Preparing figures for publications and presentations

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Photograph courtesy Tony Mastres

As researchers, we expend a great deal of thought, time, and money to generate data.

Surely it makes sense to treat data with respect, and to present data in the best possible manner, paying heed to verity, legibility, and æsthetics.

Avenir

Aa Ee Rr

Aa Ee Rr

Amsterdam.nl

abcdefghijklm
nopqrstuvwxyz
0123456789

Produkt

Produkt is the slab serif to the sans Graphik family, falling into the tradition of adding slabs to European Grotesk, creating an attractive and functional companion serif typeface. Its serifs are relatively short, particularly in the heaviest weights, so it retains the compact proportions and regular texture that characterize Graphik.

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Visual Identity

Overview   University Marks   Color   Typography   Photography   Websites

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Typography

Typography is an essential part of the UC Santa Barbara visual system. When used consistently, it unifies messaging and creates familiarity. Our full set of guidelines will help you use our typefaces for maximum legibility while reinforcing UC Santa Barbara in the eyes of our audiences. For information on obtaining either of our typefaces at no cost to your area, for either print or web use, please email brand@ucsb.edu.

Good for labeling, and for short strings of text. NOT good with paragraphs. Projects well.

NOT good for labeling, or for short strings of text. Good with paragraphs. Prints well.

UC **SANTA BARBARA**
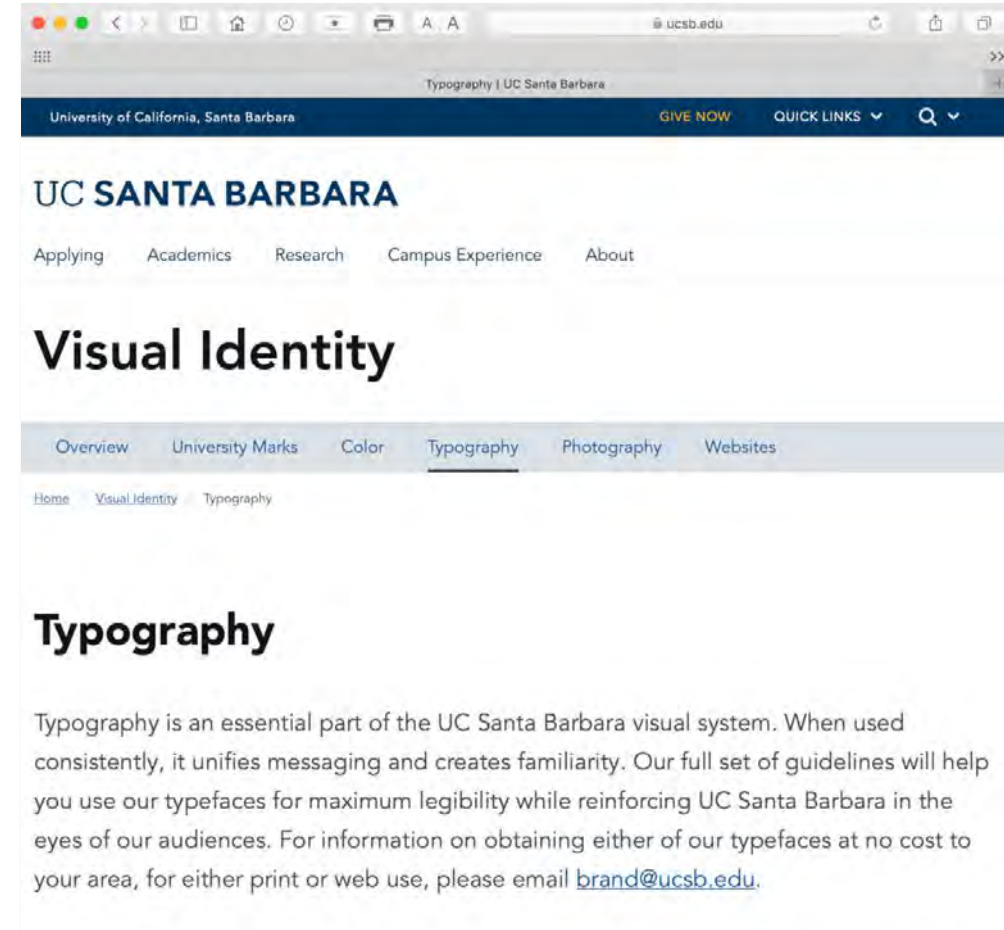
Thoughts on comic sans

A fun typeface to use in the invitation you send to your friends Heather and Pedro and Dylan and Kumar and Jazmyn and Fatima, to your 8th birthday party. Yay !

http://www.bbc.co.uk/news/magazine-11582548

Thanks to Jamie Neilson for the link.

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Calibri

Aa Ee Gg
Aa Ee Gg

Eiganes

abcdefghijklm
nopqrstuvwxyz
0123456789

Corbel

Aa Bb Cc
Aa Bb Cc

On-screen

abcdefghijklm
nopqrstuvwxyz
0123456789

Candara

Aa Ee Xx
Aa **Gg Xx**

N

Bildersturm

abcdefghijklm
nopqrstuvwxyz
0123456789

Consolas

Aa Kk Jj
Aa Kk Jj

Registration

abcdefghijklm
nopqrstuvwxyz
0123456789

Constantia

Aa Rr Gg
Aa Rr Gg

Język

abcdefghijklm
nopqrustuvwxyz
0123456789

Cambria

Aa Ee Rr
Aa Ee Rr

Doppelgänger

abcdefghijklm
nopqrstuvwxyz
0123456789

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A good plot
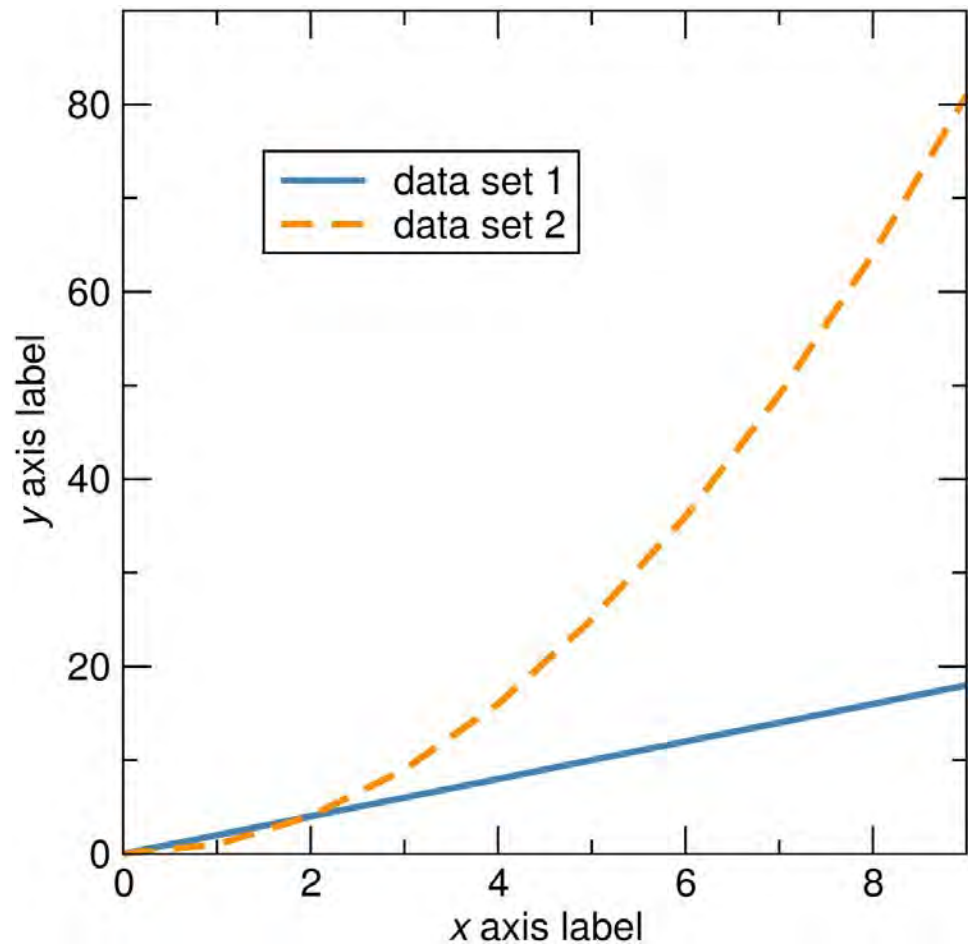
Square plots are æsthetically appealing, convey information, and shrink gracefully. It is easy to use them in theses, single column journal articles, and talks.

Blue and orange are contrasting colors and have high visibility. They are usually visible to most color-blind people as well.

Using redundant coding is helpful. The plot shown here would be legible when reproduced in black and white as well, because one of the lines is dashed.

An appropriate frequency of tick labels should be used. Tick and axes labels should be the same size, preferably.

Serif-free fonts have higher legibility. Calibri, Gill Sans, and Helvetica look nicer than Arial. Times New Roman is a bad idea.

The important metric to control is the ratio of the size of text in the plot to the width of the plot.

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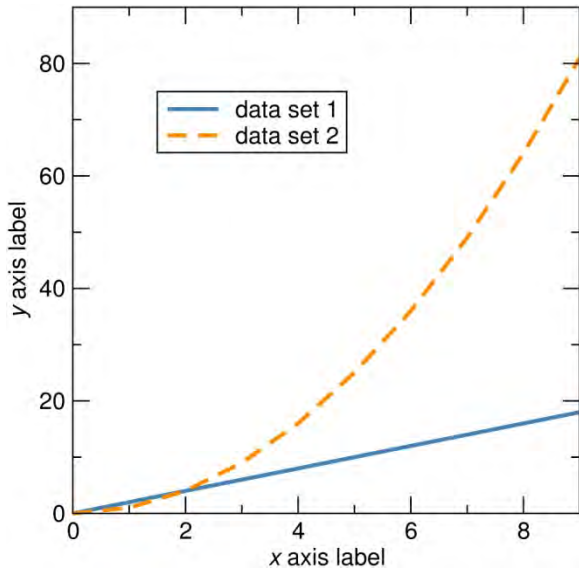
The square plot reduces in size in a manner that retains legibility. It is important to create the original plot in a size that is close to what will appear in final use.

In particular, one should pay attention to the ratio of the size of the font used – in tick and axes labels, and in legends – to the height and width of the plot as it appears in the final document or presentation.

Place legends in the plot. Don't use terms like "dashed orange line" in the figure caption.

3 in

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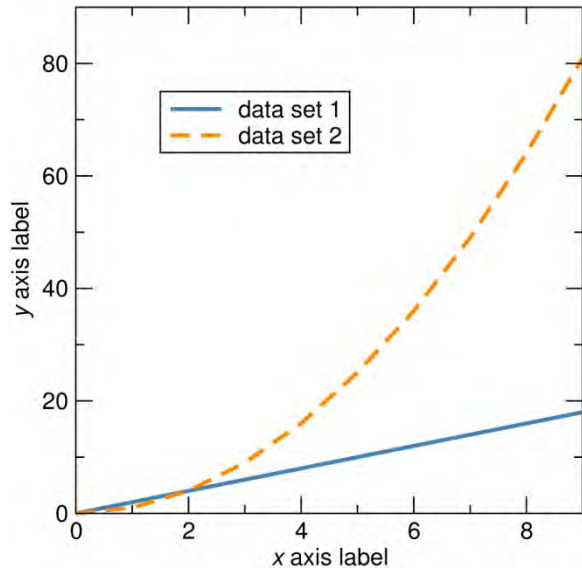
Use a few well-chosen colors: Not green, or yellow.

