

# Figures

B. DeMarco and J. Shelton  
PHYS496 Fall 2018

## Figures are part of the narrative

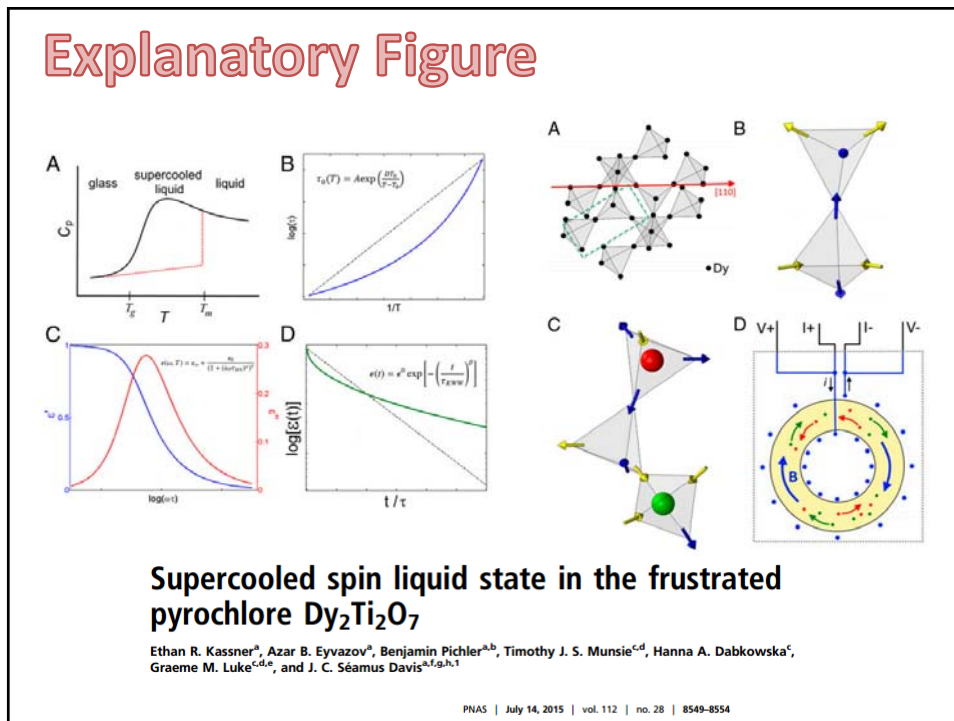
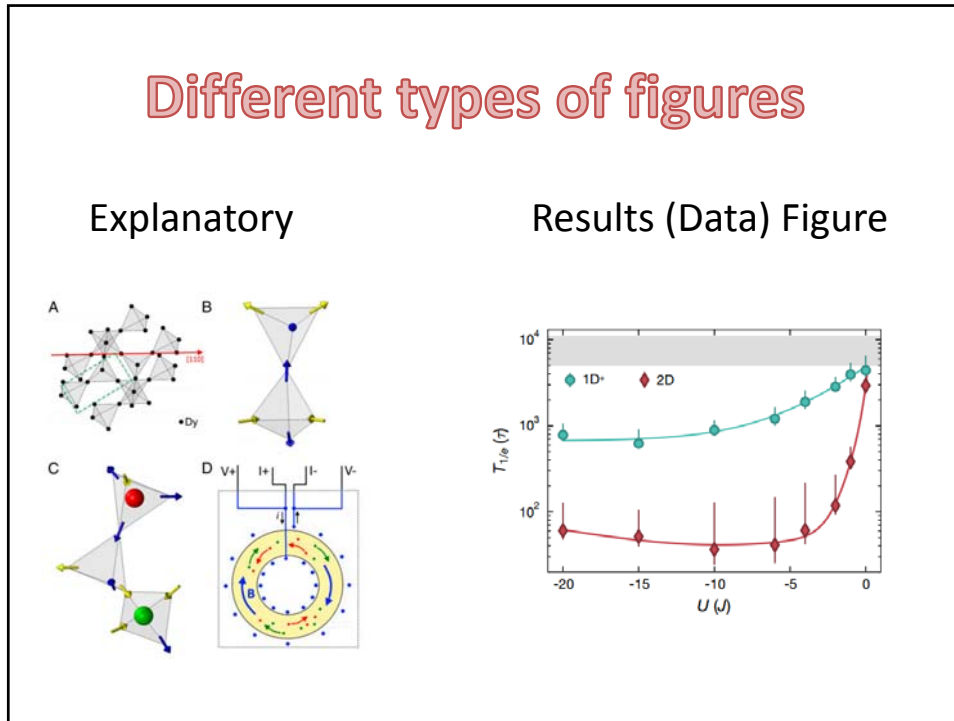


...and made him king of  
all wild things.



