Preparing figures for publication and presentations

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Photograph courtesy Tony Mastres

Philosophy

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.*

Thoughts on ~~fonts~~ typefaces

Frutiger

Aa Ee Rr
Aa Ee Rr

Accès aux avions

abcdefghijklm
nopqrstuvwxyz
0123456789

Minion

Aa Qq Rr
Aa Qq Rr

self-sufficiency

abcdefghijklm
nopqrstuvwxyz
0123456789

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.

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 !

Comic Sans

Aa Bb Cc

Aa Bb Cc

Kidz Korner

abcdefghijklm
nopqrstuvwxyz
0123456789

childish, infantile, naive, PUERILE, juvenile, frivolous, shallow, silly, EMPTY-HEADED, immature, fatuous, BAD TASTE

http://www.bbc.co.uk/news/magazine-11582548
Thanks to Jamie Neilson for the link.

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If you do want to use a less formal font:

Try Andika (www.sil.org)

Andika
Unicode-compliant font

Hamburgefonstiv
smashing typography
123456789!"§$%&/()

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ClearType: Microsoft's gift

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**
Bildersturm
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

Consolas
Aa Kk Jj
Aa Kk Jj
Registration
abcdefghijklm
nopqrstuvwxyz
0123456789

A good plot

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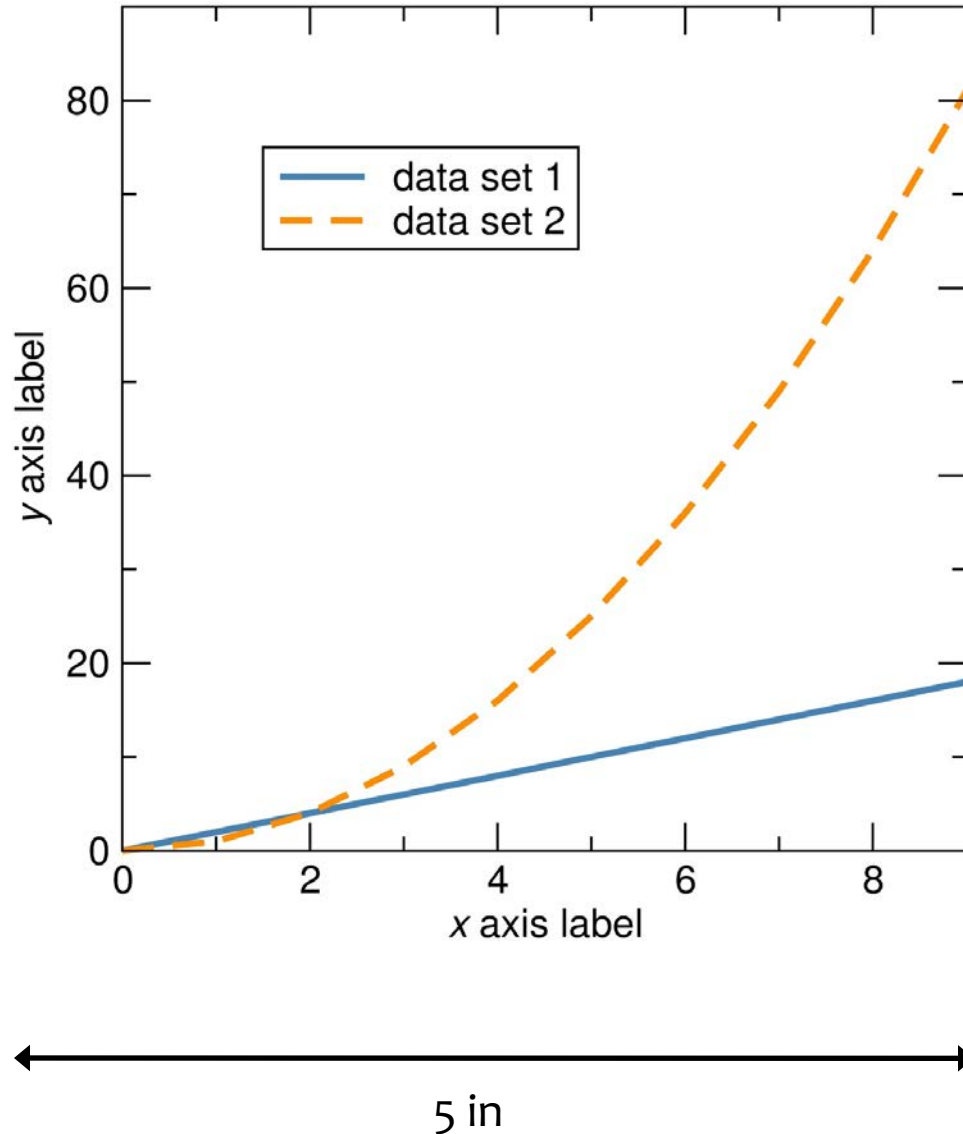
Square plots are æsthetically appealing, convey information, and shrink gracefully. It is easy to use them in theses, single column journal articles, and talks.

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.

3 in
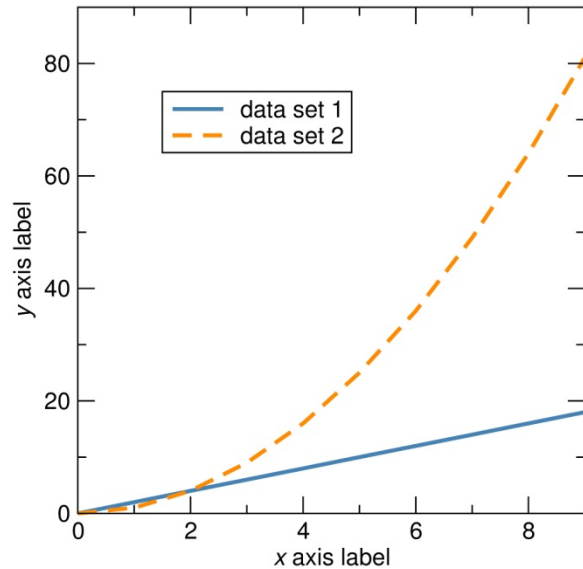
The square plot reduces in size in a manner that retains legibility. It is important to create the original plot in a size that is close to what will appear in final use.
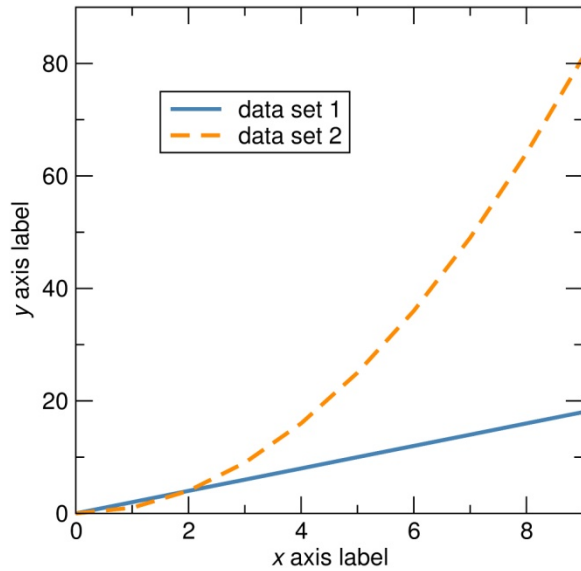
In particular, one should pay attention to the ratio of the size of the font used – in tick and axes labels, and in legends – to the height and width of the plot as it appears in the final document or presentation.