Not exotic colors that will destroy consistency.

3 in

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5 in
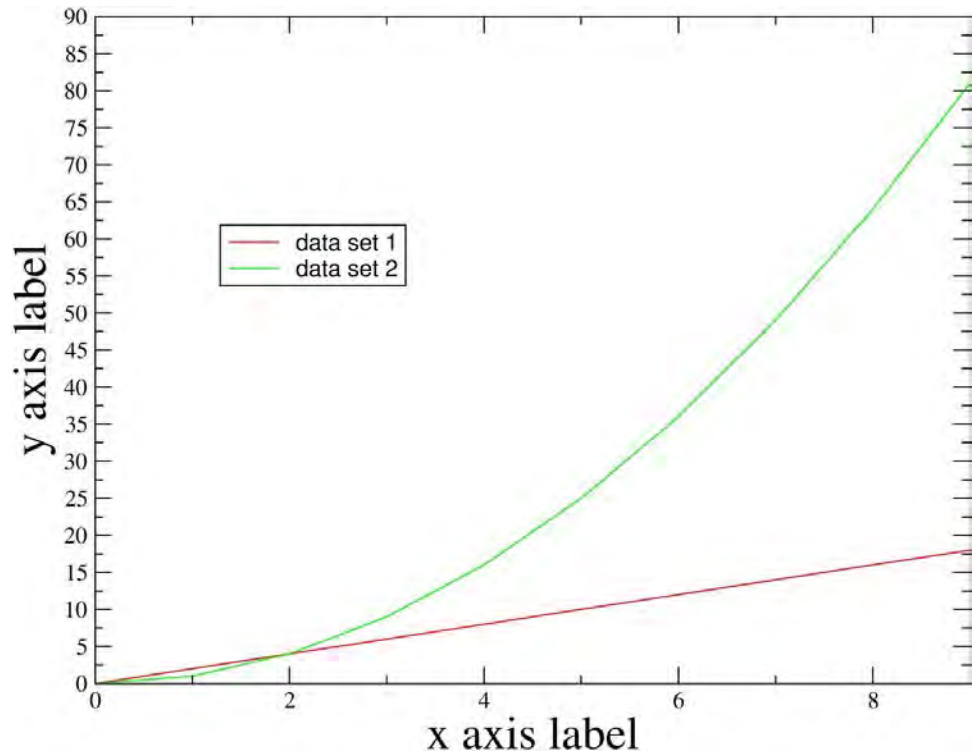
Rectangular plots (the default with some graphing programs) are less aesthetically pleasing, and the horizontal and vertical axes are imbalanced.

Such a plot may appear acceptable when printed out fully in landscape mode on a sheet of a4 or US letter paper, but does not shrink gracefully in publications.

In this plot, there are many other problems:

Red and green are bad choices, with rather low visibility. A significant proportion of the population would not distinguish them. The lines in this plot are too thin as well.

Avoid primary red, blue, green, YELLOW

There is no redundant coding used. In a B&W printout, it would be hard to distinguish the lines.

5 in
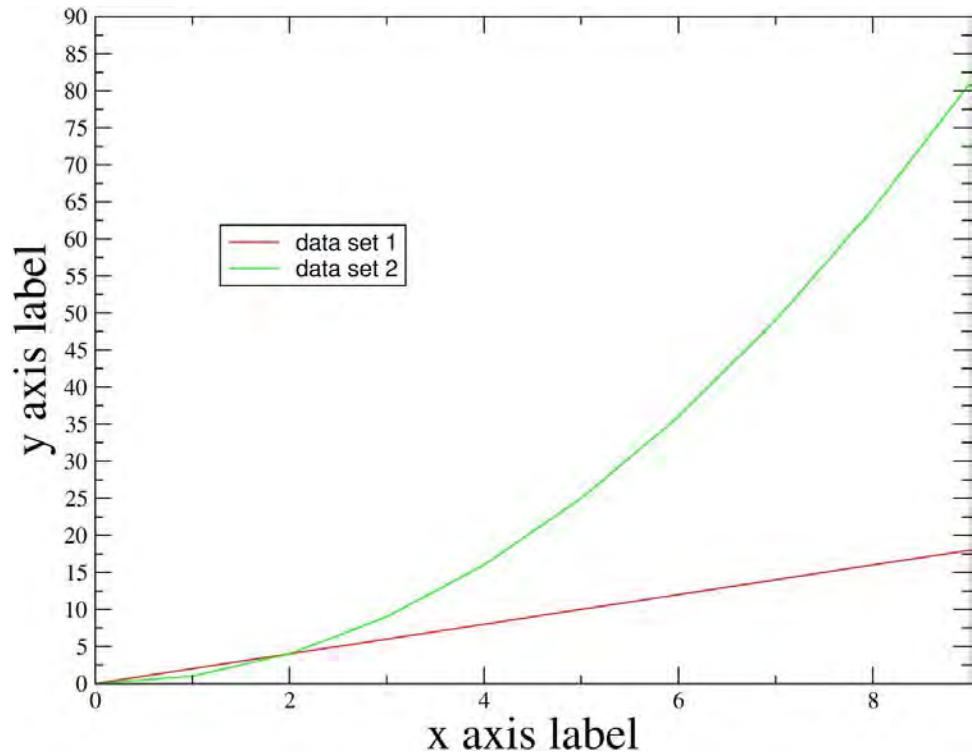
Problems (contd.):

The lines are too thin (the plot thickens?)

Fonts with serifs are used. These have reduced legibility, particularly when shrunk.

The tick labels are too small. Why use different font sizes for the tick and axes labels ?

The vertical axis has too many tick labels and tick marks. The vertical and horizontal axes are imbalanced in that sense.

The plot could be worse. At least it is not pixelated or badly aliased, and the resolution is acceptable.

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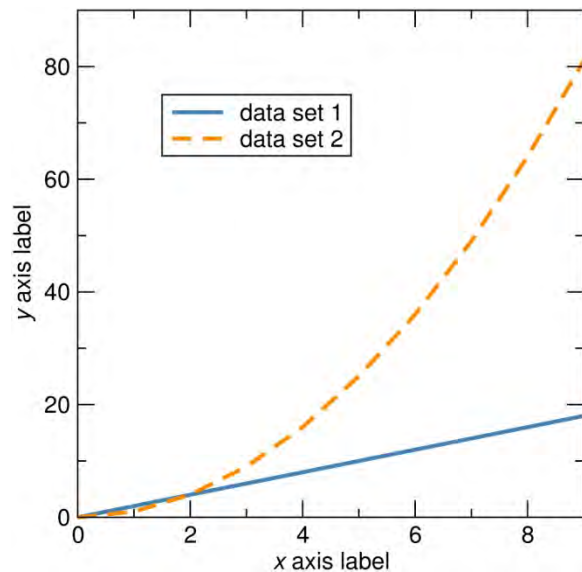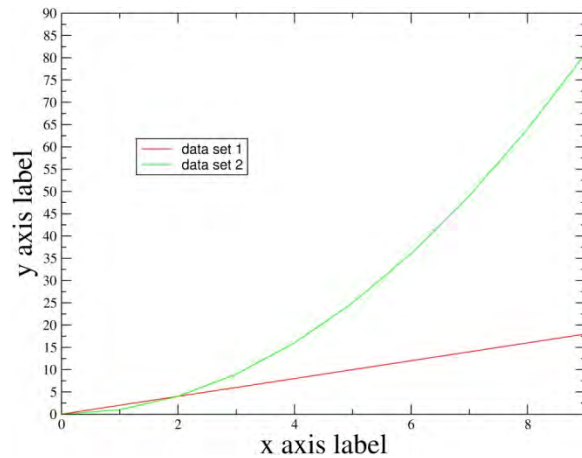
This plot absolutely does not shrink gracefully.

Compare it with our better example.

However, if this were the final size sought, both plots have labels that are too small.

The solution would have been to resize the plot in the original plotting software, as shown below in order to obtain an appropriate ratio between font size and plot size.

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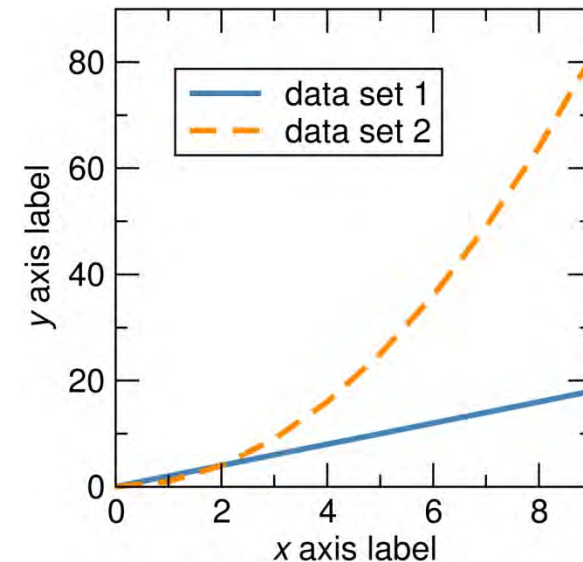
Insets (how to make them)
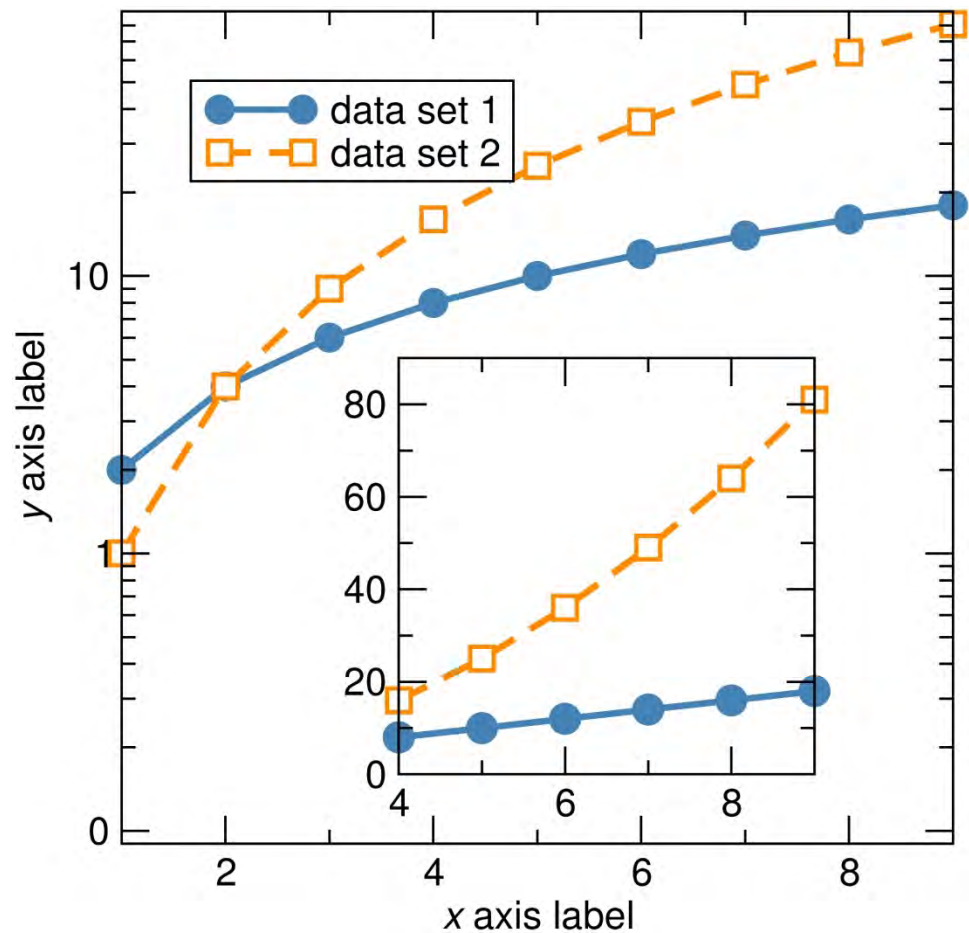
A common problem with insets is that they are frequently shrunk in every sense … symbols, text etc.