And now, cried Max, let  
the wild rumpus start!

- Each figure should have a single point (or closely related points)
- Caption (in a paper) should explain every part of figure



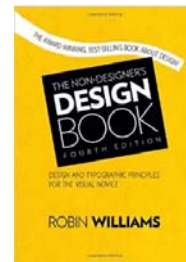
## Explanatory Figure

- Gives overview, summary, or big picture
- Often schematic
- Not data or results
- Important to (over-) simplify without introducing errors
- Important to be visually attractive

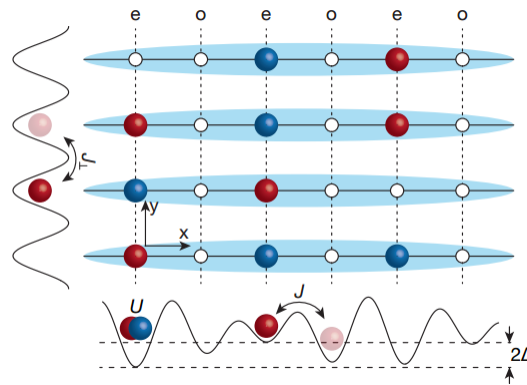
A great resource:

Learn a software platform:

Illustrator, CorelDraw, Powerpoint...

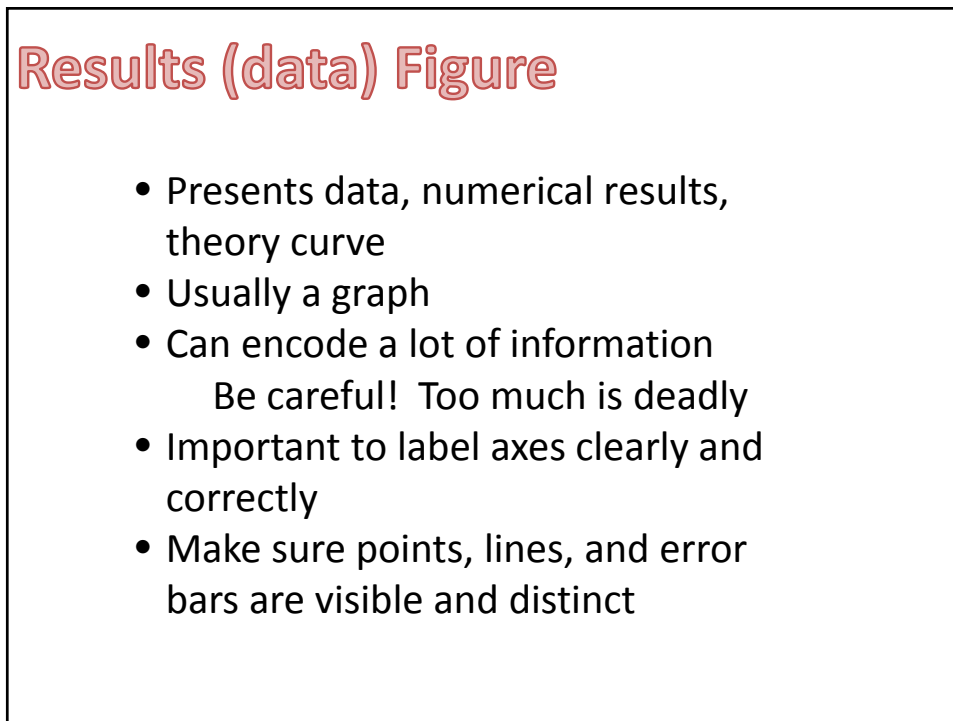
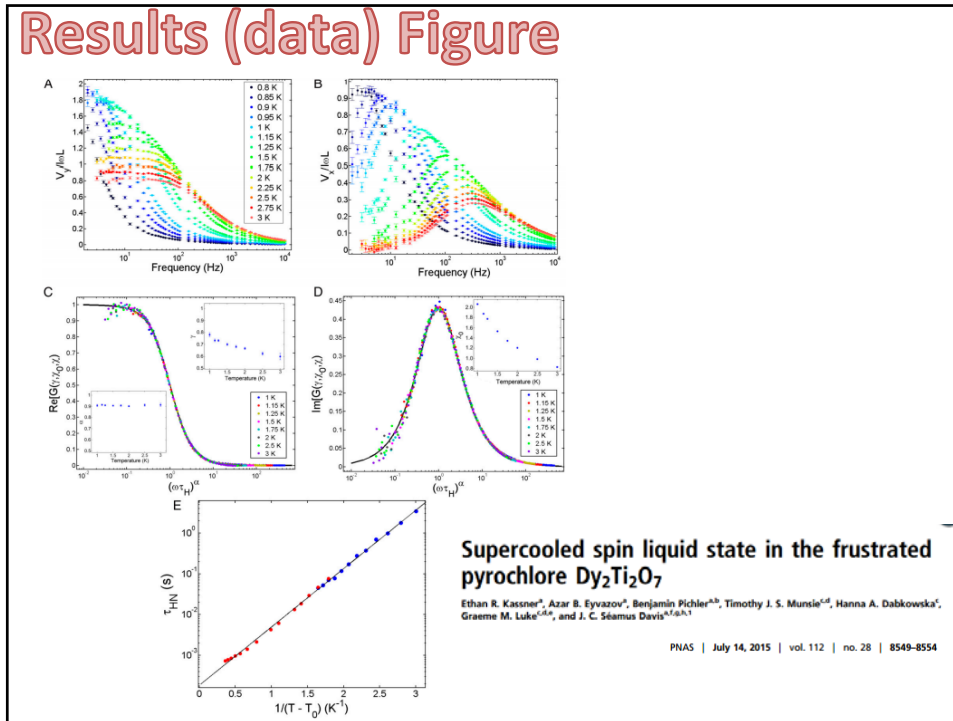