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

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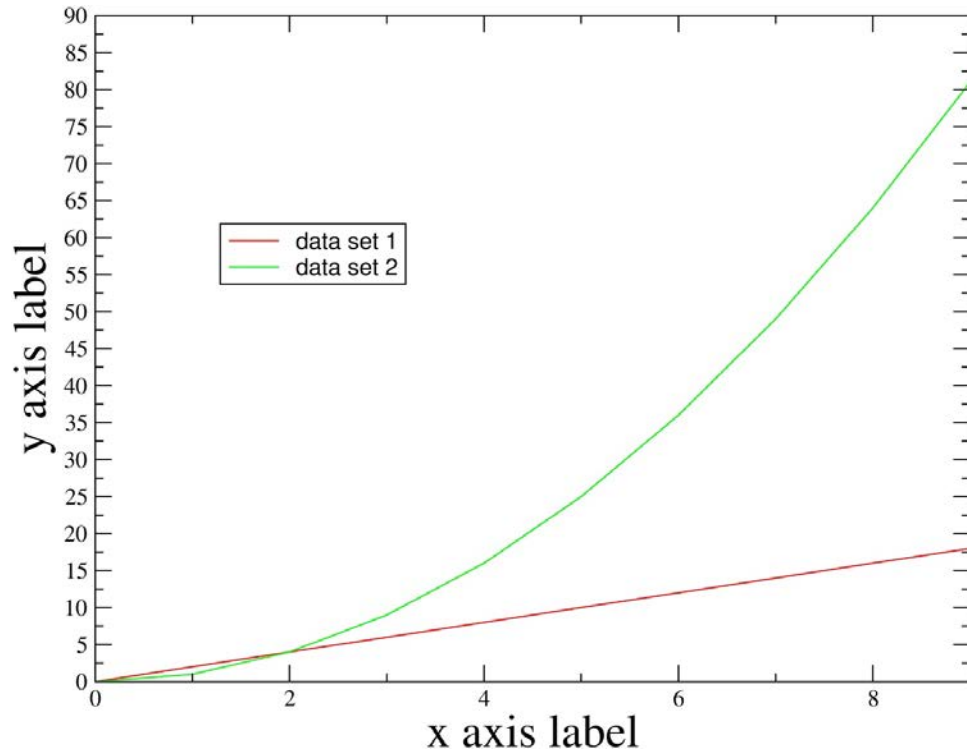
Rectangular plots (the default with some graphing programs) are less aesthetically pleasing, and the horizontal and vertical axes are imbalanced.

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.

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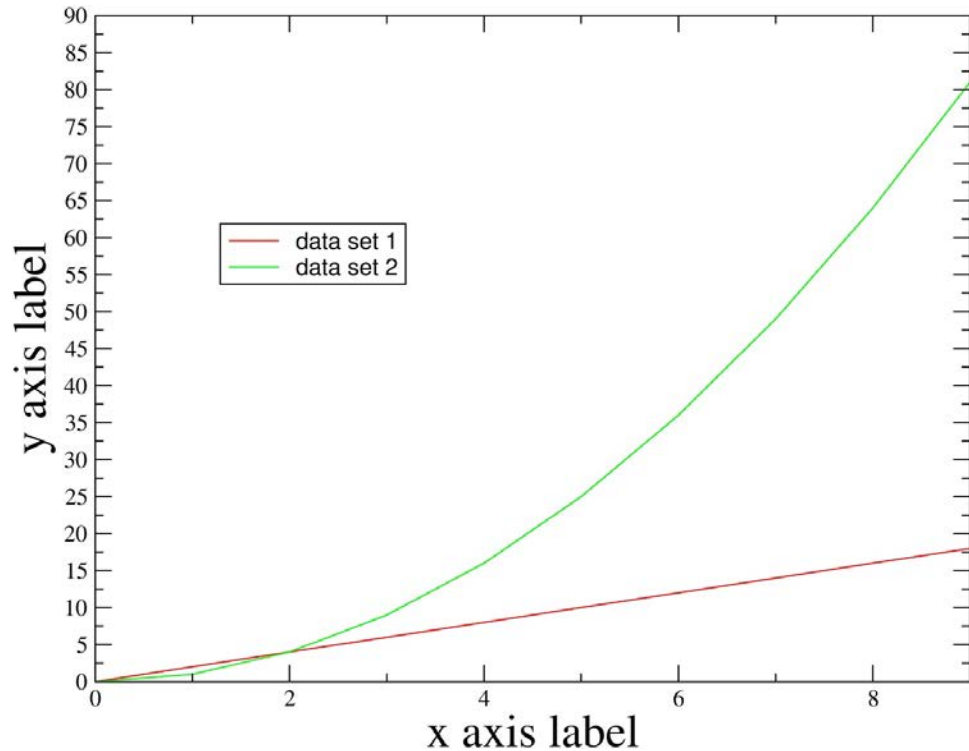
Problems (contd.):

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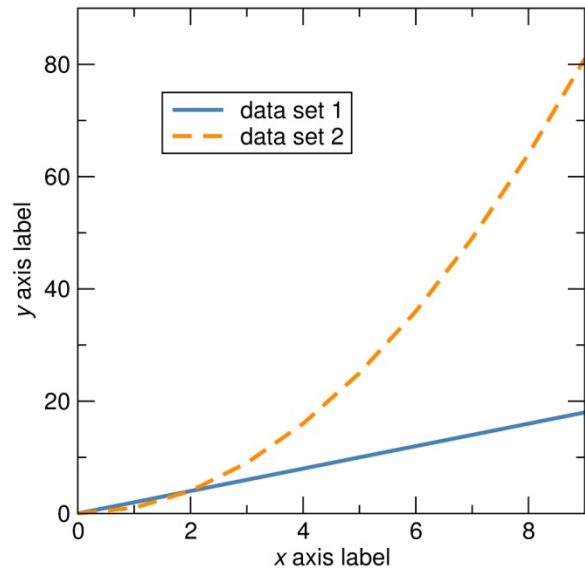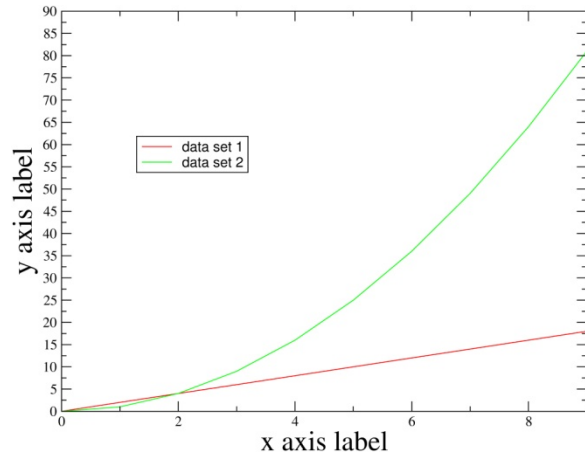
The vertical axis has too many tick labels and tick marks. The vertical and horizontal axes are imbalanced in that sense.

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

5 in

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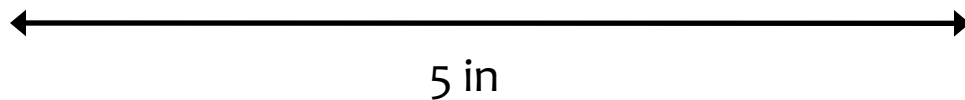
This plot absolutely does not shrink gracefully.

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.