There is no need to shrink down the size of symbols, axes labels, tick labels etc.

Also, there is no need to provide axes labels for the inset if the inset only expands (or otherwise displays) the same data.

Note that in this and the next plot, we make use of symbols, with further redundant coding.

We use distinct symbols for the two datasets, in addition to using color-filled and white-filled (or unfilled) symbols.
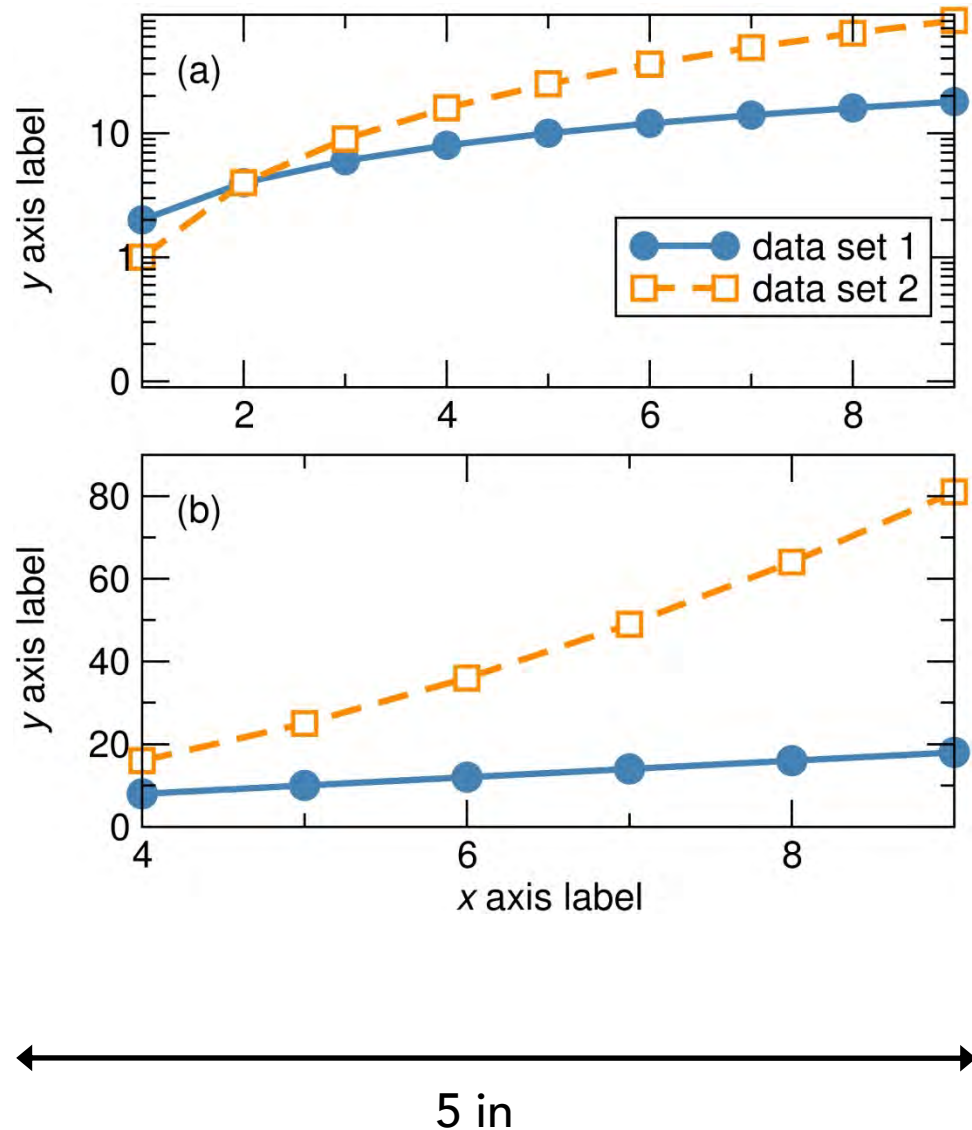
However, insets frequently do not do justice to data.

Consider multiple panels instead. Do note that in plotting the data as performed here, there is no more (screen/paper) real estate used than in the case when the inset was employed.

Note that the label on the horizontal axis is provided only once, since it is shared between panels (a) and (b).

Also note that the labels on the vertical axes are aligned, as are "(a)" and "(b)"

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Insets (the example not to follow)
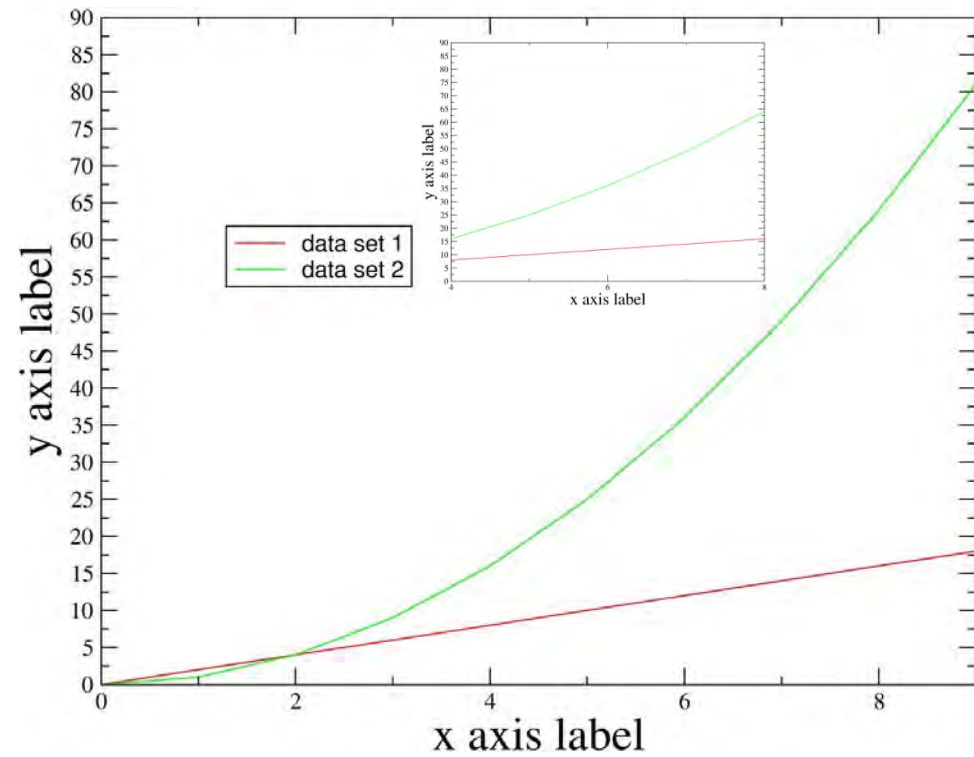
Perhaps an extreme example, but unfortunately not rare.
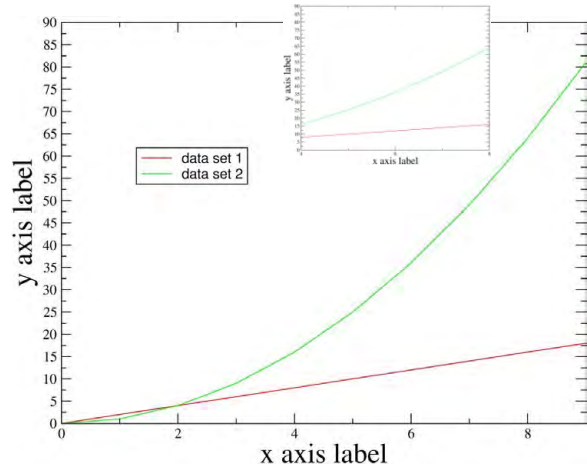
And just when you thought it couldn't get worse !

Remember that journals will reduce figures to the width of a single column.

3 in

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Plots from instruments

Absorbance / Wavenumber (cm-1)
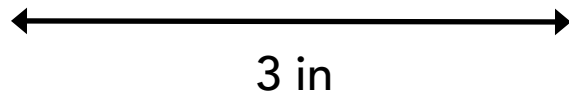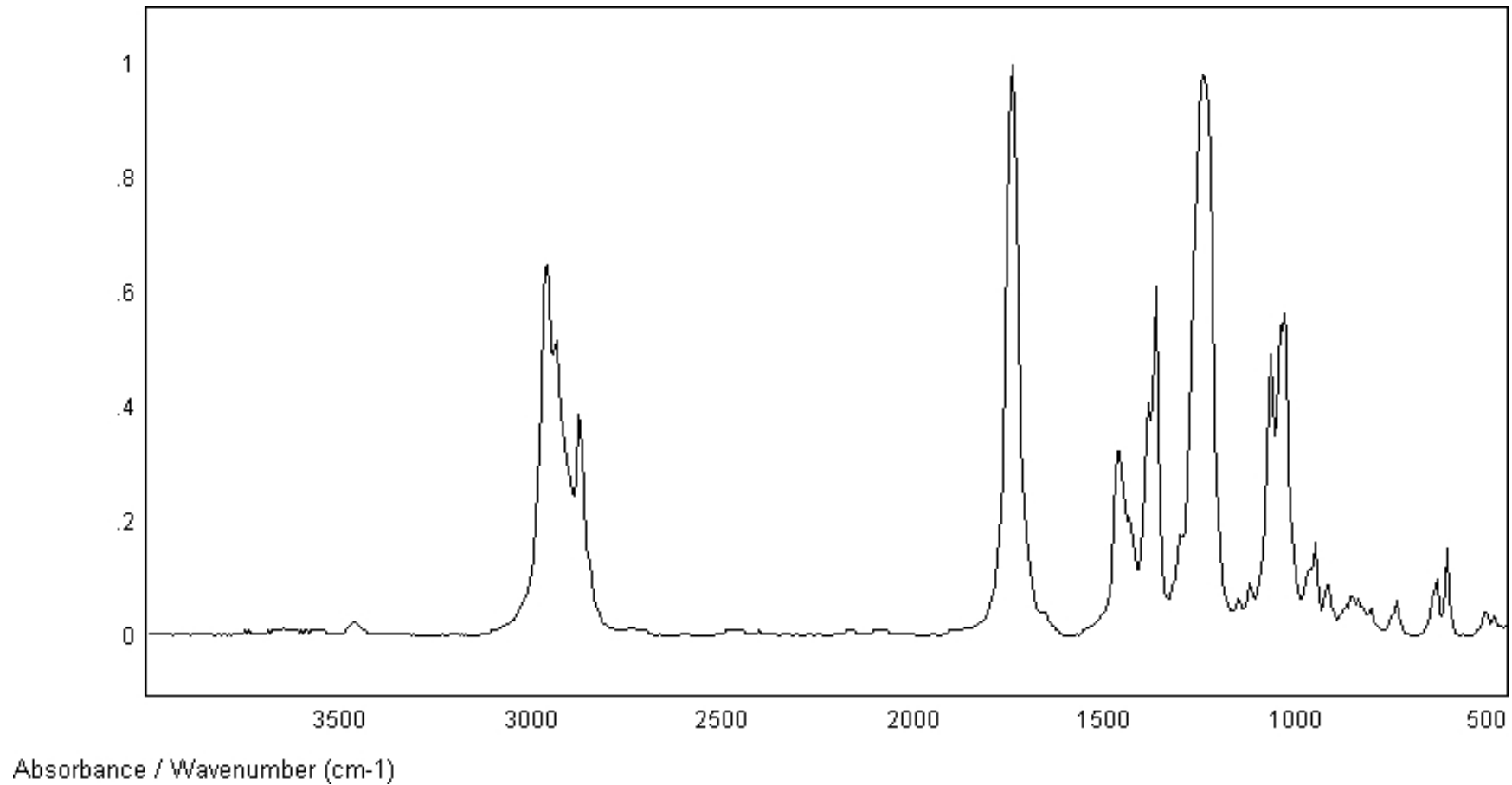
Vendors of commercial instruments (FTIR spectrum from a manufacturer's website shown here) are interested in presenting their data for A4/US letter landscape printouts …