## Example: Explanatory Figure

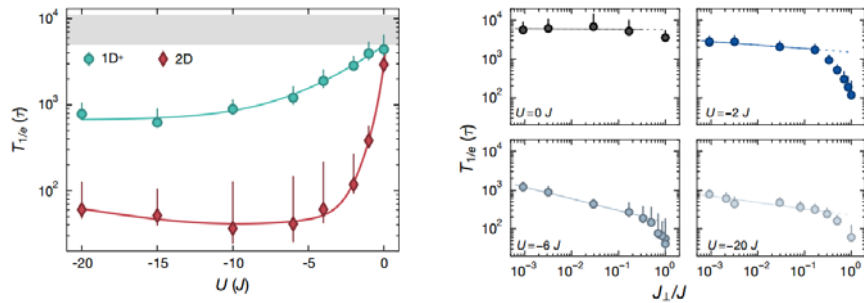


**Coupling Identical 1D Many-Body Localized Systems**

Pranjal Bordia,<sup>1,2</sup> Henrik P. Lüschen,<sup>1,2</sup> Sean S. Hodgman,<sup>1,2</sup>  
 Michael Schreiber,<sup>1,2</sup> Immanuel Bloch,<sup>1,2</sup> and Ulrich Schneider<sup>1,2,3</sup>  
 arXiv:1509.00478v1



