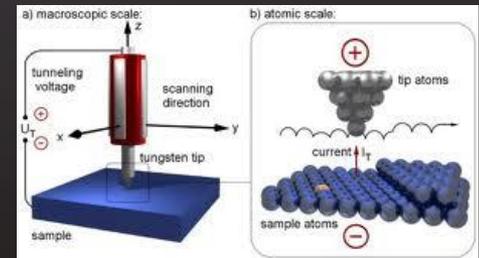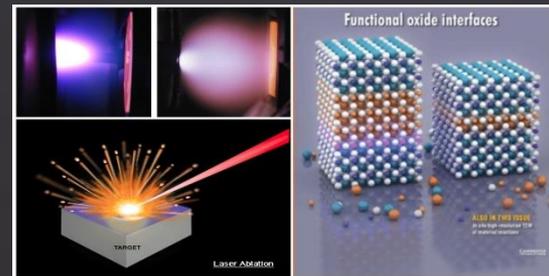# Methods Section

Purpose:

Communicate methods used to obtain results

Examples:

- Sample preparation

- Experimental Procedures

- Numerical Methods

- Theoretical approach

$$i\frac{d\Psi(x,t)}{dt} = -\frac{1}{2}\frac{d^2\Psi(x,t)}{dx^2} + V(x)\Psi(x,t).$$

$$\Psi = c_0\Phi_0 + \sum_{i=1}^{\infty} c_i\Phi_i$$

$$-\frac{d\Psi(x,t)}{dt} = (H - E_0)\Psi(x,t)$$

$$x(t+\tau) = x(t) + \tau v(t) + 0.5F(t)\tau^2$$

$$\Psi(x,t+\tau) = \int G(x,x',\tau)\Psi(x',t)dx'$$

Goals

Explain what you did

- So that others can evaluate validity of results

- So that others could reproduce

Reproducibility

Standard for something to be called "science"

That it could be reproduced

Preliminary note

Electrochemically induced nuclear fusion of deuterium

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Department of Chemistry, The University, Southampton, Hants. SO9 5NH (Great Britain)

Stanley Pons *
Department of Chemistry, University of Utah, Salt Lake City, UT 84112 (U.S.A.)

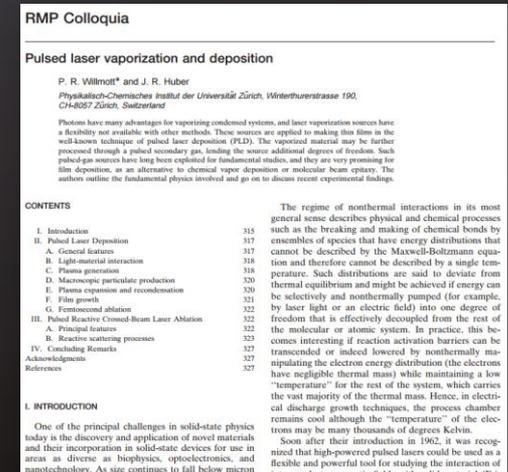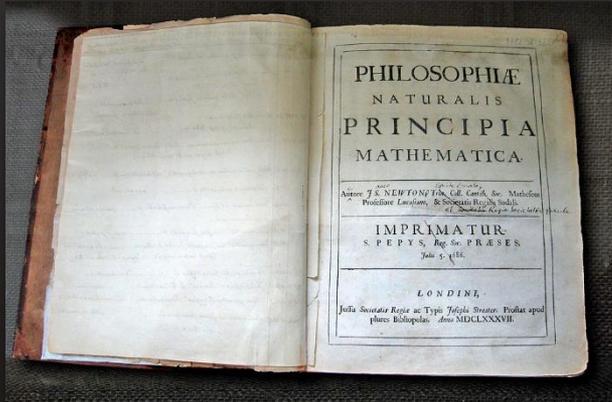(Received 13 March 1989; in revised form 22 March 1989)