3 in

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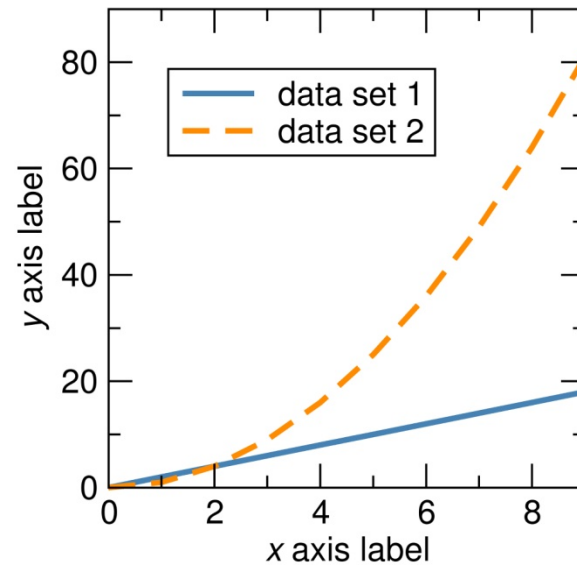
Insets (how to make them)
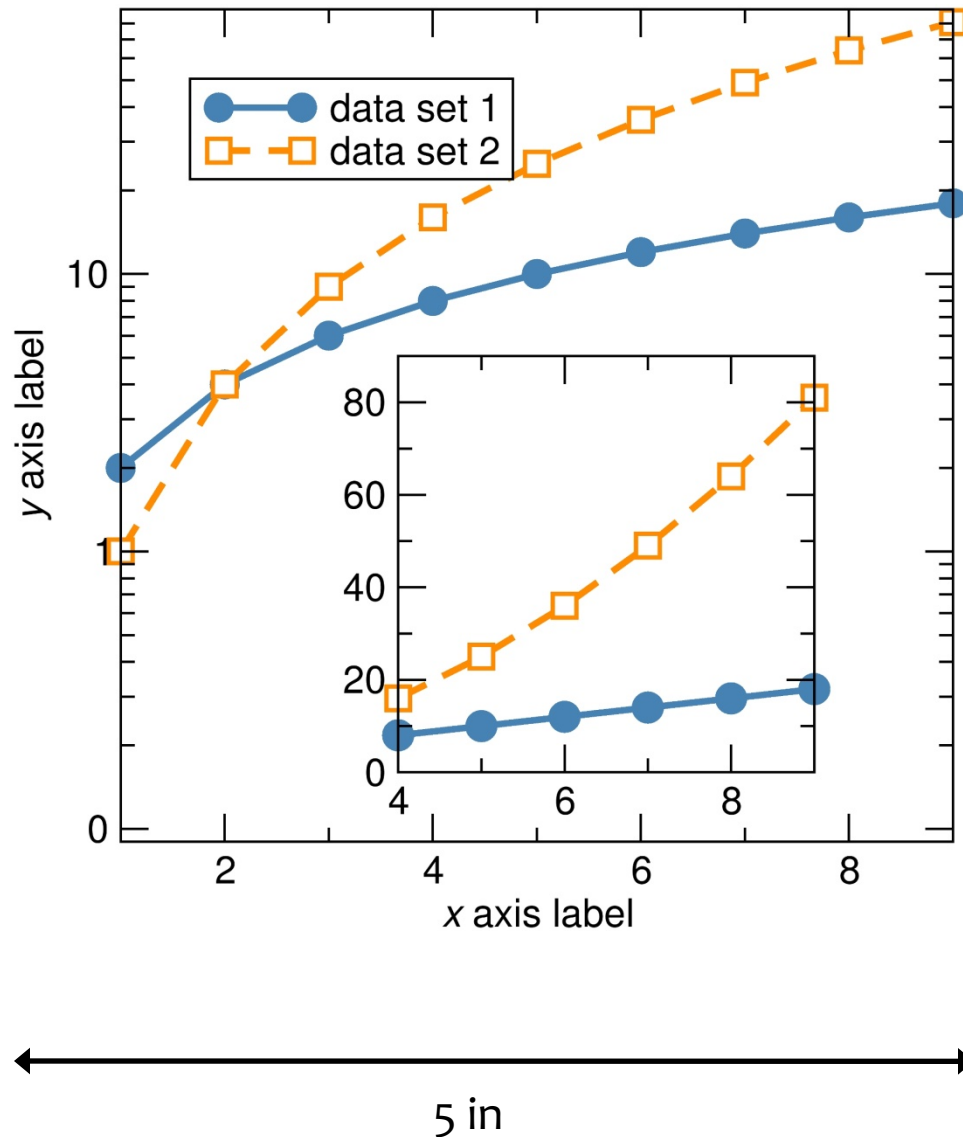
A common problem with insets is that they are frequently shrunk in every sense … symbols, text etc.

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.

Insets (alternatives to them)
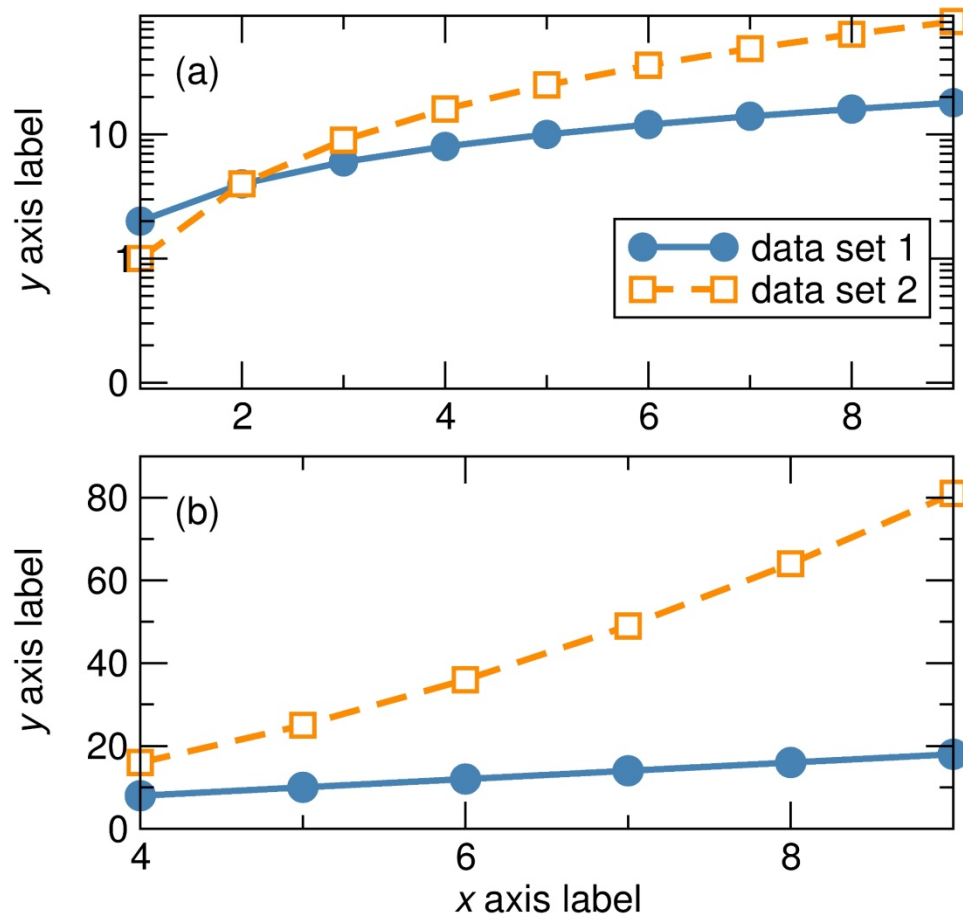
However, insets frequently do not do justice to data.

