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# 1 Keeping an Electronic Lab Notebook with Emacs Org Mode

Laboratory notebooks have a particular format and set of requirements. The first is to have proper dates, and titles for each entry. As such I have (for now) settled on the following format:

# 2 EXPERIMENT *<31 Aug 2023>* TitleIN_PROGRESS

Each entry starts with the state of the experiment (EXPERIMENT, COMPLETE, FAILED) and then the date that the entry was added. The date has the month spelled out, to remove the whole number/number/number ambiguity. This is followed by the title because the dates keep the formatting nicely static and don't produce a ragged left edge. Each experiment has a tag ($\text{not}_{\text{started}}$, $\text{in}_{\text{progress}}$, complete) at the right edge (as dictated by org mode tag formatting). The tags aren't necessary but are helpful to me in finding where I am with many different experiments in a single notebook.

Work is clocked using org mode clock tables (see 3 lines following the title) using C-c C-x C-i (clock in) and C-c C-x C-o (clock out). When an experiment is complete it is marked DONE and the clocks are summarized. At this point a discrete, signed, checkin is made to complete the entry.

## 2.1 Modified settings and variables for ELNs

The following changes are in my .emacs file for use with ELNs

### 2.1.1 Change dates to display as 01 Jan 1970 with the month in characters

;; Setup an org mode custom date to match for ELNs
(setq-default org-display-custom-times t) (setq org-time-stamp-custom-formats '("<%e %b %Y>" . "<%e %b %Y %H:%M>"))

## 2.2 Example Entry

### 2.2.1 *< 1 Sep 2023>* Getting the time in user spaceIN_PROGRESS

1. Hypothesis

   What are you trying to show? Be specific about what you are measuring: time, transactions, size of data, latency etc.

2. How

   (Procedures, calculations, equipment)

   - The Details of How
   - Equipment::CPU, Memory, Disk, Network features and base performance characteristics
   - Software::Name, Version, Options
   - Scaffolding Scripts, Executables::Location, name, command arguments passed
   - Commands Typed:Use the script(1) command before you start any interactive session that will run test or other measurement code. This command captures all commands typed and their output for later use.

3. Observations

   - Describe all that happens (planned or unplanned) during the experiment in narrative text.
   - Raw experimental data::Tables and other data that are small enough to fit directly into the notes may be place in this section.
   - Large Output Files::Point to the files, signed and stored in a repo, that contain any relevant output.

Org mode has a way to strike out text, C-c C-x C-f + which inserts plus mark characters that make a strikeout as in the following line:

~~- This idea did not work out and therefore is struck out.~~

In a Laboratory notebook we NEVER remove ideas, we leave them and strike them out. Yes, we can recover text via the version control system but that's not suffiicent for our purpose, we need to have the strikeouts remain to work as a real lab notebook.

4. Data analysis

   Processing of raw data, graphs, interpretations

   - Summarize your interpretation of the results of the experiment in narrative text.
   - Summary tables, graphs, images, etc. may be placed directly into the notes.
   - Large Tables, Graphs, Images etc.::Point to the files, signed and stored in a repo, that contain any relevant output.

5. Ideas for future experiments

   - A list of further experiments that you believe that tease out new information.