Congratulations on your epic fail

Reproducibility

Include just enough detail so that someone else could (in principle) do your experiments, calculations, etc.
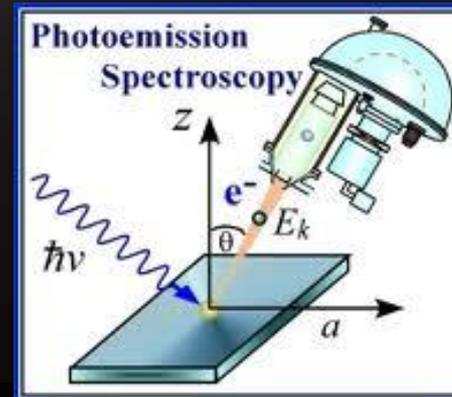
Assume that reader will have access to the same literature
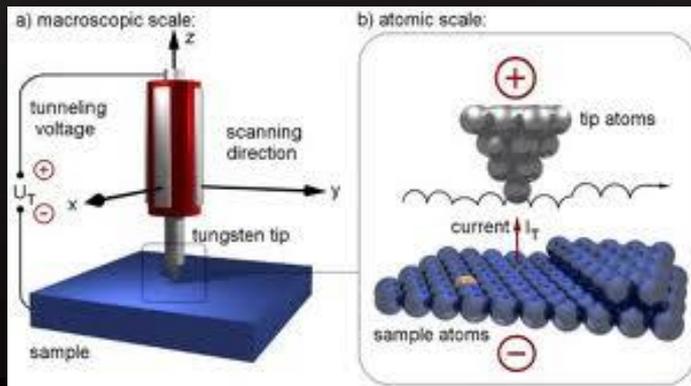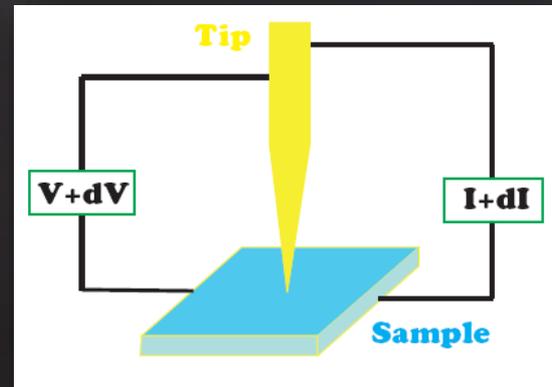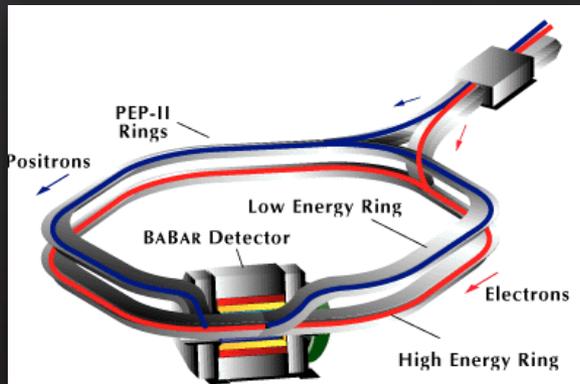

No need to derive everything, explain well-known techniques

Do include key equations, parameters, etc.

Figures

Crucial:

- Help the reader make sense of text
- Worth 10^N words!

Be careful how you "spend" your figures

FIG. 1. (Color online) Schematic of the experimental setup and frequency-bin structure. L0, pump beam focusing lens ($f = 150$ mm); PPKTP, nonlinear crystal; BD, beam dump; SLM, spatial light modulator; L1 and L2, two-lens symmetric imaging arrangement ($f = 100$ mm) to enhance the spectral resolution with a magnification of 1:6 at the symmetry axis of the four-prisms compressor; BF, bandpass filter; SPCM, single-photon counting module with a two-lens (L3, L4) imaging system. The inset shows the measured down-converted spectrum overlaid with a schematic illustration of the frequency bins for a ququart. Each of the gray shaded areas represents a single bin whose amplitude and phase can be manipulated individually.

Methods and Results

Sometimes the dividing line is fuzzy

Methods may:

- Have information on data analysis
- Benchmarks of numerical methods
- Benchmarks of experimental methods

Resources

- Richard H. Kallet, *"How to Write the Methods Section of a Research Paper"* Respiratory Care, **49**, 1229 (2004).
- How to write a paper in Scientific Journal and Format: http://abacus.bates.edu/~ganderso/biology/resources/writing/HTWsections.html
- Help with scientific writing: http://kmh-lanl.hansonhub.com/techwriting.html
- PhD Comics: http://www.phdcomics.com/