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).
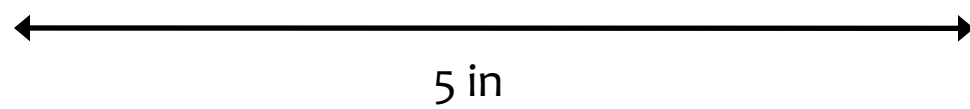
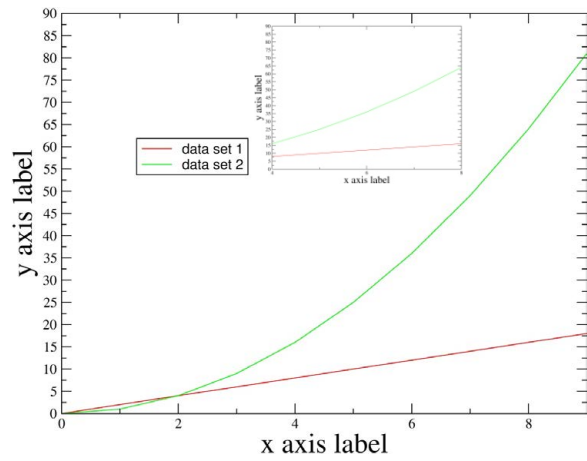Also note that the labels on the vertical axes are aligned, as are "(a)" and "(b)"
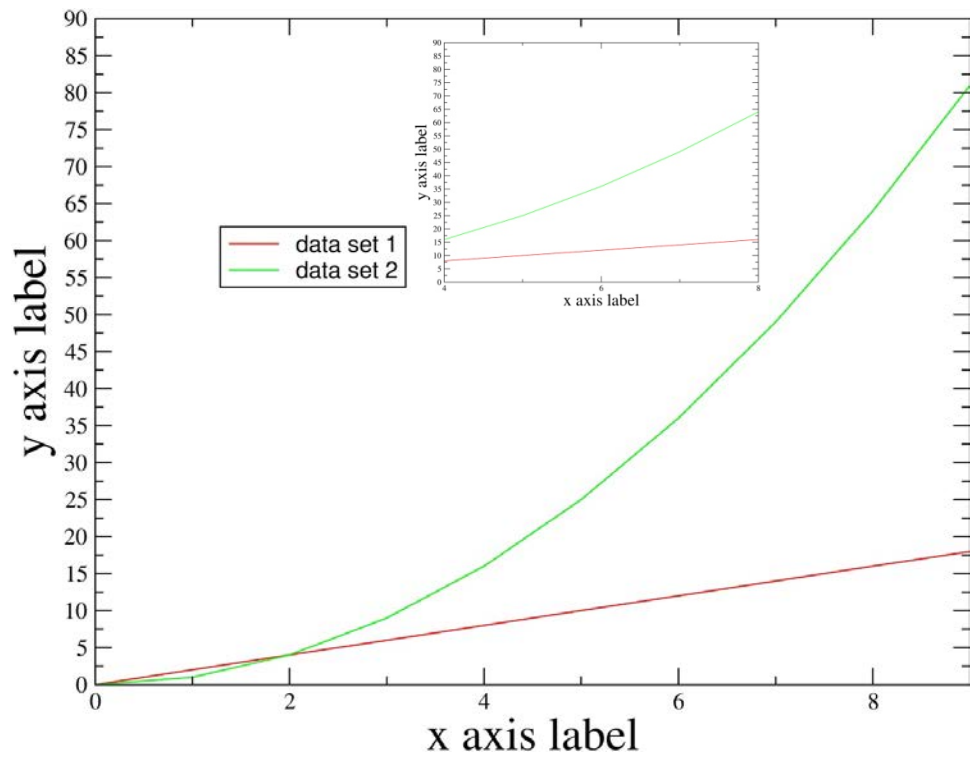
Perhaps an extreme example, but unfortunately not rare.

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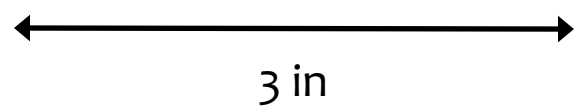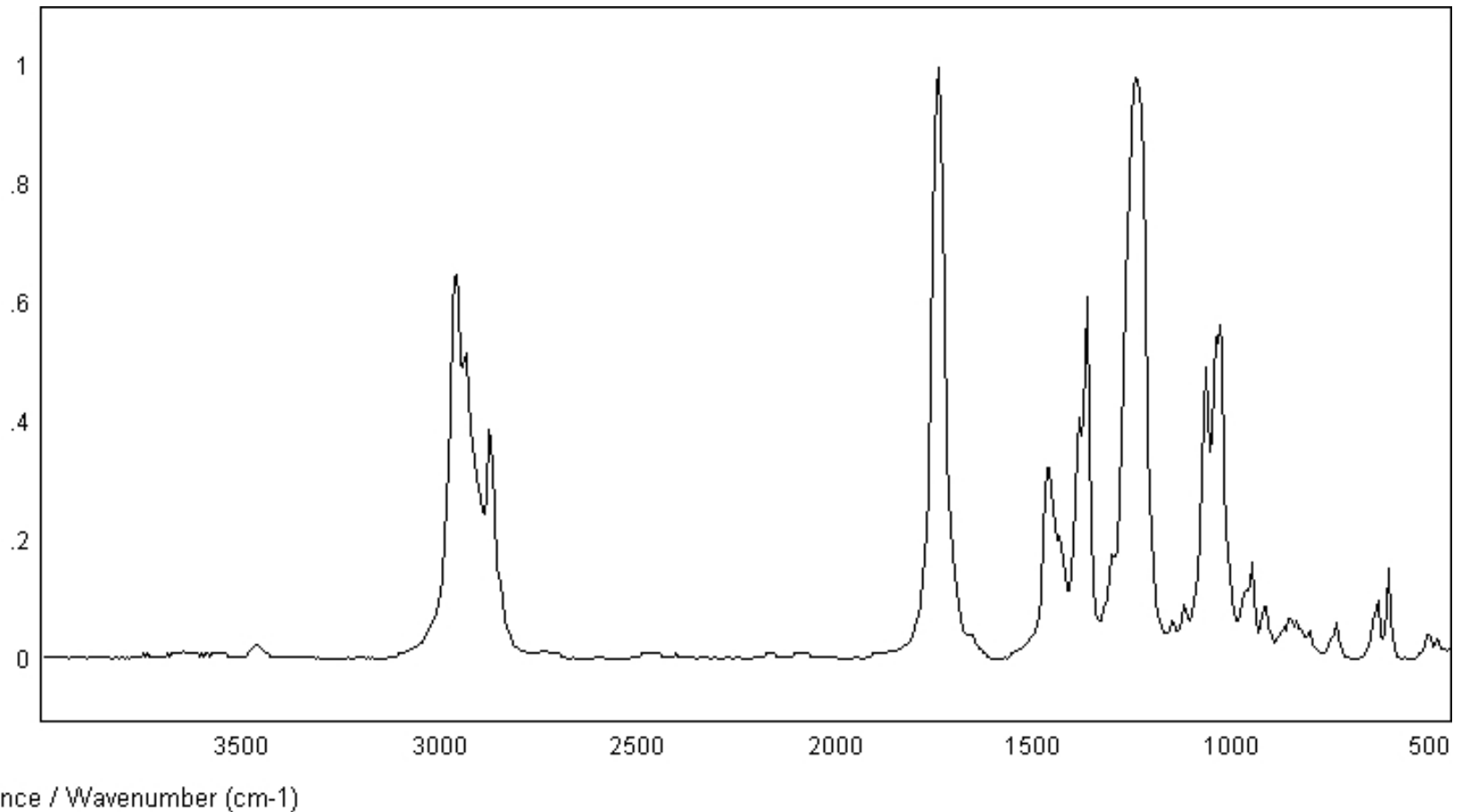
And just when you thought it couldn't get worse !