Plots from instruments

Absorbance / Wavenumber (cm-1)

5 in
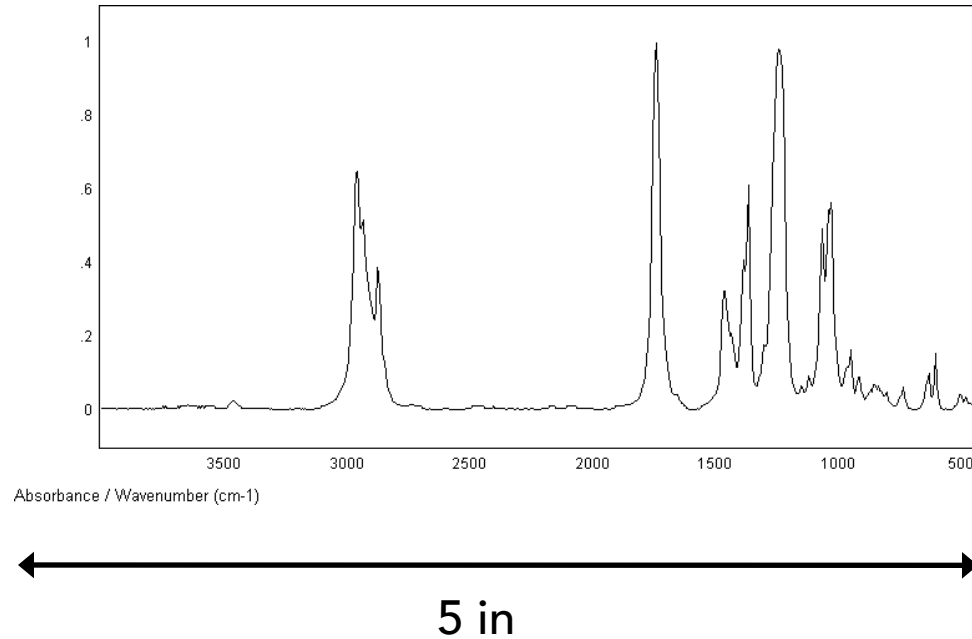
… not for reproduction in the scientific literature (or even in talks !) Also cm-1 is not a unit, cm^{-1} is. "0.2" and "0.4" etc. are preferred over ".2" and ".4"

The saving grace in this example is that the figure is not pixelated. Where are the tick marks ?

Do export ASCII (txt) files from the instrument and re-plot the data using appropriate graphing software.

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Acc.V   Spot Magn   WD   5 µm
4.00 kV 3.0   5000x   5.2

← 5 in →
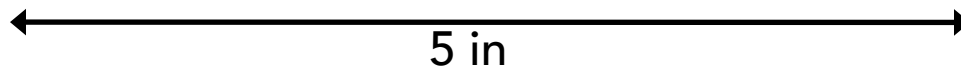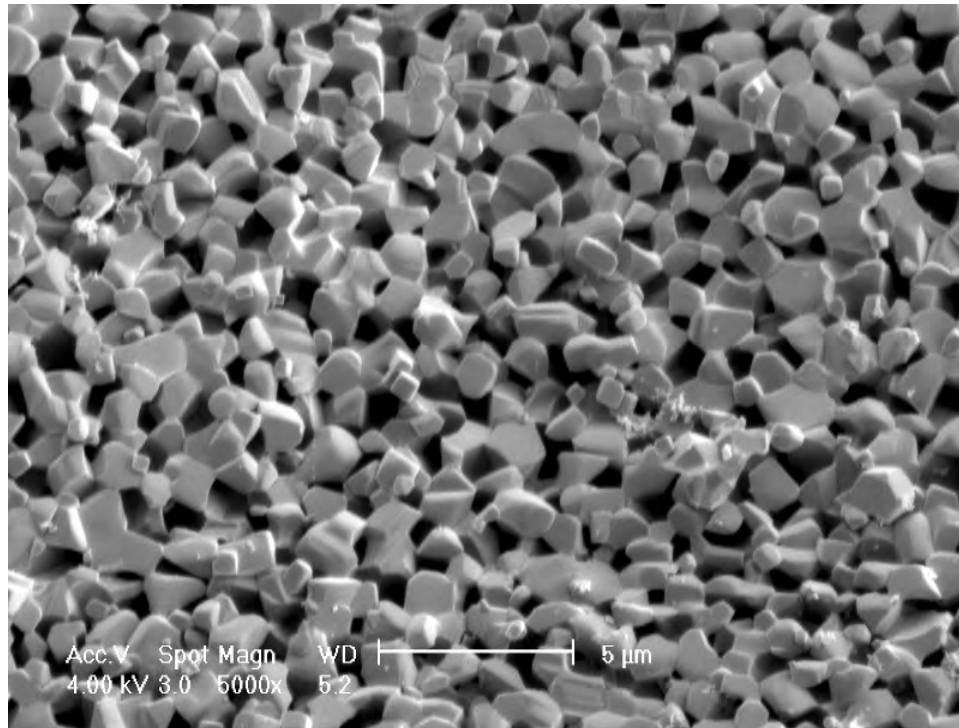
The text on micrographs (SEM image from Eric Toberer) as obtained directly from the instrument, frequently carries useless information, and the scale bar is usually too small.

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5 µm

5 in
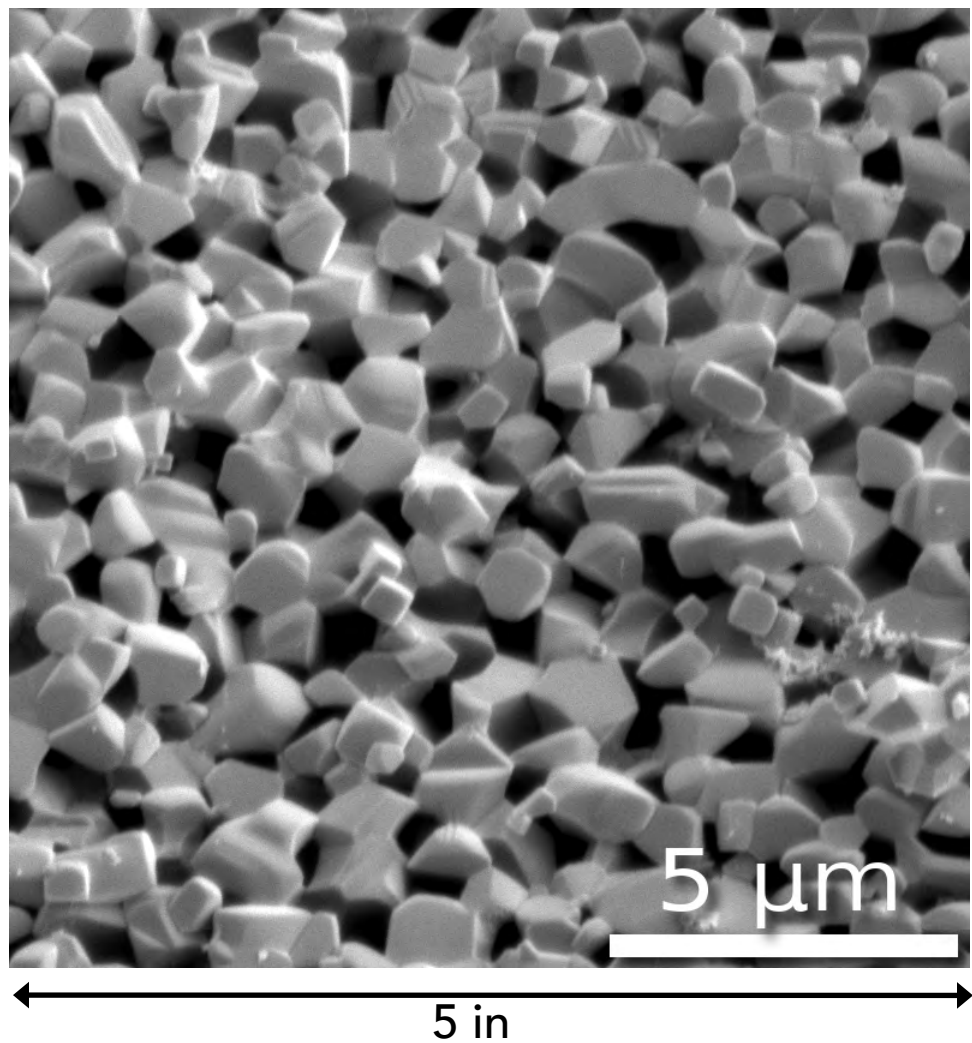
With a little effort using GIMP (www.gimp.org), a much more usable image can be created. The (personal) preference is for square images. Shadowing enhances text legibility here.

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Plots and images are annotated with ease, and the preparation of schematic images is convenient within PowerPoint.

How are these best exported? The resolution of jpg files (or other bitmap formats) saved from PowerPoint is rather low.

One solution is to export as a print quality PDF which can then be opened in GIMP with near arbitrary resolution, and then and saved as a bitmap image. An example is displayed on the left, created from a PowerPoint poster. A portion of the jpg is shown as well, in order to show the resolution of the original image.

