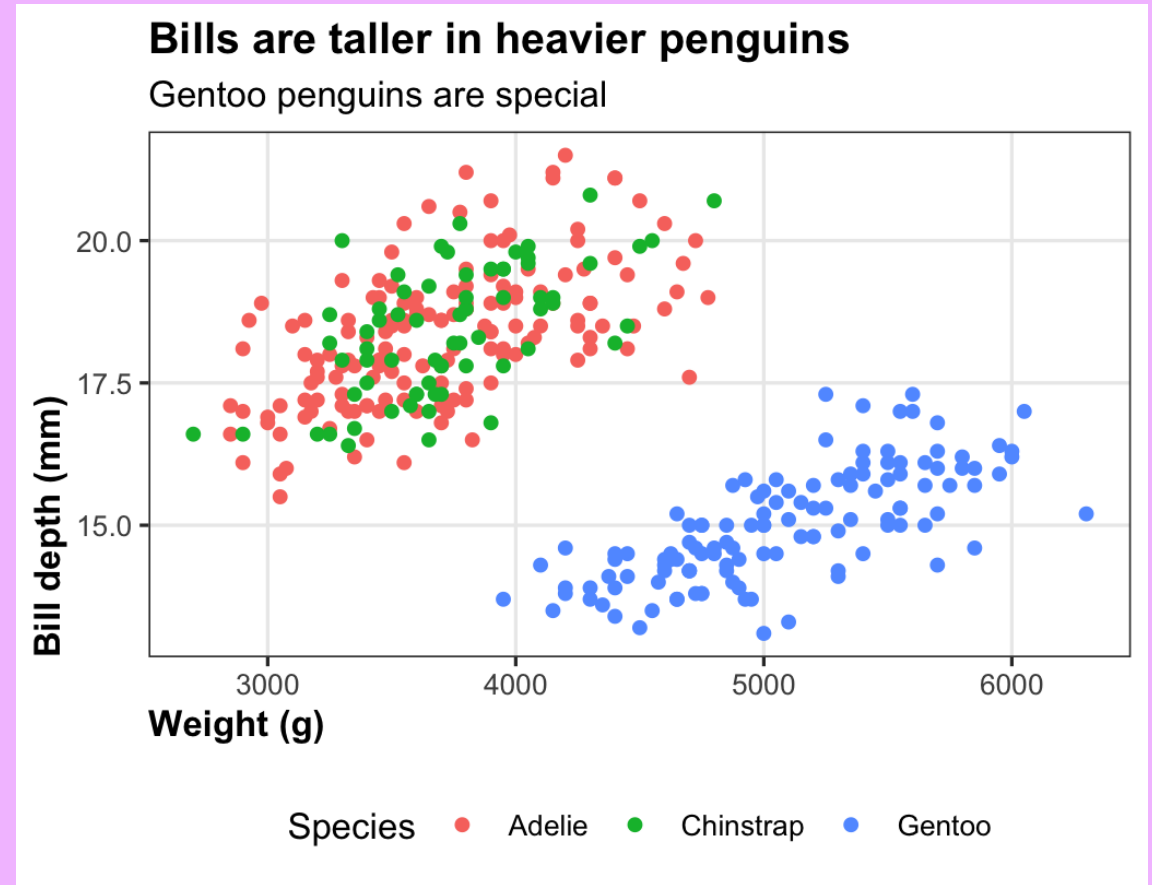
Your turn #2

Use `theme()` to do the following:

- Make the title bold
- Make the axis titles left-aligned and bold
- Put the legend at the bottom
- Remove minor gridlines

05:00

```r
ggplot(penguins,
       aes(x = body_mass_g,
           y = bill_depth_mm,
           color = species)) +
  geom_point() +
  labs(title = "Bills are taller in heavier p
       subtitle = "Gentoo penguins are specia
       x = "Weight (g)", y = "Bill depth (mm
       color = "Species") +
  theme_bw() +
  theme(plot.title =
          element_text(face = "bold"),
        axis.title =
          element_text(hjust = 0,
                       face = "bold"),
        legend.position = "bottom",
        panel.grid.minor = element_blank())
```

Bills are taller in heavier penguins

Gentoo penguins are special

Your turn #3

Use `theme()` to violate every principle of CRAP and make the ugliest plot possible.

08:00

Next up

Animated and interactive plots