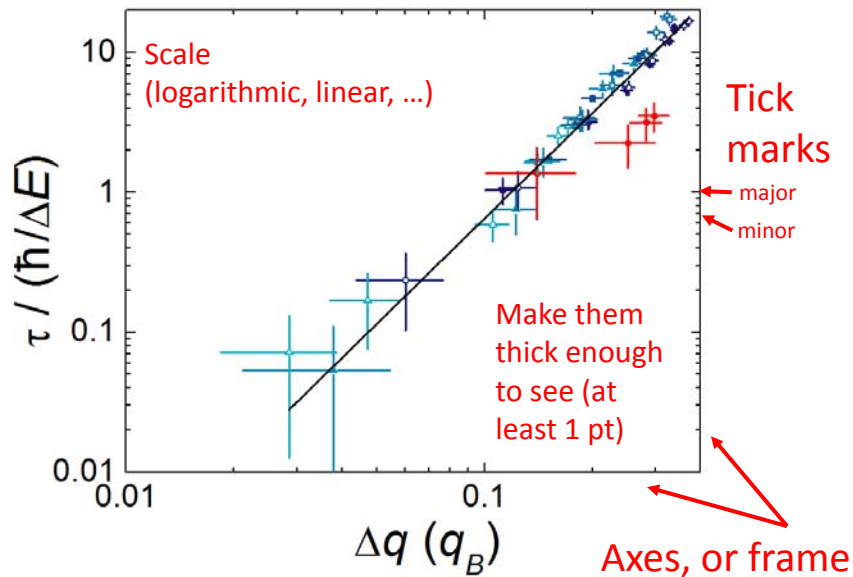
## Another example: results figure

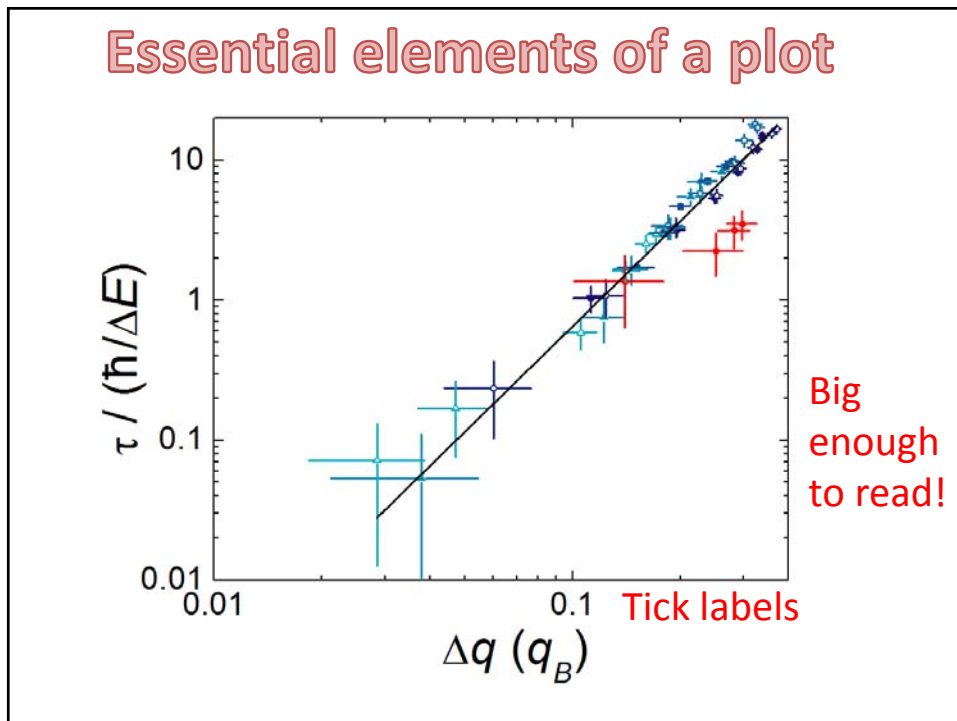
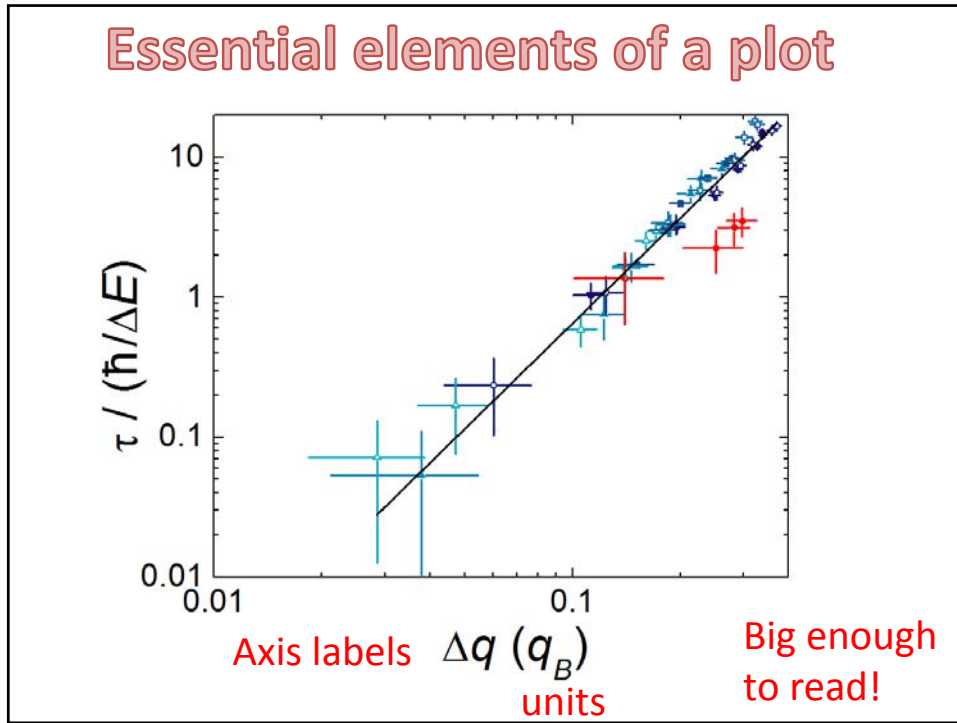