UC **SANTA BARBARA**
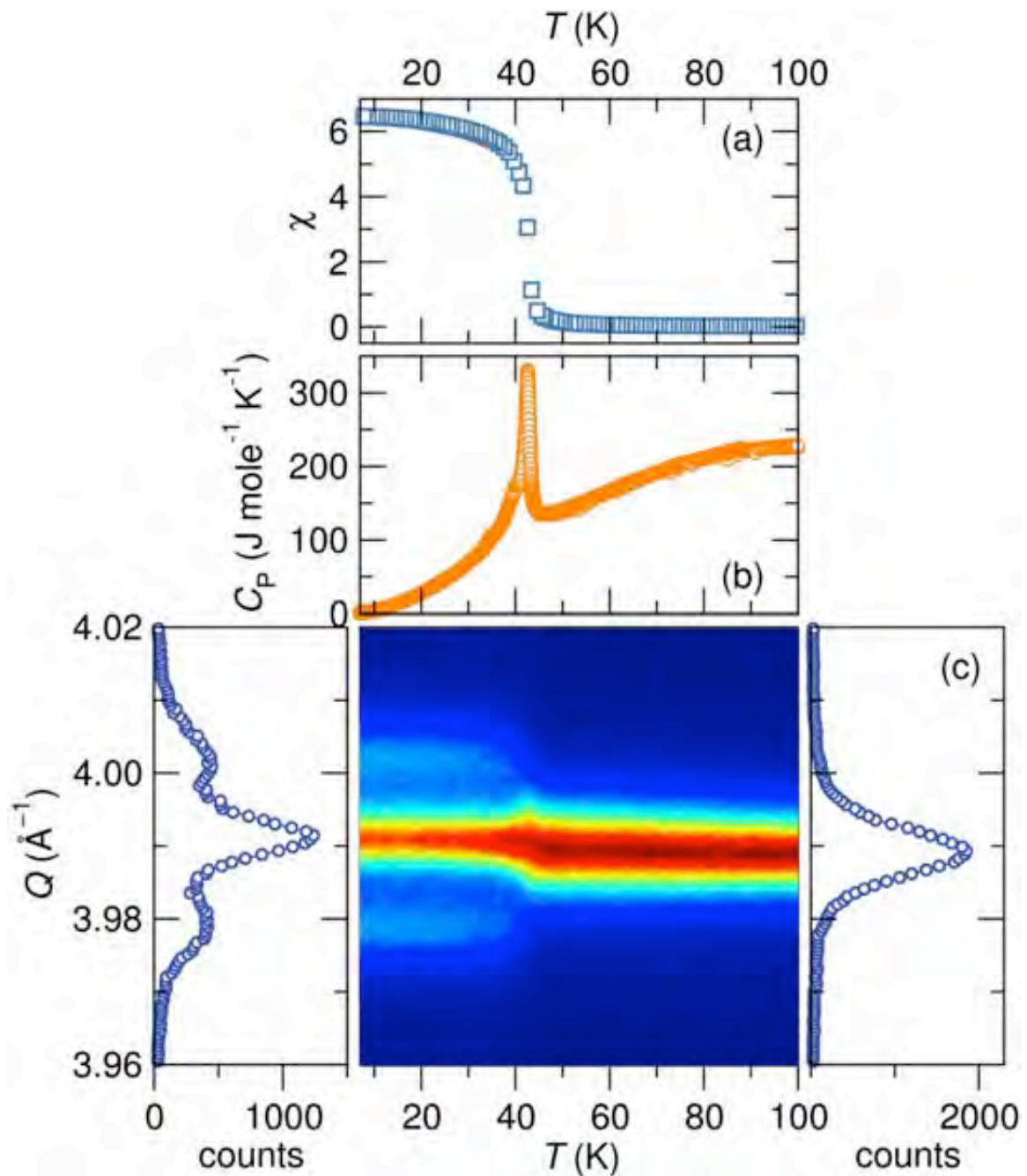
Kemei, Harada, Seshadri, Suchomel,
Phys. Rev. B **90** (2014) 064418(1–8).
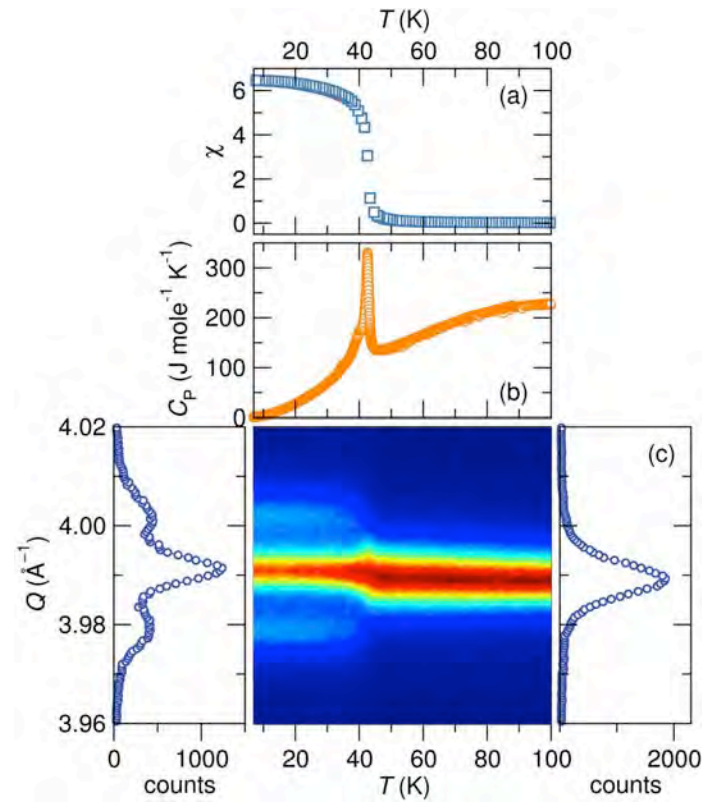
Yes, it shrinks gracefully

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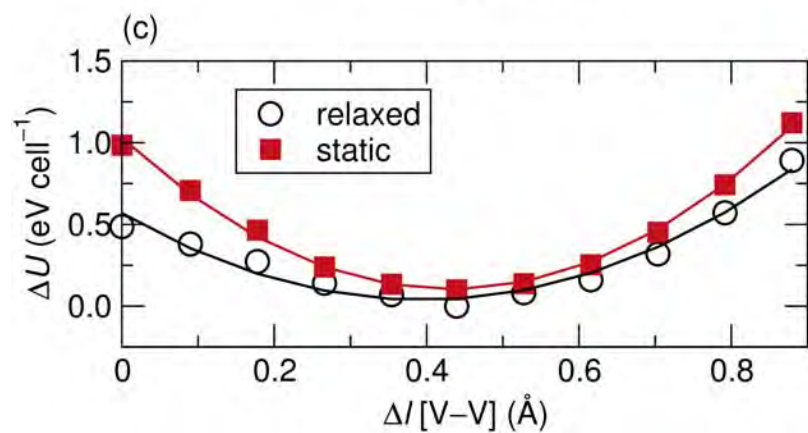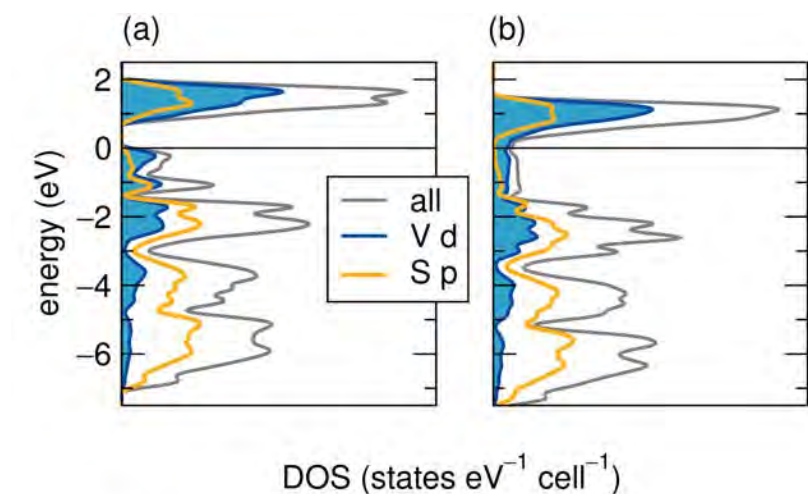
Table of contents graphic
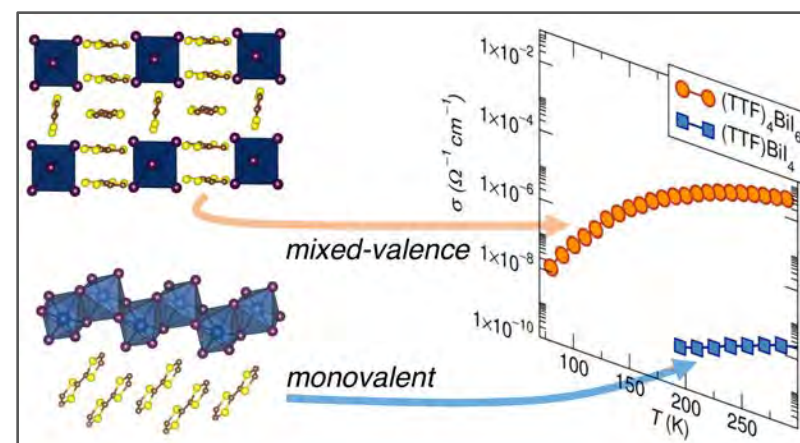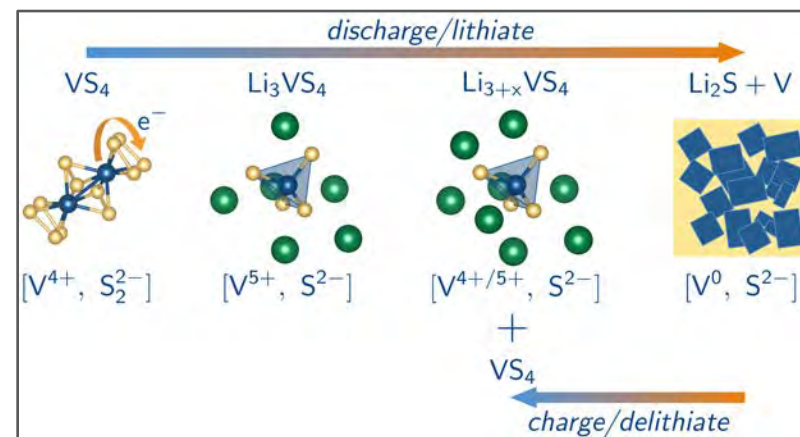
Britto, Leskes, Hua, Hébert, Shin, Clarke, Borkiewicz, Chapman, Seshadri, Cho, Grey, *J. Am. Chem. Soc.* **137** (2015) 8499–8508 (above, above right).

Evans, Labram, Smock, Wu, Chabinyc, Seshadri, Wudl, *Inorg. Chem.* **56** (2017) 395–401.