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

3 in

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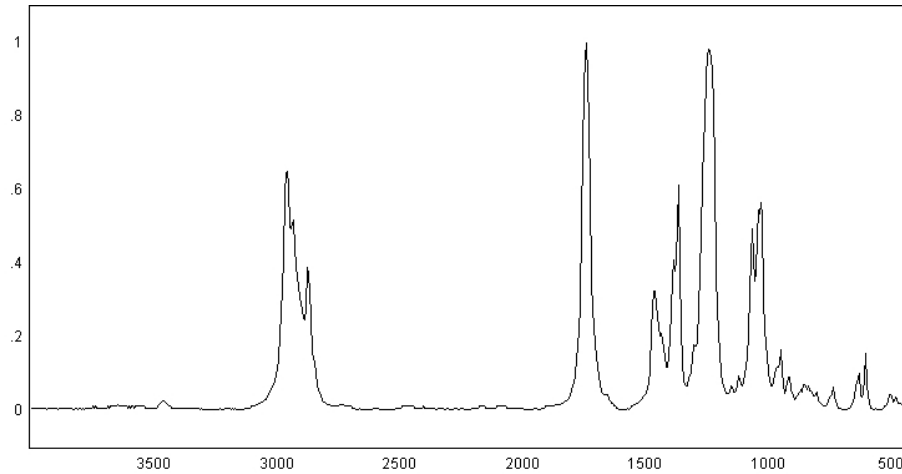science & engineering

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 ...
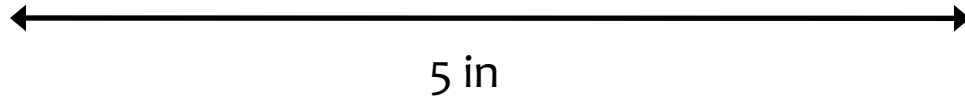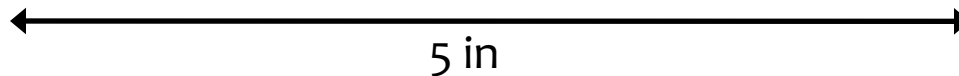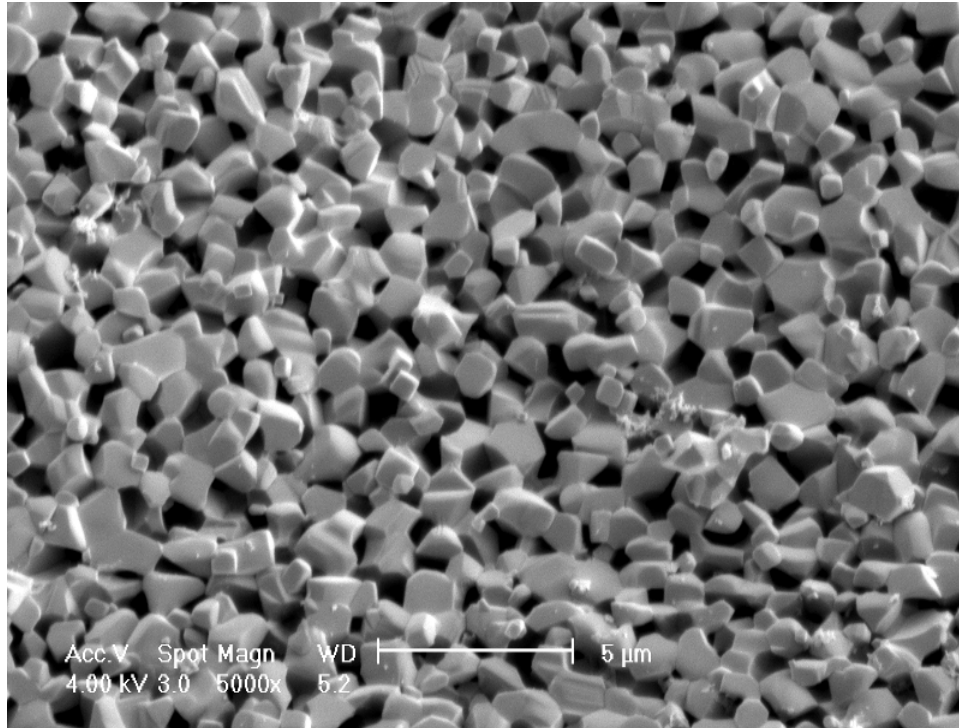
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Absorbance / Wavenumber (cm-1)

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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Microscopy and images