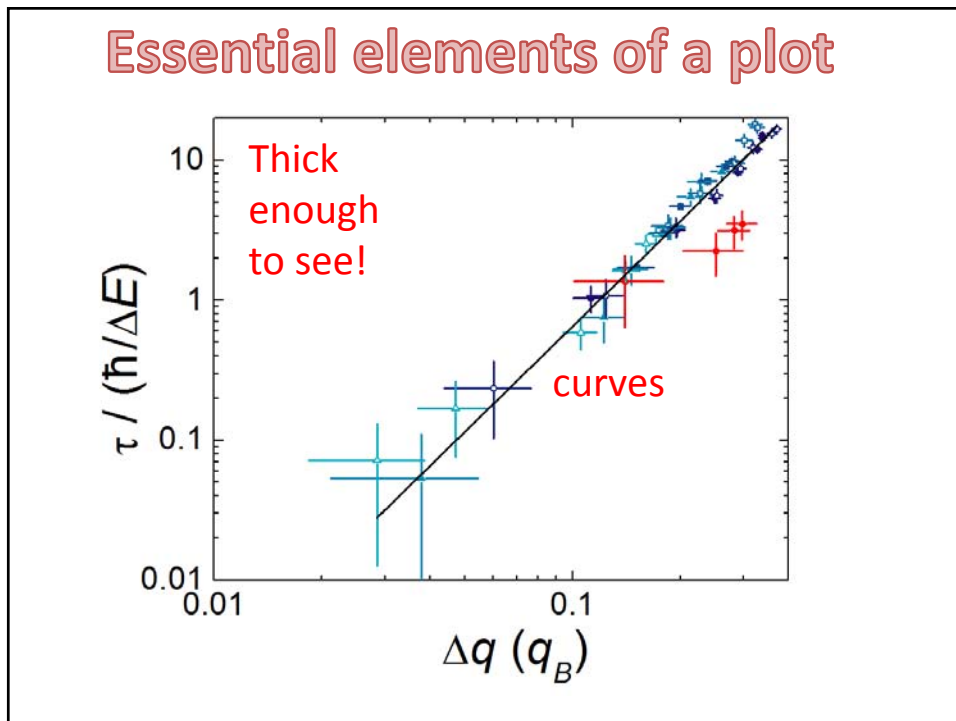
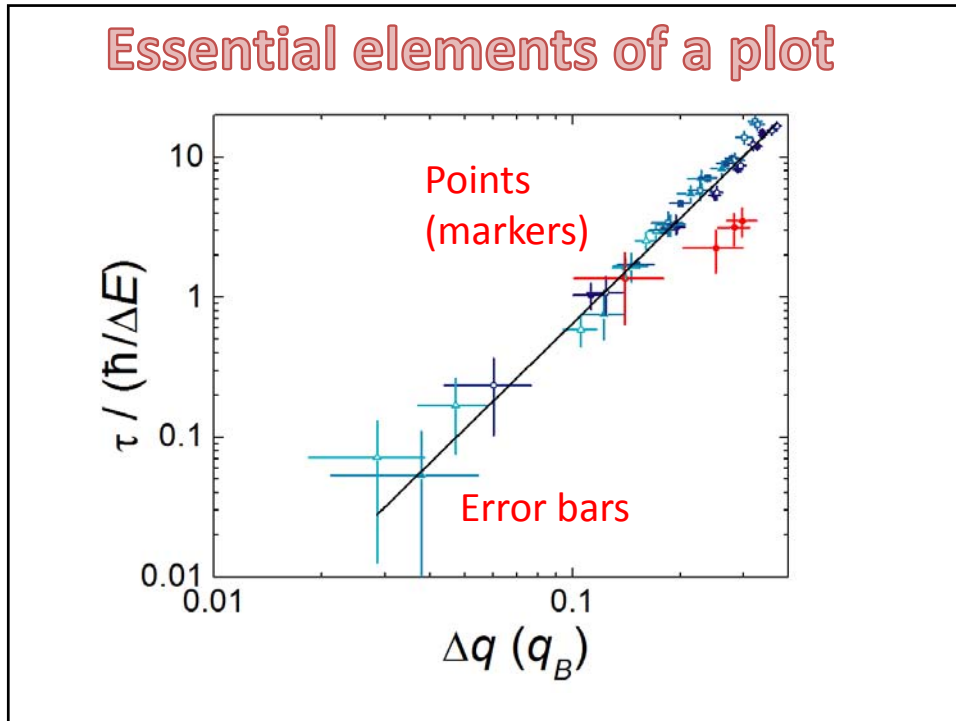
### Coupling Identical 1D Many-Body Localized Systems