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Buriak, *Chem. Mater.* **26** (2014) 1289–1290. DOI: 10.1021/cm500170v

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Dark backgrounds (yuk !)
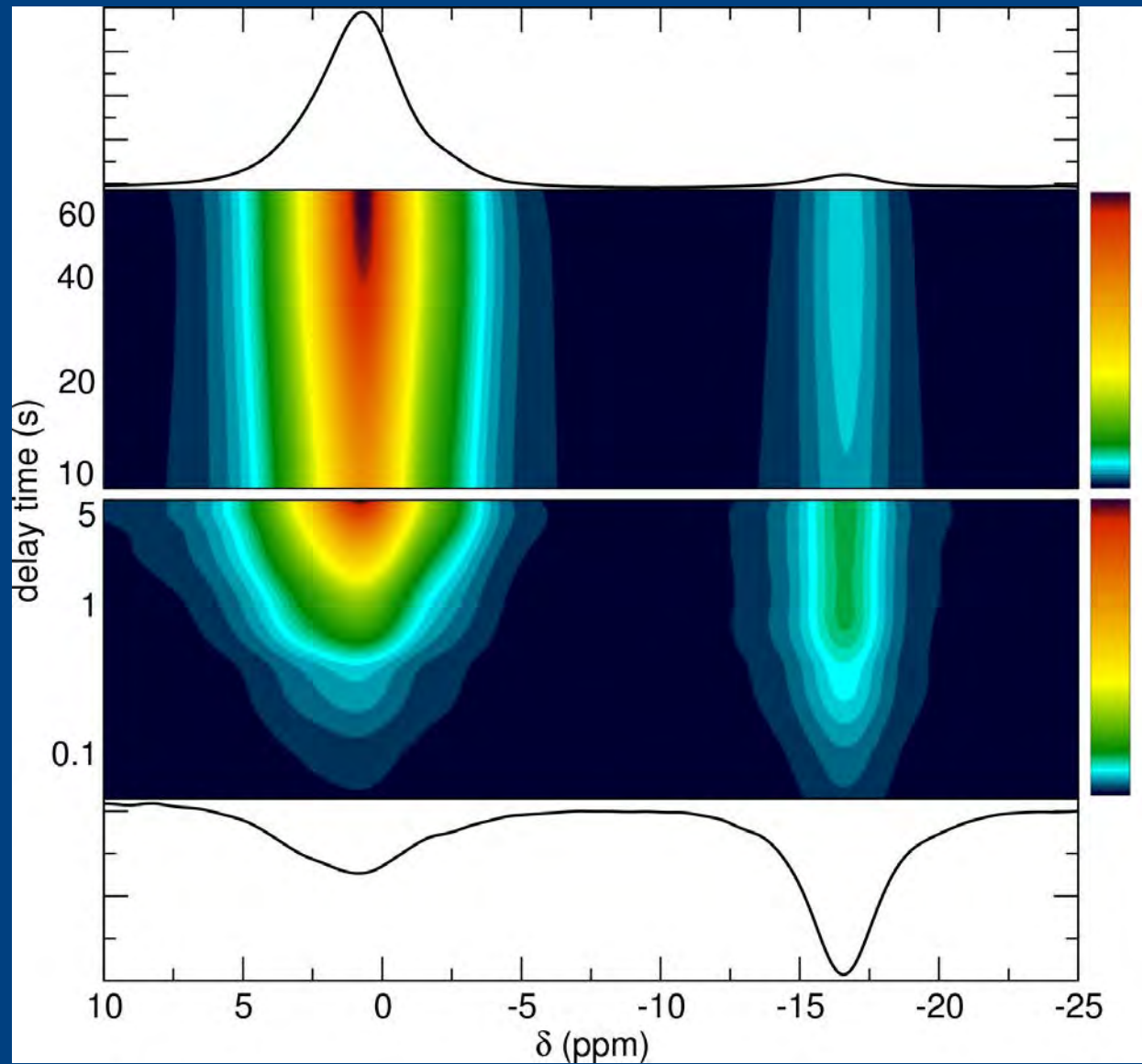
Nathan George

The discovery of superconductivity in Hg (1911)
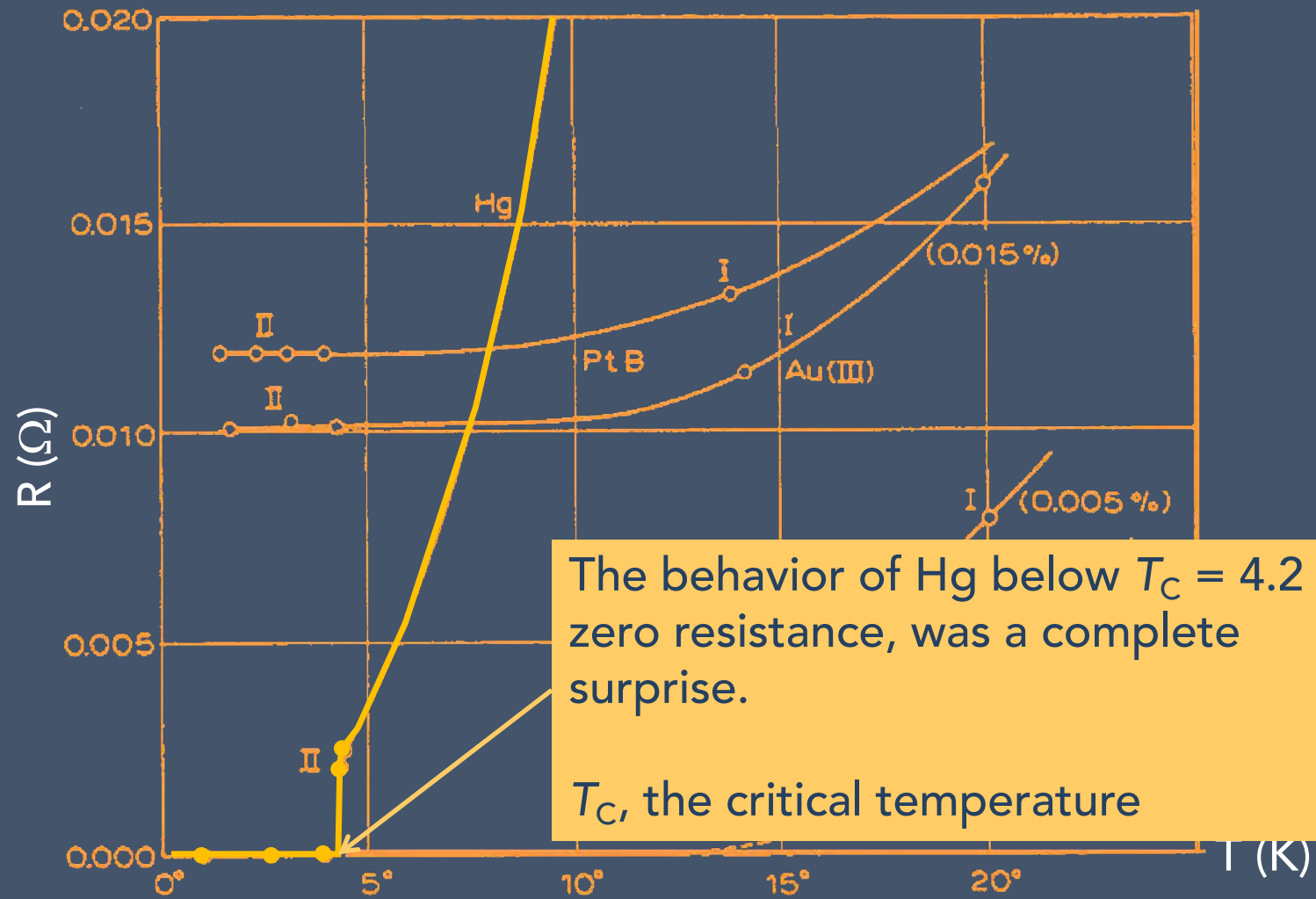
The behavior of Hg below T_C = 4.2 K; zero resistance, was a complete surprise.

T_C, the critical temperature

H. Kamerlingh Onnes, Nobel Lecture, December 11, 1913.

Li, Shi, Cai, Zhang, Huang, Liu, Yang, Studies on the equivalent serial resistance of carbon supercapacitor, *Electrochim. Acta* **174** (2015) 596–600

