

Week 6

???

6.1 Lecture 10: Scientific Visual Communication

- 2/7:
- Long report submissions delayed until Friday.
 - The content of today may be useful!
 - Thursday.
 - Anna Wuttig on the current state of EChem.
 - Tokmakoff will stick around after for us to chat about our reports with him.
 - There are many aspects beyond *visual* communication, but this is one that isn't always seen, so Tokmakoff decided to focus on it today.
 - Take all the guidelines and extra chapters seriously; they're exactly what is being graded for.
 - We should care about communication because it's as important to our career development as anything.
 - Our science must be distributed; otherwise, we're just a hobbyist.
 - We need to convey very complicated, quantitative information to other scientists, management, government agencies, policy makers, investors, and the general public.
 - Reduce complex quantitative data accurately into clear, concise messages: Data interpretation.
 - Often, there are real requirements on content and formatting.
 - Excellence in communication.
 - Content is key, but saying it well will really level you up.
 - It develops *trust* in your methods, results, and communications.
 - A well-communicated report and graphic can change the world, e.g., the hockey stick curve.
 - **Communication:** The means of exchanging information.
 - **Medium:** Any channel of communication.
 - Media we will discuss.
 - Print (text, graphics).
 - Graphics are how people digest scientific information.
 - Oral (in person with visual support).
 - Never use double columns if you want transport to online.

- The common starting point for all communication.
 1. Audience.
 - Identify; sets the objective, expectations, language, and aspects of your work to focus on.
 - You need to know if you're talking to fellow bench scientists, or senior management.
 2. Message.
 - What are you trying to say? Just say what you need to, and get rid of the rest.
 - When your TA or Tokmakoff reads your report, what are they going to think of my magenta line.
 3. Media.
 - What tools are at your disposal, and how are they best employed.
- Visual presentation tips for text and graphics.
 - Our goal: Communicate quantitative information clearly and concisely.
 - Make your viewer's life easy (be consistent, define the purpose of each element, etc.).
 - Simplicity is good; clutter is bad.
 - Color should be chosen with a real focus in mind.
- Typefaces and fonts.
 - The visual representation of language. Its style should help, not interfere, with your communication.
- **Typeface**: The design elements for lettering. A collection of glyphs.
- **Glyph**: A single representation of a character.
- **Font**: A variation of a typeface like size, weight, and spacing.
- Classes of typefaces: **Serif** and **sans serif**.
 - Sans-serif is good for titles, headings, and labels.
 - Serifs are good for presenting large amounts of text.
- History of typefaces.
 - Use legacy typefaces; they're still supported.
 - "Microsoft is your friend."
 - Computers revolutionized typography; Microsoft drove the development with proprietary stuff, which eventually caused them to lose the edge, and now there's great open-source fonts.
- Typefaces for equations.
 - Times New Roman and Garamond have full math support.
 - Computer modern (\TeX) is probably still the best in terms of being able to distinguish things since it includes so many helpful flourishes.
 - You're probably encountered difficulties with the lab manual (e.g., v vs. ν) because it's not in Computer modern.
- Tokmakoff's recommendations for formatting: Typed 8.5×11 documents should have a...
 - Single column format.
 - 1" margins.
 - 11-12 point type.

- ~ 90 characters per line including spaces (15 characters per linear inch).
 - 4-5 lines per vertical inch.
- Why worry about font size?
 - Legibility vs. readability; too small impacts legibility, and too big impacts readability.
- Why worry about line spacing?
 - $1.5\times$ is Tokmakoff's recommendation.
 - $2\times$ is legacy from typewriters, when single and double were the only options.
- Why worry about margins?
 - White space helps with clarity.
 - Don't just insert figures; make figures break text.
- Equations should be numbered.
- Color.
 - Don't let it distract; let it help you make a cleaner presentation.
 - Really bright colors draw the eye too much.
- Scientific figures.
 - Purpose: To convey quantitative information on the relationship between different physical variables with minimal effort.
 - Each figure should convey information on exactly one topic.
 - Again, know your audience, be aware of your medium (typed vs. oral), clarity, etc.
 - Additional consideration for scientific reports: Often the figure is the only documentation of the data.
 - If the reader wanted to analyze your data, can they read data values off the graph using the axis labels?
 - Raw Excel sheets, other records may not be saved, so the literature report may be the only way for future scientists to reanalyze your data.
- Examples of good and bad figures.
 - As you see scientific figures going forward, take note of what you like and what you don't like and learn.
 - Tokmakoff asks for the class's feedback on his examples.
- You should have 4-6 axis labels and 4-10 tick marks.
 - More tick marks than labels is a good idea!
- Make sure colors translate to black and white, so maybe I should vary both shapes and colors in my Birge-Sponer plot.
- Rowan is very picky about what Excel settings you use.
 - Don't cut and paste into word; stuff gets realigned.
- Tokmakoff doesn't look for units for unitless quantities (e.g., absorbance).
- Use a legend when there are two or more series being plotted.
- Caption.

- Use for report figures.
 - It should describe what is plotted and is needed to interpret the data beyond what is in the figure itself.
 - For data, typically quote specific experimental conditions.
- Titles are only for oral presentation graphics.
- Don't mislead! Rescaling your axes can mislead about growth.
- Make everything 300 dpi.
- Publishers use JPG in CMYK color profile.
 - Online: Use RGB color profile.
 - Everything else is up to us.
- Takeaways.
 - Clarity and conciseness.
 - White space is good!
 - Microsoft is (mostly) your friend.
 - Their templates, colors, and fonts have been professionally designed... with everyone in mind.
 - Use recommended formatting, but be aware it isn't for scientists.
 - There are no firm rules — just guidelines. It is an art.