# 05 Graphic Design

36-721 Statistical Graphics and Visualization

Jerzy Wieczorek

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## Last time

- Grammar of Graphics overview
- ► Tableau and ggplot examples
- ► In-class feedback survey
- ► HW 2

# In-class feedback survey

#### Thank you!

## Changes I can make:

- Report common HW problems, clearer grading feedback
- Practice exercises to do at home
- Slides posted earlier, as PDFs
- Speak louder

## Dissent between surveys:

- ▶ More vs. less class time on R code, examples, exercises
- More vs. less class discussion and interaction

# Today

- Designing multi-part static graphics (infographics, conference posters, etc.)
- Graphic Design elements: text, graphics, color, typography, layout
- Graphic Design principles: contrast, repetition, alignment, proximity
- ▶ Page layout and graph editing in Inkscape

# **Today**

## Follow along:

- PDFs of graphs in 05\_GraphicDesign\_STEM.pdf, 05\_GraphicDesign\_NonSTEM.pdf, 05\_GraphicDesign\_Biz.pdf
- Output example in 05\_GraphicDesign\_Layout.svg

(I made the back-to-back bar charts as in this Learning R tutorial)

# Examples of multi-part static graphics

- Hannah Fairfield, Driving Shifts Into Reverse
- Scientific American on Nobel prizes and on US health
- Dorothy Gambrell, Missed Connections
- xkcd, Dominant Players
- Alberto Cairo's students' projects

#### They contain:

- Headings and body text
- Richly informative, complementary graphs (not just data decoration)
- Annotations: interesting features; how to read the graph; data sources

# Graphic Design elements

- Message
- ► Text: headings vs. body
- ► Images, symbols, graphs
- Color
- ▶ Typography
- Layout

#### **Text**

Headings should structure your work. Make them short, informative, and stand out for the reader's first glance.

Body text should be readable, but smaller than headings so it doesn't overwhelm.

Headings and body should be set in contrasting types and sizes, to make their different roles clear.

# Graphics

For us, as statisticians. . .

- Graphics should support your message and inform the viewer, not just draw attention
- Choose a graph that tells the story clearly, not just a default choice (e.g. having spatial or temporal data doesn't always call for a map or timeline)

"Charts shouldn't be about making the story more eye-catching, but about communicating more efficiently—meaning, showing a pattern in the data that would be too laborious to describe in prose."

-Mike Bostock

#### Color

Use a limited palette to support your structure and subject matter.

Check that they show up well on your final display: paper? projector? variety of browsers and devices?

Again, Color Brewer is helpful

# **Typography**

## Typeface categories:

# AaBbCc Sans serif font AaBbCc Serif font AaBbCc Serif font with serifs highlighted in red

- Bold sans-serifs: good for headings
- Readable serifs: good for body text
- Script or decorative: best for careful limited use

# **Typography**

Limit yourself to a few contrasting fonts (typeface size, weight, and style combinations)

Ways to contrast with typography:

- Size
- Weight (regular vs. bold)
- Structure, category, form
- Direction
- Color

# Layout

Grids are helpful. To avoid "dull" symmetry and add contrast, try:

- Rule of thirds
- ▶ Golden section

What grid layouts are common for these formats?

- Book
- Magazine
- Conference poster

## Layout

Negative space or white space: don't fear it :)

Use it to reduce clutter and guide the viewer's eye

If things don't look great, try removing elements, not adding them

# Graphic Design principles

- Contrast
- Repetition
- Alignment
- Proximity

Principles and examples below are from Robin Williams, The Non-Designer's Design Book (the whole book is a short, excellent read!)

# Proximity

#### Sally's Psychic Services

Providing psychic support in Santa Fe
Contact lost loved ones, including pets. Get help
with important decisions. Find clarity in a



fog of unknowns. Special rate for locals sally@santafepsychic.com santafepsychic.com



Phone consultations available 555-0978

This postcard is visually boring—nothing pulls your eyes in to the body copy to take a look, except perhaps the two hearts. But just as importantly, it takes a moment to find the critical information.

#### Sally's Psychic Services

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Sally@SantaFePsychic.com SantaFePsychic.com

Special rate for locals! PHONE CONSULTATION 555.0978

# **Proximity**

Group related items together.

Proximity organizes related elements into coherent units.

Relate captions and headings with their graphics or text.

Use empty space to your advantage, as structure.