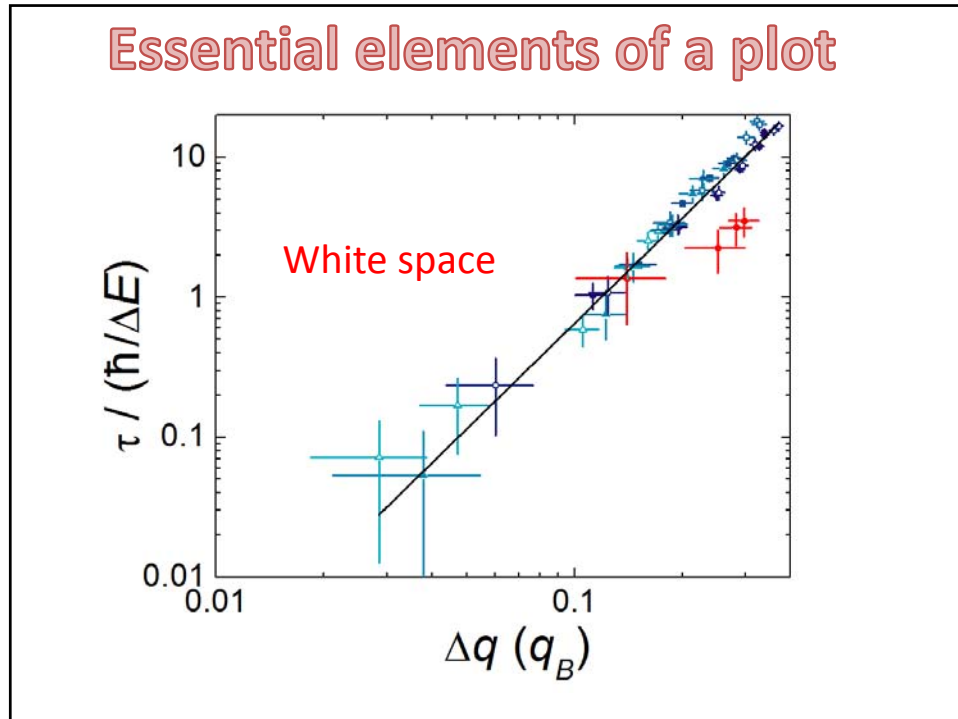
Pranjal Bordia,<sup>1,2</sup> Henrik P. Lüschen,<sup>1,2</sup> Sean S. Hodgman,<sup>1,2</sup>  
 Michael Schreiber,<sup>1,2</sup> Immanuel Bloch,<sup>1,2</sup> and Ulrich Schneider<sup>1,2,3</sup>  
 arXiv:1509.00478v1

