Lab Notebooks

Leonardo da Vinci
Modern World

- Legal (Patents, other disputes (e.g., Facebook))
- Reproducibility (*Cold Fusion?*)
- Personal record of work (mental health)
Bad Notebook (Futurama)

https://twitter.com/figshare/status/483310011020750849/photo/1
The Need for Notebooks

I think the most important thing we need is an electronic lab notebook that really allows us to go back and understand exactly what we did, repeat it, modify it, record it, etc. If you accept this, it leads to a number of points:

1. Why don’t more people (including me) do this now?
2. What tool(s) should we use?
3. How should this integrate into the publication process (for papers, software, data, etc.)

https://danielskatzblogger.com/2015/07/15/the-need-for-notebooks/
**Woody Guthrie’s Notebook**

**Woody Guthrie’s New Year’s Resolutions – 1941**

![Image of Guthrie’s notebook page with New Year’s resolutions]

Jim Morrison (The Doors) Notebook

Jim Morrison’s handwritten lyrics for *Riders On the Storm.*

https://twitter.com/oldpicsarchive/status/639078637501829120/photo/1
Fig. 5. Field-effect disclosures in Shockley's notebook of ideas developed after a five-year gap caused by World War II. (a) An amplifying structure and circuit, dated 13 April 1945, composed of a sequence of parallel layers. (b) A similar amplifying circuit, dated 16 April 1945, using a single layer, and (c) a proposed layer structure utilizing space-charge penetration at two surfaces without any net charge being added to the layer by virtue of the presence of a p-n junction.

http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=1478477
http://www.pbs.org/transistor/background1/events/junctinv.html
**Open Notebook Science**

@kaythaney  
Interesting. New online class teaches you the importance of and how to manage an open lab notebook in 2 weeks.  
http://t.co/QyNd3OPr8Y #ONS  
6/16/13 4:00 PM  

http://scifundchallenge.org/blog/2013/06/15/welcome-to-scifund-201-open-notebook-
Paul Klee & Leonardo da Vinci Compared

Paul Klee & Leonardo Treatise on Painting (1540) compared, draft page ET, *The Thinking Eye*.

In thousands of notebook drawings, Paul Klee derived afresh and investigated the fundamental play of lines, planes, volumes, strata, pattern, color, pattern, texture, form, volume, forces, flows, structures—a direct, workaday, hands-on intensity of seeing, understanding, producing. Klee’s notebooks are for modern art and design as Leonardo’s Treatise on Painting (1540) was for Renaissance art.

https://twitter.com/EdwardTufte/status/612469459517861888/photo/1
Renaissance man Thomas Jefferson had a mind that never stopped, so he needed a way of jotting down notes on the go to be recorded in notebooks by night at Monticello.

The solution?

Pages of ivory that could be erased once his ideas were transcribed.

http://holykaw.alltop.com/thomas-jeffersons-unique-pocket-notebook
Marie Curie’s papers

Marie Curie’s papers, clothing, furniture, etc Radioactive and will be for >1,500 years.

http://www.openculture.com/2015/07/marie-curie-s-research-papers-are-still-radioactive.html
First Computer Bug

A moth found trapped between points at Relay # 70, Panel F, of the Mark II Aiken Relay Calculator while it was being tested at Harvard University, 9 September 1947. The operators affixed the moth to the computer log, with the entry: “First actual case of bug being found.” They put out the word that they had “debugged” the machine, thus introducing the term “debugging a computer program.”

https://www.facebook.com/media/set/?set=a.10150265545333344.318488.76845133343&type=3
Creation of Pac-Man

Toru Iwatani, creator of Pac-Man, showed the *Control* magazine some original drafts of Pac-Man!
Losing a Notebook

@osxreverser
F***!!!!!! I guess I lost most of my previous EFI research. Can’t find my firmware bruteforcer and notes. Grrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr
A gallery of interesting IPython Notebooks


Double Pendulum


Kalman and Bayesian Filters in Python

Garrett Lisi (Physicist, The Theory of Everything)

Home page: http://li.si

The E8 root system, with each root assigned to an elementary particle field.

Personal wiki notebook in theoretical physics.
http://deferentialgeometry.org
Engineering Logbooks

http://www.webpages.uidaho.edu/mindworks/Capstone%20Design/Project%20Guides/Logbook_Handout.pdf
ENGINEERING LOGBOOKS

Definition:
An engineering logbook is a personal/professional reference about project learning and results. To protect intellectual property in the workplace, it should be bound so that pages cannot be inserted/removed, written in ink, dated, and fill consecutive pages.

Rationale:
High performing individuals in all professions are similar to the extent that they monitor and control where they invest their time, they learn and apply the best practices their profession, and they regularly take time to learn from their successes and failures.