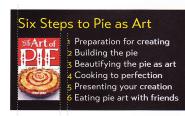
# Alignment

## 6 Steps to Pie as Art

- Preparation for creating
- 2 Building the pie
- 3 Beautifying the pie as art
- 4 Cooking to perfection
- 5 Presenting your creation
- 6 Eating pie art with joy



There is a nice, strong, invisible line along the left edge of the type, and there is a nice strong line along the left edge of the image. Between the text and the image, however, there is "trapped" white (empty) space, and the white space is an awkward shape, which you can see with the green dotted line. When white space is trapped, it pushes the two elements apart.



Transat Text Standard

# Alignment



The elements on this card look like they were just thrown on and stuck. Not one of the elements has any connection with any other element on the card.

Sock and Buskin

109 Friday Street

Penshurst, NM

Get in the habit of drawing lines between elements to determine where the connections are lacking.

Take a moment to decide which of the items above should be grouped into closer proximity, and which should be separated.

#### Sock and Buskin Ambrosia Sidney

109 Friday Street Penshurst, NM (505) 555-1212 By moving all the elements over to the right and giving them one alignment, the information is instantly more organized. (Of course, grouping the related elements into closer proximity is also critical.)

The text items now have a common boundary; this boundary connects the elements

# Alignment

Nothing should be placed on the page arbitrarily. Every item should have a visual connection with something else on the page.

Alignment creates unity and organizes the page.

Distant elements can still appear related if aligned to a bold line.

Centered text looks formal and sedate;

left-aligned or right-aligned is bolder and often works better.

# Repetition

#### PIE JUST WANTS TO BE SHARED

WORKSHOPS for PIE ARTISTS



#### SLAB PIES

When you have a large group for sharing, consider a slab pie. With a higher proportion of crust to filling and easy slicing into squares, your crowd will love it.



#### JAR PIES

Make sweet pies in small wide-mouth jars, top them with a lid and a ribbon, and share the pie joy.



#### POP-TART PIES

Make a batch of pop-tart pies and freeze them. Pop them into the toaster when someone drops by for tea.

MERMAID TAVERN PIE SHOP SANTA FE





typefaces
Transat Text Medium
Brioso Pro Regular and Italic
Heart Doodles ♥

## Repetition

Repeat some aspect of the design throughout the entire piece.

Repetition creates unity and consistency as well as interest.

Find existing repetitions and strengthen them. . .

but not so far they overwhelm.

## Contrast

# ANOTHER NEWSLETTER!

#### Exciting Headline

Wants pawn term diere wereted lede gulf hoe het soerch putty yovder cols debt pimple colder Gulty Leois. Gulty Looks tit inner ladie cerdige seturated adder shit closidence femer bag florist, any lodle gulf aphan atter murder toe letter gore entity florist oil baver shelf.

#### Thrilling Subhead

singularly, "Hominy teams area gain asthma suture stooped quin-chin? Golter door Berist? Sandely sui!" "Wire nut, murder?" wined Gully Looks, hoe clint peony tension tore

\*Cause dorsal lodge en wicket bei inner florist hoe orphan molesses pimple, Lodle gulls shut lepper w

#### Another Exciting

Headline Wall, pimple oil wares wander doe wart udder pimple dum wempum ottrine, who movinery, testify looks debipted market, a will entirely debipted market and the second market protection of the

#### Boring Subhead

wen tawey lade boil. Guilty Lode tucker spun fuller sop firmer gran bog boil-busily spurted art inner hoary! "Arch!" caster gull, "Debt suply to hart!" barre mar mouse!" Dingy traitor sop inner muddle-su

This is nice and neat, but there is not much that attracts your eyes to it. If eyes are not attracted to a piece, few will read it.

#### **Another Newsletter!**

#### **Exciting Headline**

gull hoe het search putty yovker cols deht pingle colder Guity Locke Guity Locks lift nier belde cordspe saturated adder shirt dissidence frimer bag florist, any locke gull myhan acter murder too letter gore entity florist.

#### Thrilling Subhead "Guity Looks!" creter murd

angularly, "Horriny terms area asthma sucure stooped quiz ch Goiter door florist? Sordidly not "Wire nut, murder?" wined Guil Looks, hoe dint peony tension

> Cause donal lodge an wicket beer inner florist has orphan molasses pimple. Ladie galls shut lipper were from debt candor ammond, an stare otter debt florist! Debt florist's much toe electrones fairs ladie gall?