## Essential elements of a plot







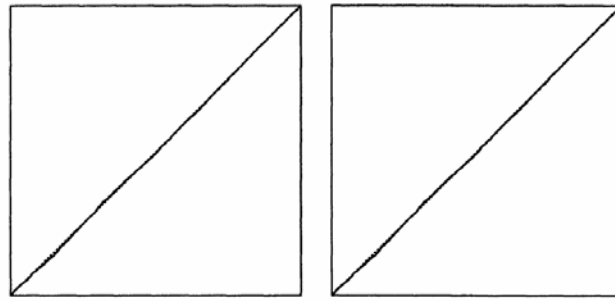


### General Advice

- Legible fonts
  - Print the figure at 100% (reproduction scale)
  - Line thickness
- Avoid similar colors, yellow, orange; red/green
- Avoid arbitrary units
  - Use physical, standard units
- Explain every part of the figure in the caption
  - symbols, insets, what each part is about
- Include scale bars & color bars
- Use high resolution, high contrast images
- Use vector graphics when possible



## Problems



(a)

(b)

Figure 1. SRQ Plots of  $T_i/T_n$  (Vertical Axes) Against  $i/n$  (Horizontal Axes) for the Gibbs Sampler (a) and an Alternating Gibbs/Independence Sampler (b) for the Pump Failure Data Based on Runs of Length 5,000. Lines through the origin with unit slope are shown dashed; axis ranges are from 0 to 1 for all axes.

## Problems

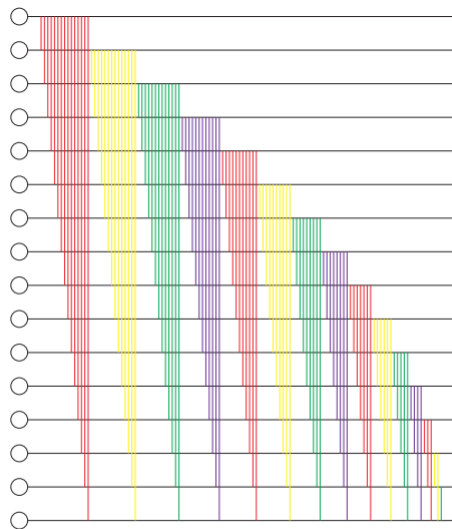
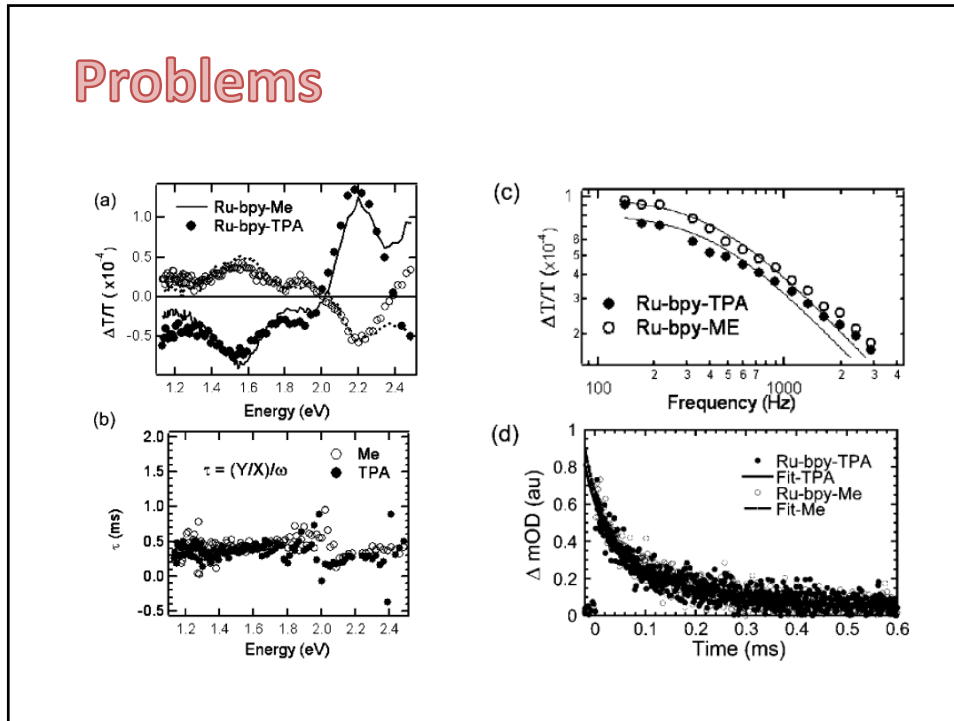


FIG. 2. (Color online) Possible layout for the 16-qubit chip.