General Expectations:
• 5-6 pages of thoughtful entries per week in support of a quality design process
• log of planning, communications, team meetings, and lecture notes (~20% of entries)
• project learning and product development (~70% of entries)
• review of individual/team/product performance (~10% of entries)
• organization/format for easy re-reading/re-use (self, team, mentor, instructor)

Industry Expectations:
1. Record the date on each page. Start each day on a new page.
2. Label each entry and record this in a table of contents (reserve 3-4 pages at start).
3. Use ink. Do not erase. Delete an entry by neatly drawing a single line through it.
4. Do not remove pages, and do not skip pages.
5. Avoid backfilling. If you realize later that you left something out, or just want to summarize something, go ahead and write it in, noting that it’s after-the-fact.
6. Include everything you contribute to … good, bad, and ugly.

    Sketches/doodling  Customer needs/requirements
    Class notes        Project objectives
    Meeting notes      Action Items
    Half-baked Ideas   Math calculations
    Work-in-progress   Design alternatives
    Vendor notes       Research findings
    Sources of ideas   Evaluation of data/results
    Design reviews     Decision criteria
    Design process     Rationale for decisions
    Project reflections Professional development
## Logbook Prompts:

<table>
<thead>
<tr>
<th>If you just finished…</th>
<th>Ask yourself…</th>
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<tbody>
<tr>
<td>A meeting,</td>
<td>• What were the main outcomes of the meeting?</td>
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<td>• Was the meeting productive, and why?</td>
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<td>• What are your personal action items before the next meeting?</td>
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<td>• Is the team heading in the right direction?</td>
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<td>Brainstorming,</td>
<td>• Which ideas seem most feasible, and why?</td>
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<td>• Are there enough good ideas?</td>
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<td>• How could better ideas be developed based on this session?</td>
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<td>Engineering Analysis,</td>
<td>• What were the governing equations?</td>
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<td>• What were the most important findings?</td>
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<td>• What do the results mean and how should they be applied?</td>
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<td>Visualization, (by hand</td>
<td>• What are the major features/discoveries and why are these significant?</td>
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<td>or in CAD)</td>
<td>• What was learned about the problem or solution possibilities?</td>
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<td></td>
<td>• What problems were resolved and what still needs to be addressed?</td>
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<td></td>
<td>• How does this piece integrate with the whole?</td>
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<td>An internet search</td>
<td>• What key information did I find? How does it help achieve the project objectives?</td>
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<td>• Are there other sources that should be pursued?</td>
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<td>• What new questions were generated?</td>
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LOGBOOK REVIEW FORM

Engineer: ______________________ Reviewer: ______________________ Date: ______________________

STEP 1: Inventory your six best logbook entries and rate each one using the rubric below.

<table>
<thead>
<tr>
<th>Entry</th>
<th>Date</th>
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1- Missing  
2- Incomplete, minimal long-term value to author  
3 – Complete, clear long-term value to author  
4 – Exemplary, considerable long-term value to others

STEP 2: Self-assess your logbook in the areas below using the scales provided.

--------- 2--------------- 3------------------------------------- 4-------------------------------------

**Project Management** → overall rating for logbook since last review

- vague goals  
- multiple/divergent goals  
- focused & strategic goals  
- few action items  
- sequenced tasks  
- tasks remove bottlenecks

(in the context of ME 410, consider your client to be mentors, staff, and instructors)

**Design Development** → overall rating for logbook since last review

- sparse notes & analysis  
- relevant notes & analysis  
- detailed notes & analysis  
- random decisions  
- major decisions highlighted  
- key decisions justified  
- no illustrations  
- basic illustrations w/o discussion  
- detailed illustrations & discussion

**Assessment (of self & team)** → overall rating for logbook since last review

- little reflection  
- occasional reflection  
- regular & effective reflection  
- little awareness of strengths  
- basic awareness of strengths  
- detailed knowledge of strengths  
- little awareness of improvements  
- some areas cited for improvement  
- detailed action plans for improvement

**Organization** → overall rating for logbook since last review

- entries on demand  
- regular entries  
- spontaneous entries  
- entries without labels  
- entries with generic labels  
- entries with informative labels  
- haphazard layout  
- readable  
- thoughtful layout for rereading

STEP 3: Paste this form in your logbook and make an entry examining the two greatest strengths and two greatest areas for improvement in your personal documentation. State why each strength as well as each improvement adds value. Explain how you might implement each improvement.
Bad Notebook (Futurama)

YOUR LAB NOTEBOOK IS BAD

AND YOU SHOULD FEEL BAD

https://twitter.com/figshare/status/483310011020750849/photo/1