5 µm

5 in
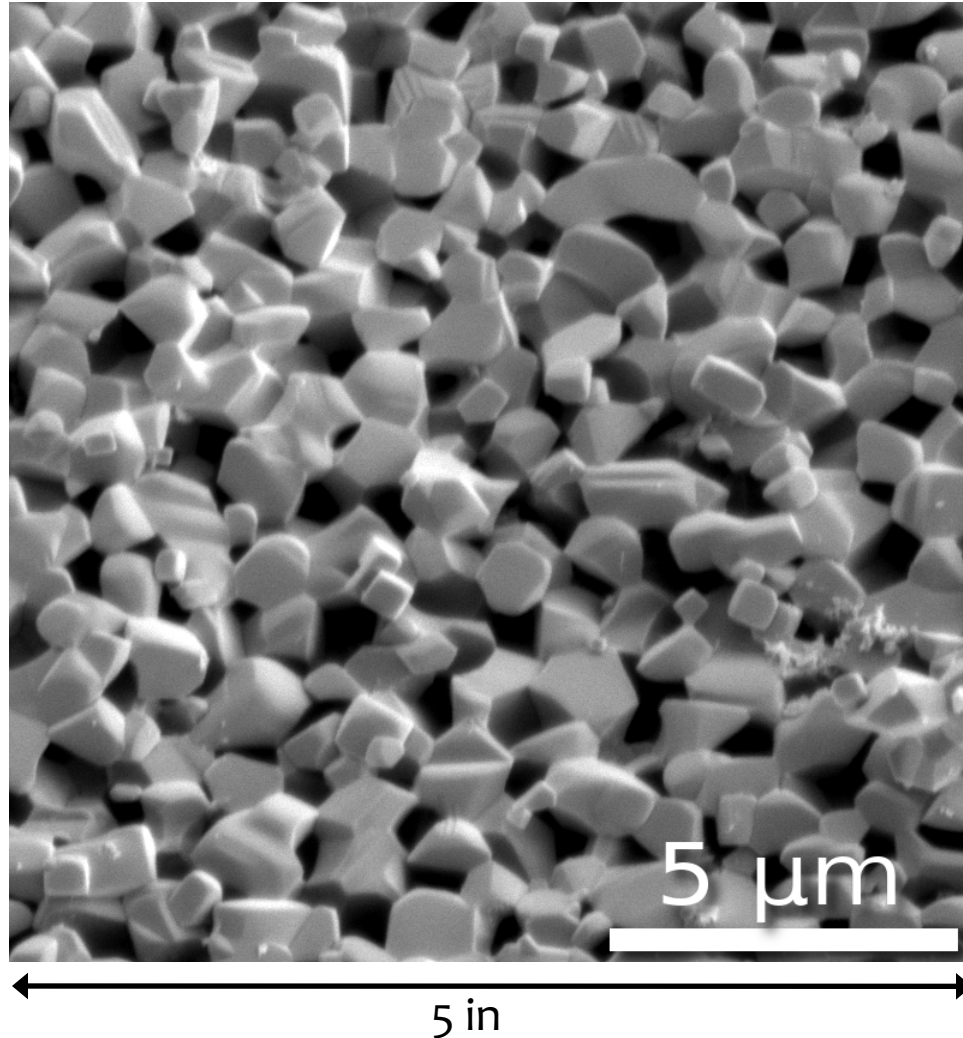
With a little effort using GIMP (www.gimp.org), a much more usable image can be created. The (personal) preference is for square images. Shadowing enhances text legibility here.
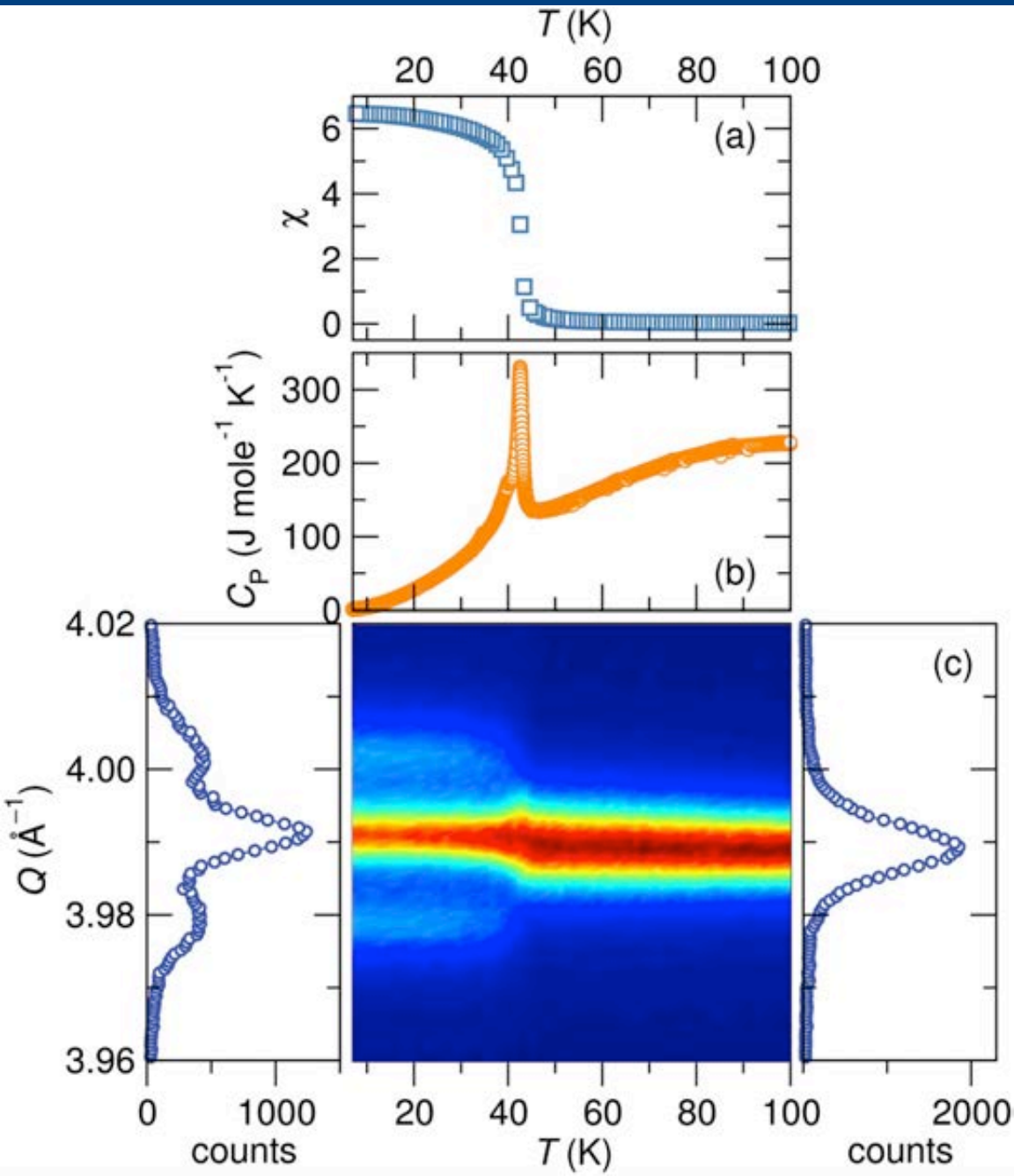
Plots and images are annotated with ease, and the preparation of schematic images is convenient within PowerPoint.

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.
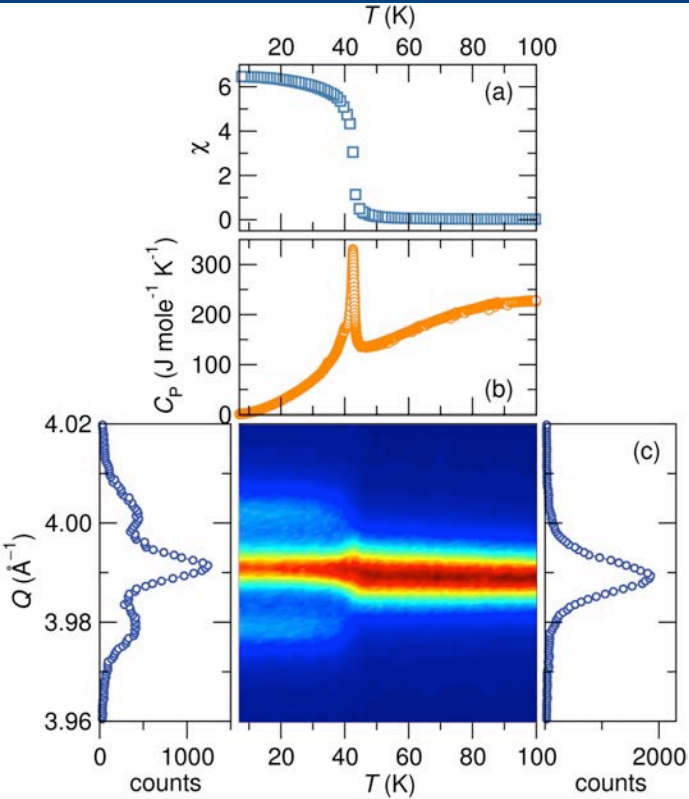
Kemei, Harada, Seshadri, Suchomel, *Phys. Rev. B* **90** (2014) 064418(1–8).