## Problems



## Dark personal history

- Count the problems:

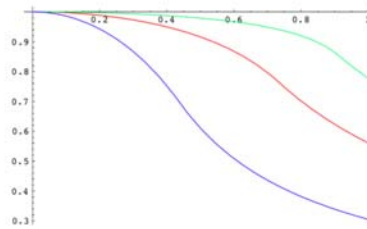


FIG. 4: Polarization reduction factor  $\cos \omega$  for three different sets of new particle masses, as a function of parent top partner boost  $\beta$ . The phase space integral over  $d \cos \theta$  has been performed. The red (central) curve is for a top partner with mass 500 GeV and boson partner 150 GeV. The green (upper) curve is for a top partner with mass 900 GeV and boson partner 300 GeV. The blue (lower) curve is for a top partner with mass 900 GeV and boson partner 700 GeV.

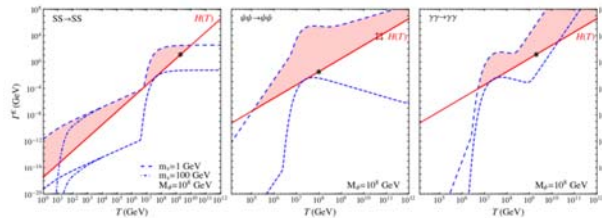
PHYSICAL REVIEW D 79, 014032 (2009)

Polarized top quarks from new physics: Signals and observables

Jessie Shelton\*

## Dark personal history

- Better use of Mathematica options:



**Figure 3.** Comparison of the energy transfer rate (blue, dashed) to the Hubble rate (red, solid) for the scalar-scalar model (left panel), the Dirac fermion-Dirac fermion model (middle panel) and the gauge-gauge boson model (right panel). In each case the energy transfer rate is shown for a value of  $k = 0.5$  and for  $M_\phi = 10^8$  GeV. The lower curve in each case is the lowest value of the width for which thermalization occurs (for  $k = 0.5$ ), while the upper curve is the upper allowed value. The black star indicates the reheating temperature and corresponding Hubble rate for the lower width, while the red # (visible only in the fermion case) indicates the maximum value of the reheating temperature.

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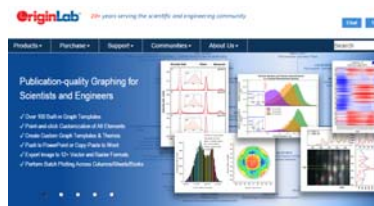
**Chilly dark sectors and asymmetric reheating**

Peter Abhinet, Yusef Cal and Justin Shuller

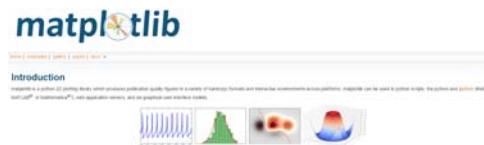
## Resources

Software for making professional-quality plots

Origin (Webstore)



Matplotlib (Python)



MATLAB, Mathematica...caution



## Resources

Software for making professional-quality figures

### Line / vector art

Illustrator, CorelDraw, Inkscape (free)

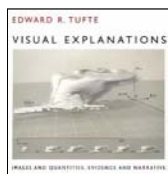
Mathematica

### 3D Illustration

SketchUp (free), VPython (free), Blender (free)

Autodesk products (free for students)

## More resources (Celia)



Edward R. Tufte, *Visual Explanations: Images and Quantities, Evidence and Narrative* (Cheshire, CT, Graphics Press, 1997).

“Graphing Resources”

(<http://www.ncsu.edu/labwrite/res/res-homepage.htm>), particularly their “Revising your Visuals” section.