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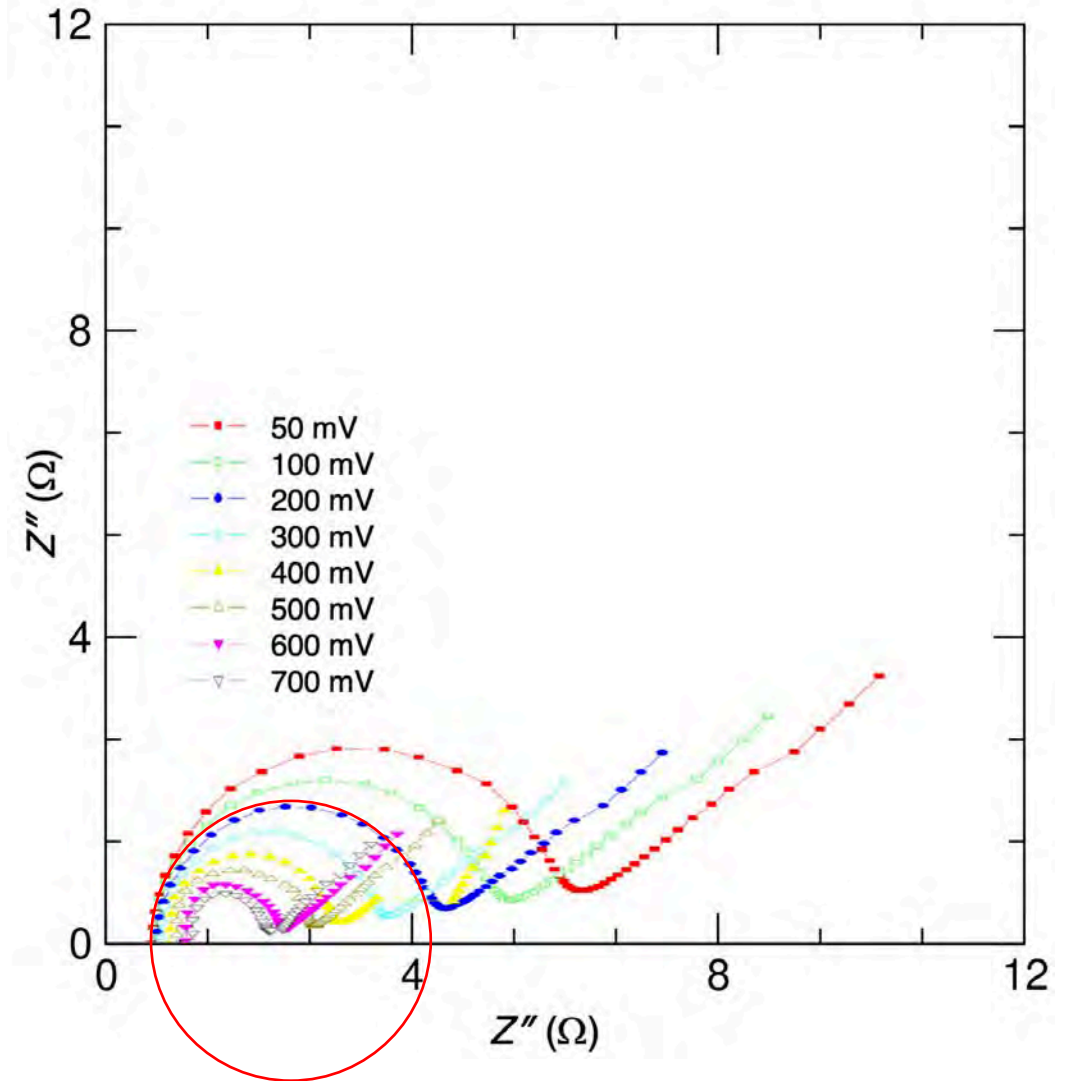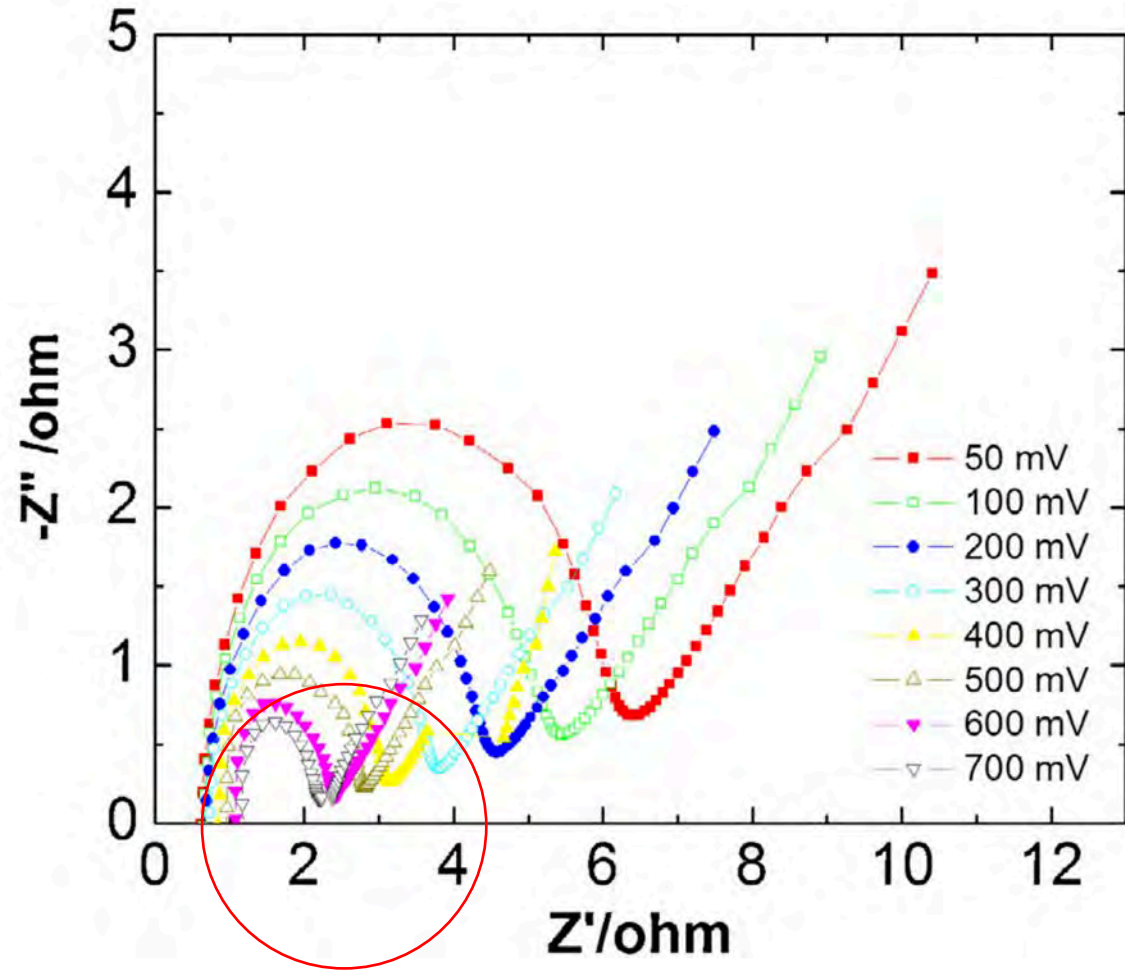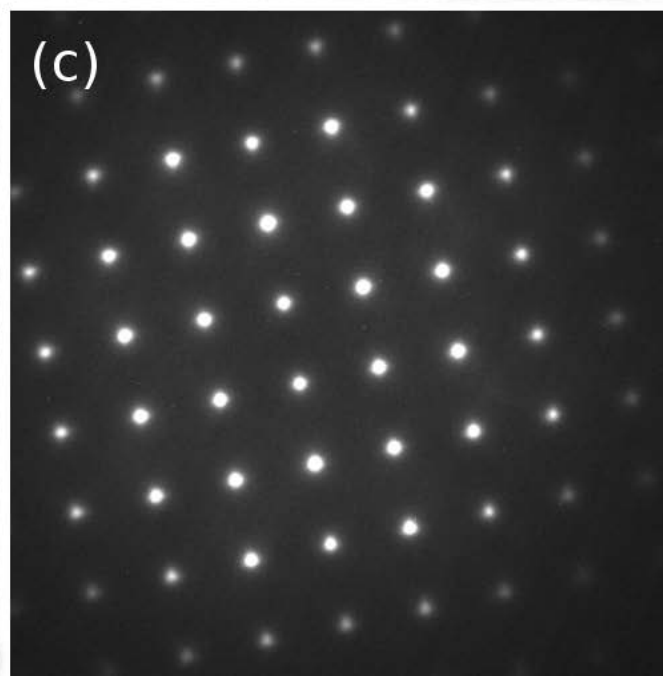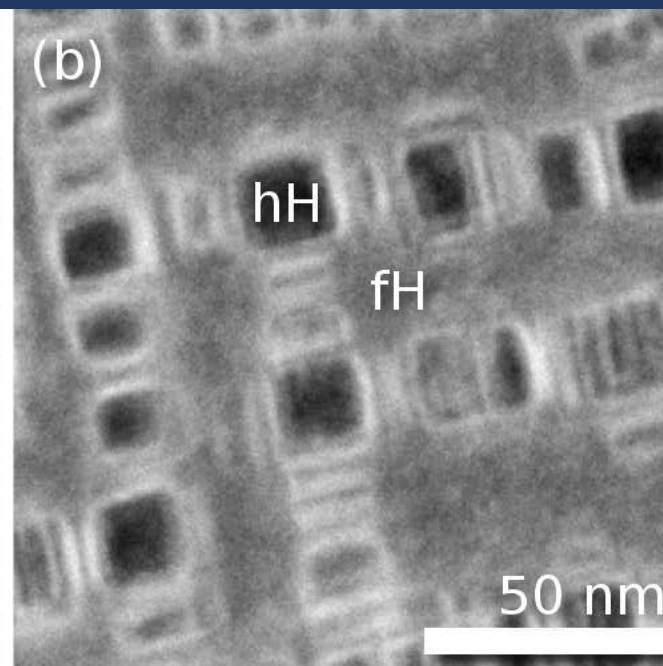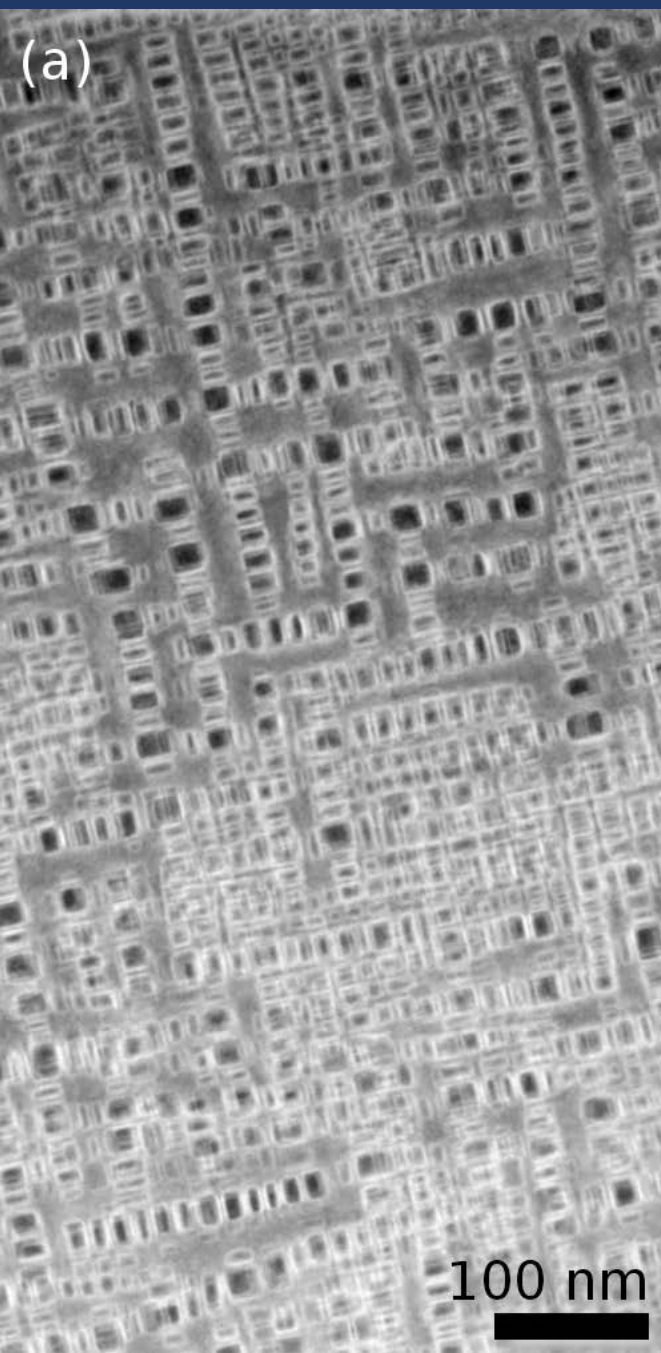
Samples and image assembly by Jason Douglas.

Microscopy by Dr. Nisha Verma

K_2NiF_4 and Ruddlesden-Popper (m = 1, 2, 3)
General formula: $[SrO][SrTiO_3]_m$

Please don't use the horrible compass directions output by VESTA.
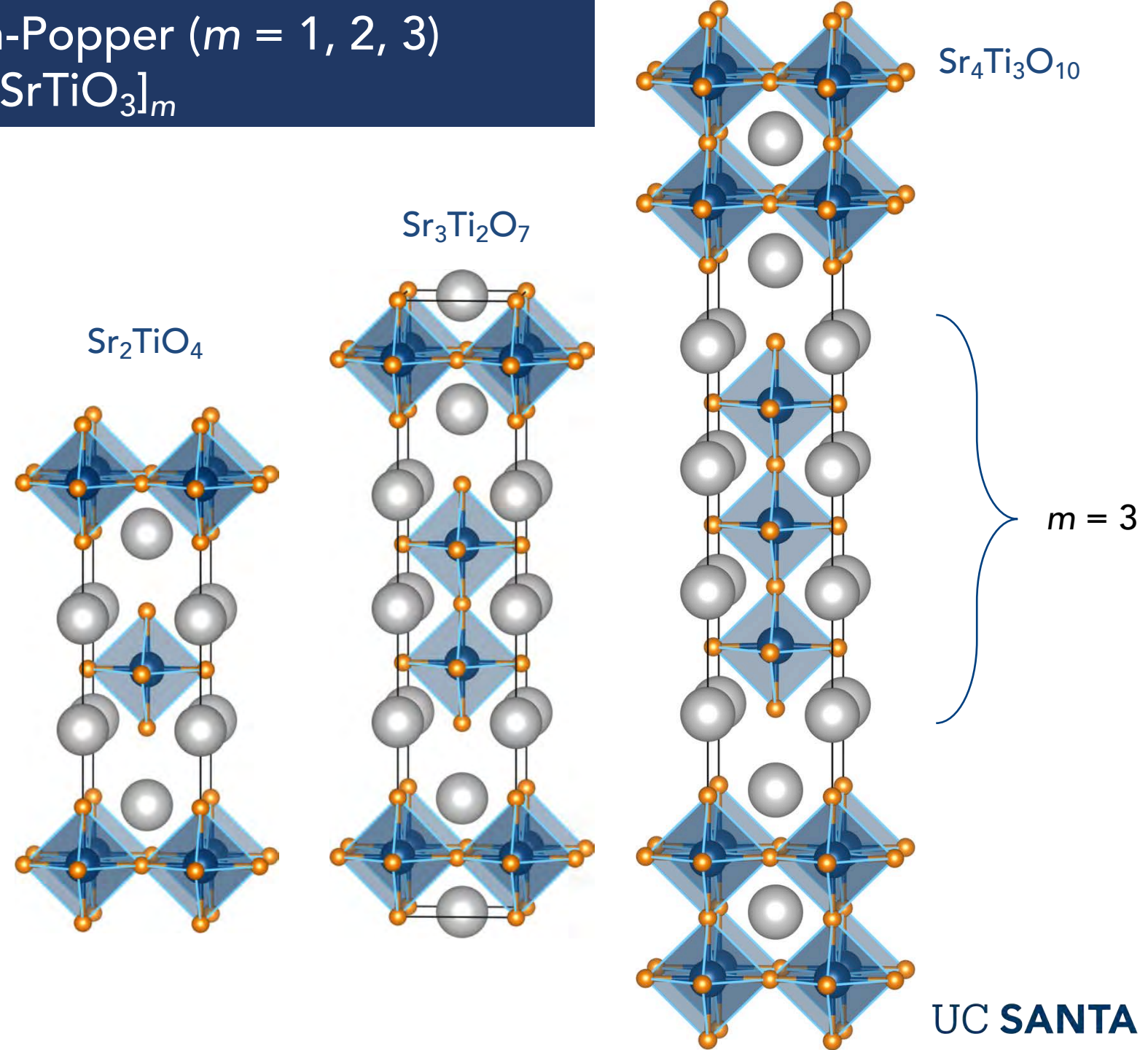
Sr_2TiO_4