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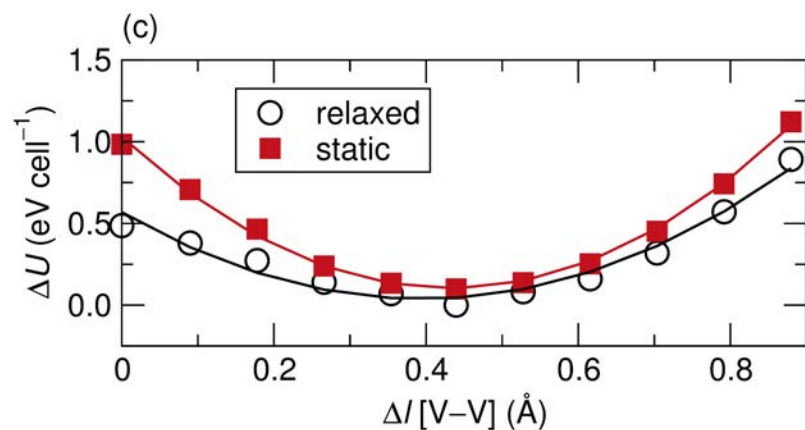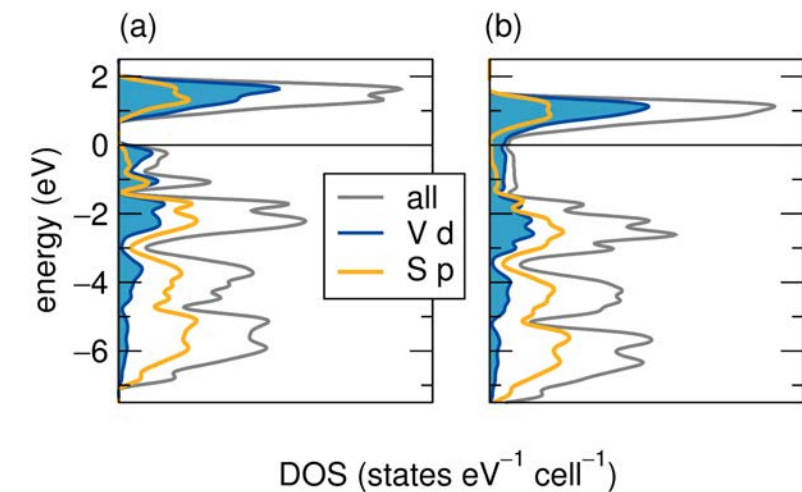
Yes, it shrinks gracefully
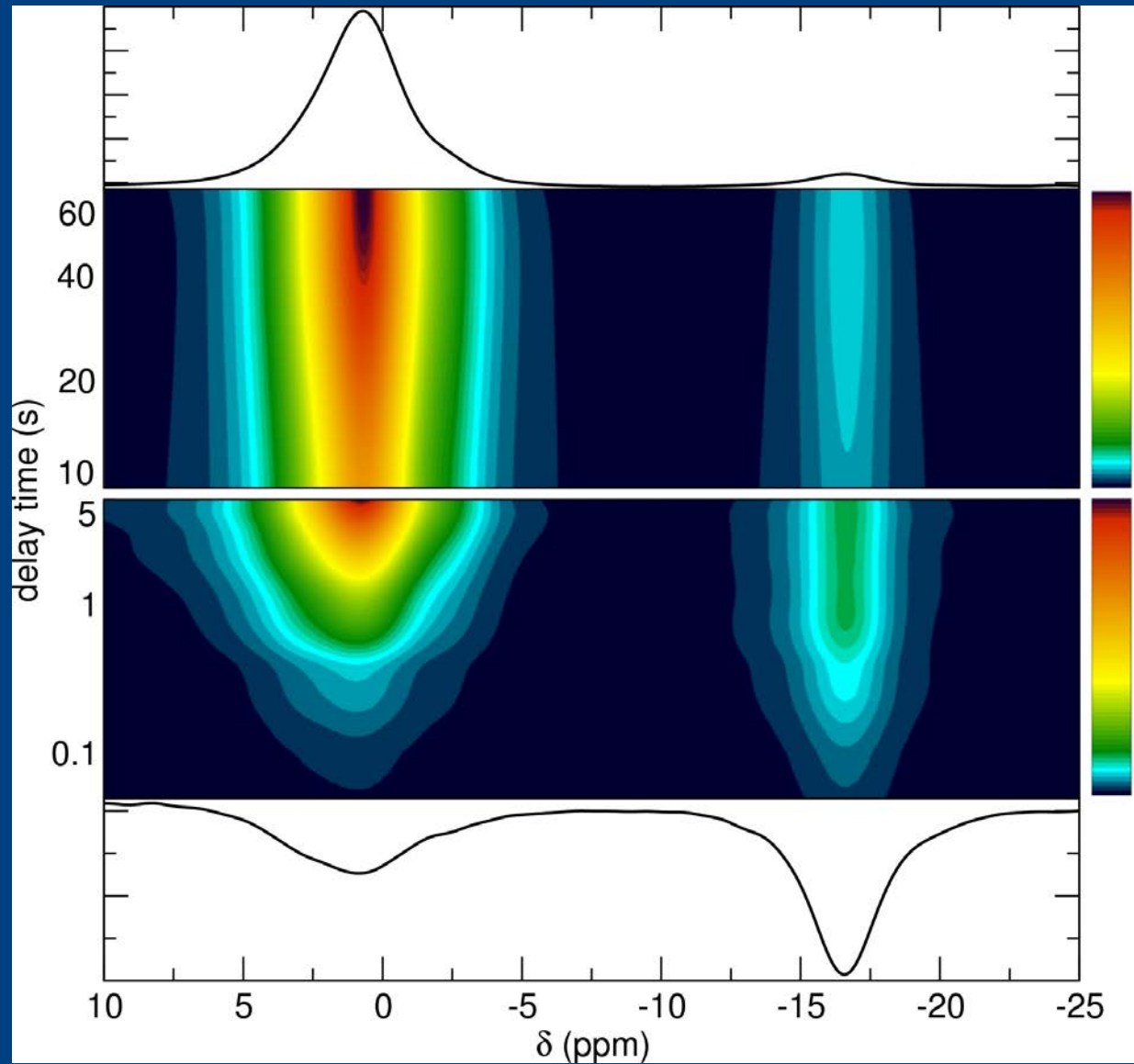
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Table of contents graphic
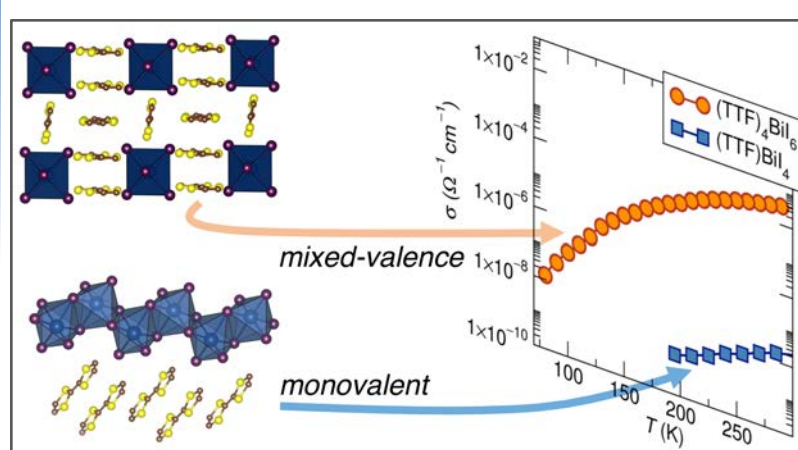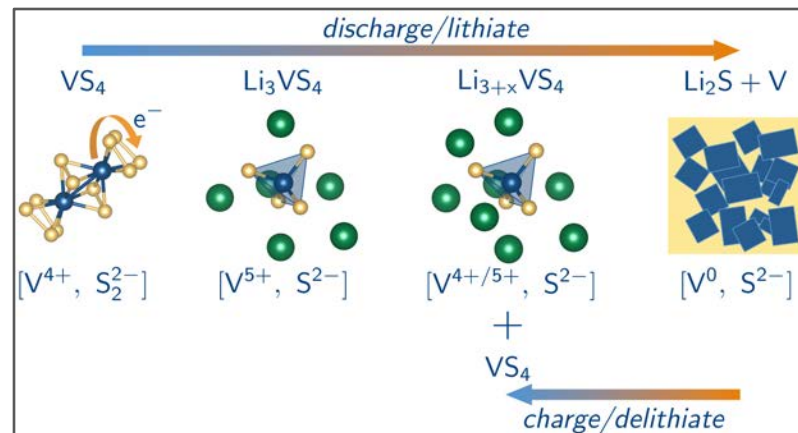
Britto, Leskes, Hua, Hébert, Shin, Clarke, Borkiewicz, Chapman, Seshadri, Cho, Grey, *J. Am. Chem. Soc.* **137** (2015) 8499–8508 (above, above right).