#### Another Exciting Headline

Wall, pimple oil-wares wander doe wart udder pimple dum wompum toe doe. Debt's jest hormone ruiture, Wen moening, Guilty Looks dissipater murder, en win entity florist. Fur lung, chik avergeress guil wetter putty yowler coils can tore mornised ludio rendence inhibited.

Todas, Fur lang, dale wavelgeried gill wetter party yavier colo can to cere wetter party yavier colo can to cere wetter party yavier of beens - Fodde Beer Cheme prepio, for dolskind Beer, an Ladie Broe Beer, Disk analies, racked "Spowing"), Murder Beer, an Ladie Broe Beer, Disk market, and the Broe Beer. Disk harders an radio-barriers, can hat gun entity ferinit to ee pade babel barriers an radio-barriers. Cally Locker prefer doubly half; brought, of custs, nor-bowdy werels larm, sought date gull with day and werels larm. Sur Sully fadle gull was boldy not entity.

#### **Boring Subhead**

tree bols fuller sop-wan grade beg boller sop, wan muddle-sesh boll, an wan tawry ladle boll. Guilty Locks tucker spun fuller sop firmer grade bag boll-bushy spurted art inser hoary!

AscH2" crater gull, "Debt sop's toe sart - berns mar mouse!" Dingy traitor sop kner muddle-sasl

Can you feel how your eyes are drawn to this page, rather than to the previous page?

#### Contrast

Contrast various elements of the piece to draw a reader's eye into the page.

Contrast creates interest and organizes information.

Make contrast dramatic! Small contrast leaves readers guessing.

Contrast your typefaces, colors, line thicknesses, use of space, etc.

# Graphic design in practice

First, find your story or message.

Choose the right graphic forms to support it.

Next, sketch layout ideas on paper: set structure before style. Rough sketching is OK: squiggles for text, X-ed out boxes for images. Try many variations.

Then, choose a visual style: types, colors, non-chart images, etc.

Last, try out on computer.

See **sketch examples** from Alberto Cairo's students.

# Practice: sketching

On Blackboard are three PDF graphs I made for the degrees-by-field-and-gender dataset:

- 05\_GraphicDesign\_STEM.pdf
- 05\_GraphicDesign\_NonSTEM.pdf
- 05\_GraphicDesign\_Biz.pdf

Sketch at least two different layout ideas. How could you use contrast, repetition, alignment, proximity?

# Practice: Inkscape

**Inkscape** is free and open source software for editing vector graphics and laying out single-page documents.

Industry standard **Adobe Illustrator** is available on CMU campus clusters, but expensive otherwise.

Also useful: **Photoshop** and **GIMP** for editing raster graphics (including photos), or **InDesign** and **Scribus** for complex, multi-page layouts.

# Practice: layout in Inkscape

- ► File > Document Properties to choose size
- View > Grid to see a grid (and snap elements to it)
- View > Snap to toggle snap-to-grid behavior
- ▶ Drag from rulers on left and top to create guides for your layout
- Add background boxes or rules (lines) for headings
- ► File > Import to add my PDF graphs from R

# Practice: editing graphs and text in Inkscape

- ▶ **S** key for selector tool to move elements, align graphs
- ► T key for text tool to create and edit text boxes; click and drag before releasing to create a box with text wrap
- Text > Remove Manual Kerns on selected textbox if edited text looks smushed together
- ▶ Add direct labels, change text colors, delete legends
- ► Fix negative numbers, add spaces in degree names
- ► Edit subplots' title text (STEM and Non-STEM), delete Business title text
- ▶ Add overall title, subtitle, body text, credits, data sources

#### Resources

- Cairo textbook DVD
- Robin Williams, The Non-Designer's Design Book
- ► Lynda.com online tutorials (design principles, Adobe Illustrator, etc.)—free access through CMU
- Inkscape tutorials
- Ian Mitchell, "Authority or Cliche?": article on graphic vs. information design

#### For next time

- We'll learn basic concepts of Interaction Design, how to apply them to your visualizations, and how to implement them in Shiny and D3.js
- Install Shiny R package and download D3.js if you want to follow along
- ► Readings: Cairo Ch 9
- ► HW 3 (Grammar of Graphics) due Saturday at 5pm, through Blackboard