$Sr_3Ti_2O_7$

$Sr_4Ti_3O_{10}$

m = 3

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(a) PbI_2 $P\bar{3}m1$
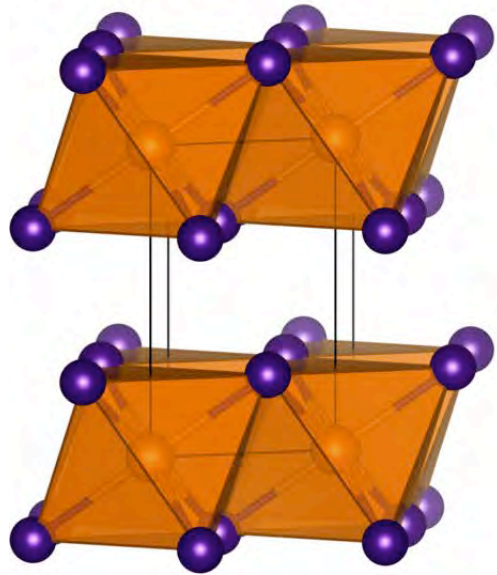
(b) δ-$APbI_3$ $Pnma$
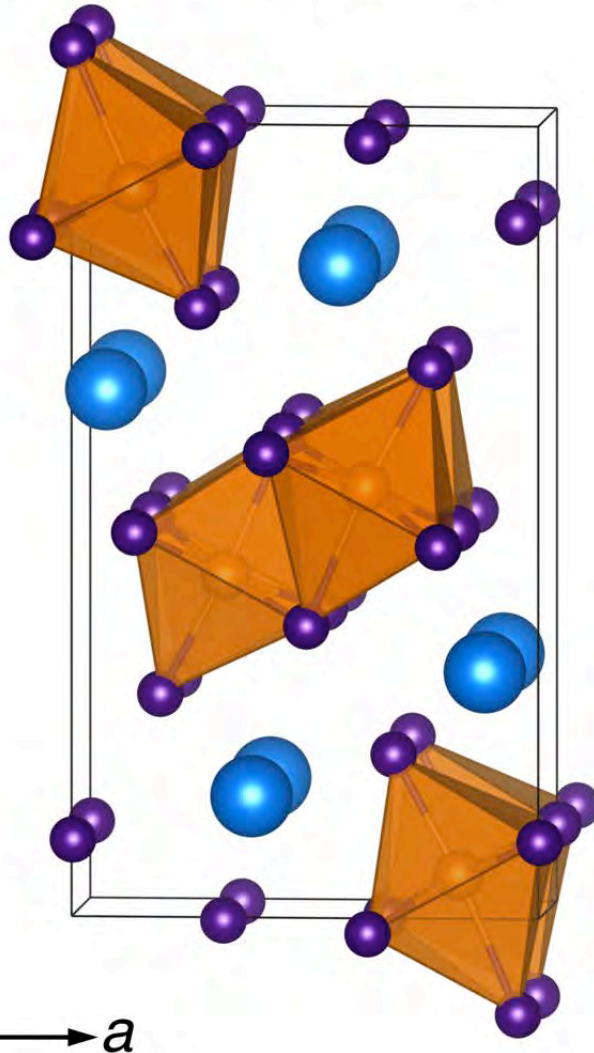
(c) α-$APbI_3$ $Pm\bar{3}m$

All structures to scale.

Labeling using LaTeXiT and PowerPoint.

Brgoch, Lehner, Chabinyc, Seshadri,
J. Phys. Chem. C **118** (2014) 27721–27727.

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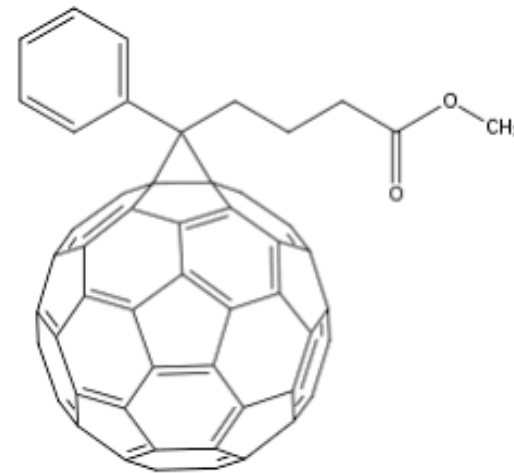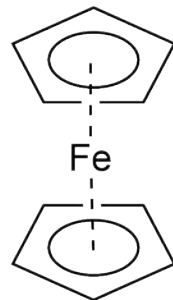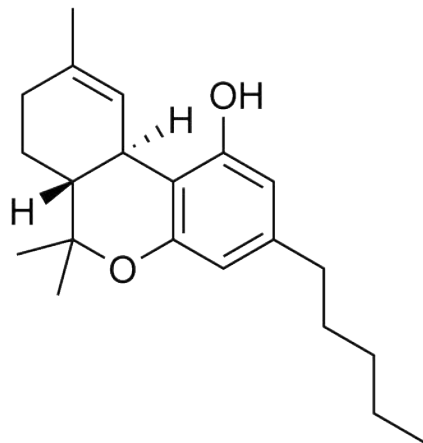
A not-so-nice PCBM from *wikipedia*
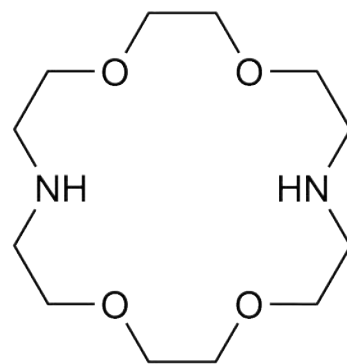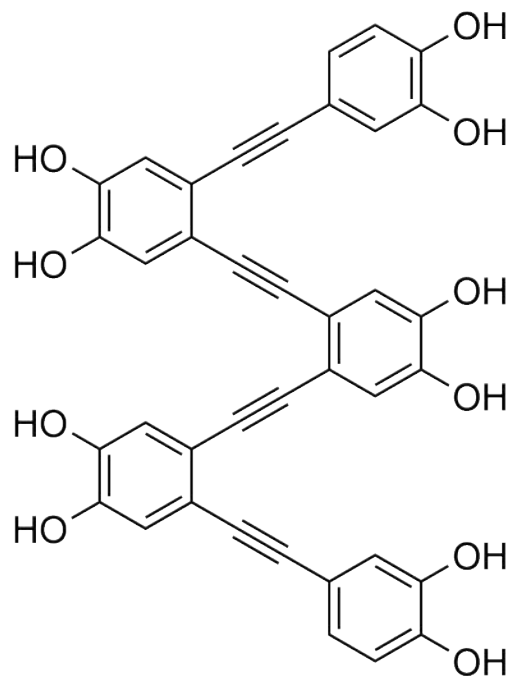
Thanks to Molleigh Preefer

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Anatomy of a reference: The goal is to be complete and consistent !

initials separated by space

", and" except for two-author papers

"," at end authors, not " ."

article title in sentence case

1. Q. Lu, E. Danner, J. H. Waite, J. N. Israelachvili, H. Zeng, and D. S. Hwang, Adhesion of mussel foot proteins to different substrate surfaces, *J. R. Soc. Interface* **10** (2013) 20120759. DOI: 10.1098/rsif.2012.0759

"," at end of title

journal title properly abbreviated,* and in italics

volume number in bold, year inside parentheses. No punctuation in-between

Article number or journal first and last pages. For the latter, separate by – (not -). End with period. Do not list issue number
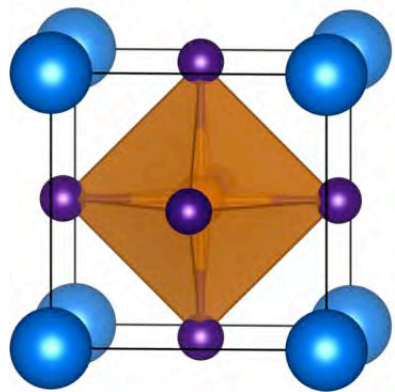
Hard space between "DOI:" and identifier (option + spacebar in Mac). No period at end

*Journal abbreviations, see: http://cassi.cas.org/search.jsp

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Some typesetting etiquette for Word and PowerPoint

- The minus sign: – not -
- Multiply: × not x
- Approximately: ≈, not ~ and certainly not ˜
- Proper chemical nomenclature: never H2O
- Spaces after units: 300 K, never 300K.
- Ranges written 300 K to 2 K, never 300 - 2 K
- Variables are always in *italics*: T = 300 K
- $A_{1-x}B_x$
- $CsBBr_3$ *vs.* $CsBBr_3$

Still and video photography

Dr. Jason Grebenkemper and Dr. Joya Cooley
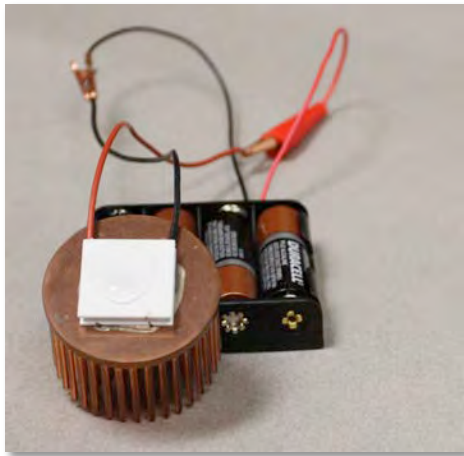
- Use a real camera, with a fixed focal-length lens allowing a wide aperture

- Keep the camera still: In the case of videos, the camera does not need to move; allow the action to.

- Remove any clutter in the background

- Learn about depth of field, and even possibly, *bokeh*

- Aim for even lighting

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For example, books by:

Jean-Luc Doumont
Felice Frankel
Edward Tufte

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Production notes:

Most graphs were produced using XMGRACE (http://plasma-gate.weizmann.ac.il/Grace/; free software that runs under Linux and Mac).

Vector graphics (eps files) were exported from XMGRACE and opened with GIMP (http://www.gimp.org/; also freely available for all platforms) at 600 dpi with strong text antialiasing, and converted into jpg or png images of appropriate quality.

QtGrace is free and works on Mac, Linux, Win

VESTA for the crystal structure depictions: http://jp-minerals.org/vesta/en/

These were imported into PowerPoint.

As a general rule, directly copying and pasting from graphing software into Word or PowerPoint is ill-advised, and creates problems associated with cross-OS (in)compatibility and missing fonts. It is always preferred to export high resolution image files.

All image widths and positions have been specified using the size and position commands in PowerPoint.

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