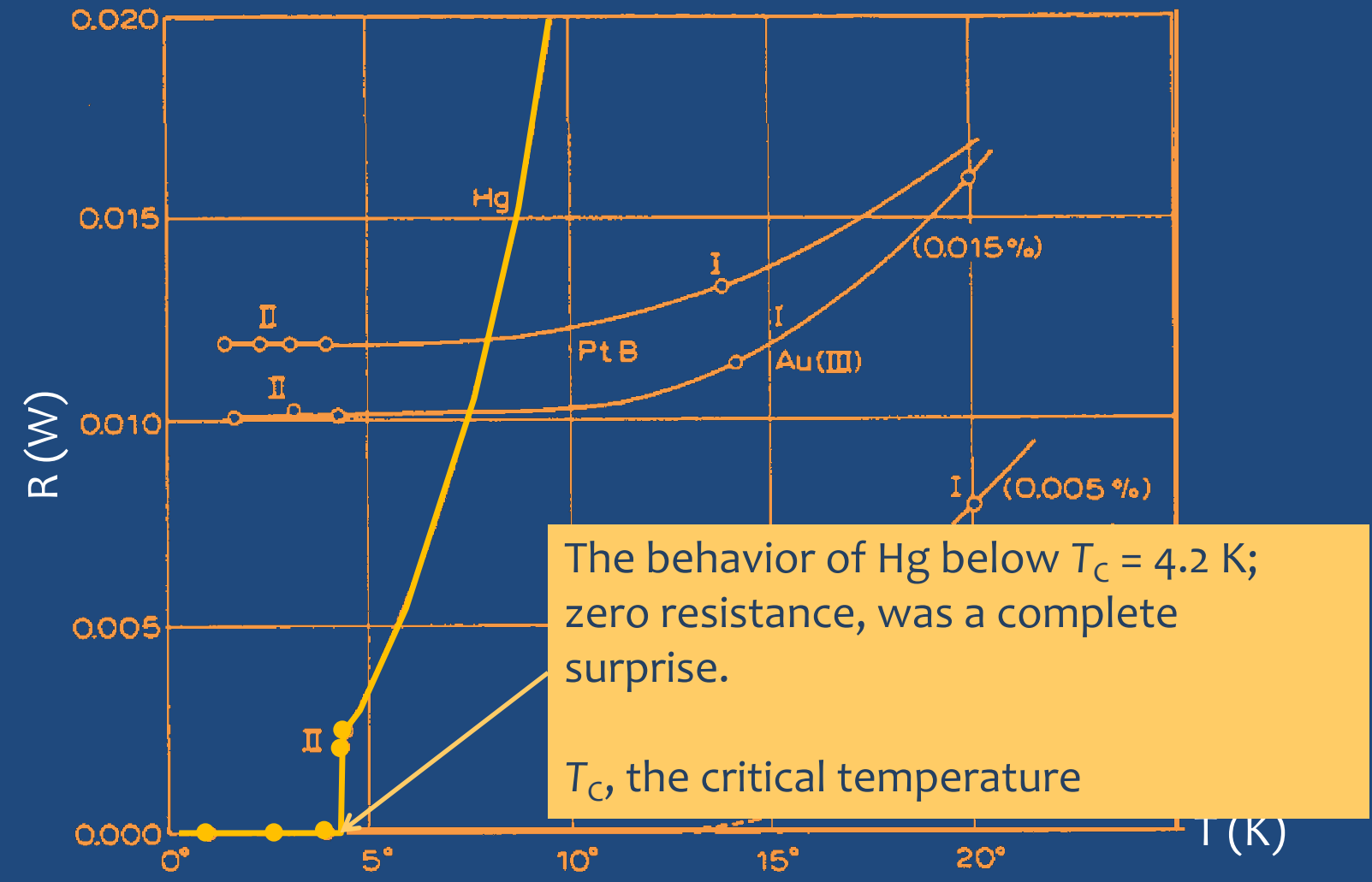Evans, Labram, Smock, Wu, Chabinyc, Seshadri, Wudl, *Inorg. Chem.* **56** (2017) 395–401.

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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.

Examples of acceptable figures

(a)

100 nm

(b)

hH

fH

50 nm

(c)

Samples and image assembly by Jason Douglas.

Microscopy by Dr. Nisha Verma

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

$Sr_4Ti_3O_{10}$

$Sr_3Ti_2O_7$

Sr_2TiO_4

$m = 3$

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(a) PbI_2 $P\bar{3}m1$

(b) δ-$APbI_3$ $Pnma$

(c) α-$APbI_3$ $Pm\bar{3}m$

c

a
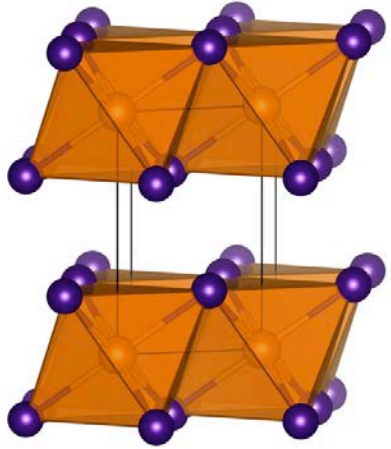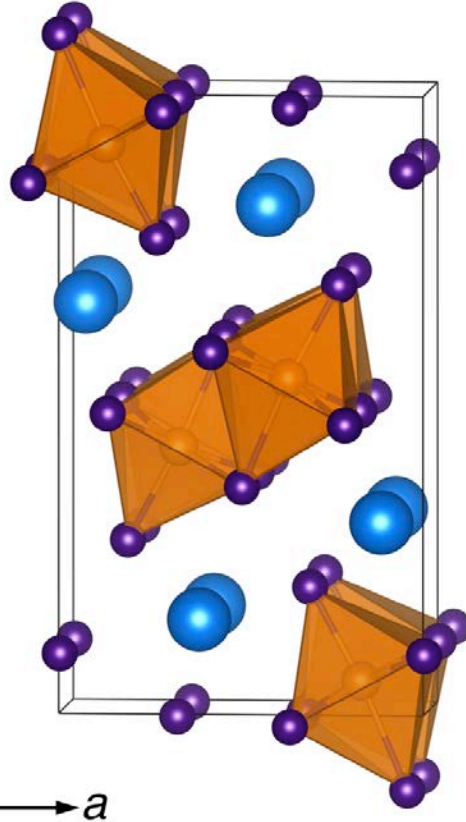
All structures to scale.

Labeling using LaTeXiT and PowerPoint.

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

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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

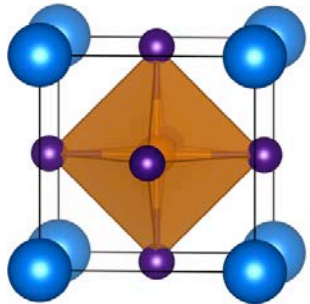Article number or journal first and last pages. For the latter, separate by – (not -). End with period. Do not list issue number

Hard space between "DOI:" and identifier (option + spacebar in Mac). No period at end

journal title properly abbreviated,* and in italics

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

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

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Still and video photography

Dr. Jason Grebenkemper and Dr. Joya Cooley

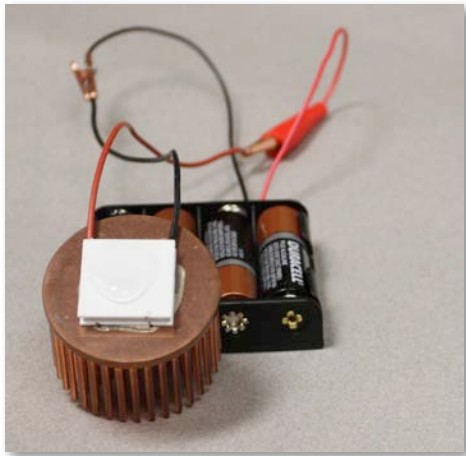- Use a real camera, with a fixed focal-length lens allowing a wide aperture

- 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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This document

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.

thank you