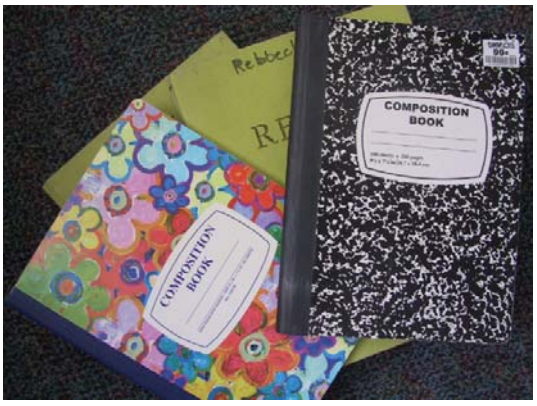
What Makes a Great Science Lab Notebook?

Joanne Rebbeck, Ph.D.
February 24, 2005

Whether you are a research scientist or a first-time science fair student, a lab notebook is a crucial part of any research project. It is a detailed account of every phase of your project, from the initial brainstorming to the final research report. The lab notebook is proof that certain activities occurred at specific times. Journals and lab notebooks are subject to scrutiny by the scientific community and are acceptable evidence in a court of law.

Here are a few pointers that are easy to follow. As a research scientist, I practice these suggestions everyday. They should help keep you organized, and certainly will impress any science fair judge. It's a great opportunity to show off all of your hard work!

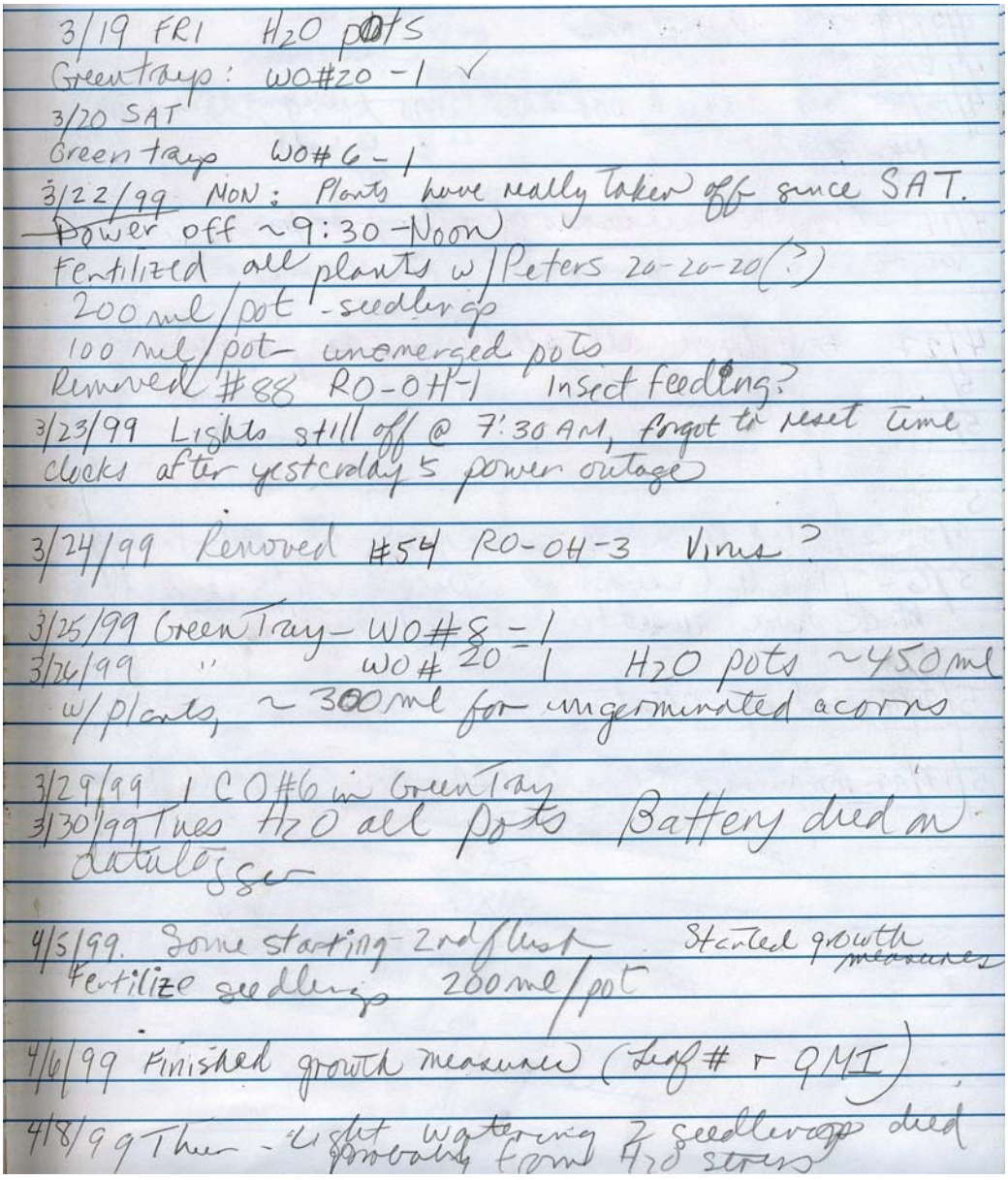


1. **Find a durable hard-bound notebook or black and white composition book**, typically a lined journal works great. Do not attempt to use a spiral bound notebook. They won't hold up over the course of your experiment. Papers are too easily removed or torn from them, and before you realize it, important items are missing. Loose papers are a disaster waiting to happen.

2. **Label your lab notebook** with your name, phone number, email address, and teacher's name in a prominent location. Make lab notebook entries in pen not in pencil. This is a permanent record of all of your activities associated with your project.

3. **Number the pages in your lab notebook before using it**, unless already numbered for you.

4. **Always date every entry**, just like a journal. Entries should be brief and concise. Full sentences are not required.

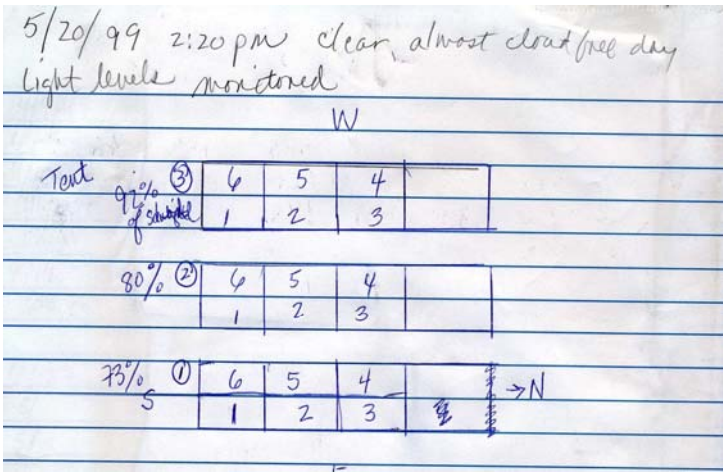

3/19 FRI H_2O pots
Green trays: WO#20 - 1 ✓
3/20 SAT
Green trays WO#6 - 1
3/22/99 MON: Plants have really taken off since SAT.
~~Power~~ off ~9:30 - Noon
Fertilized all plants w/ Peters 20-20-20(?)
200 ml/pot - seedlings
100 ml/pot - unemerged pots
Removed #88 RO-OH-1 Insect feeding?
3/23/99 Lights still off @ 7:30 AM, forgot to reset time clocks after yesterday's power outage
3/24/99 Removed #54 RO-OH-3 Virus?
3/25/99 Green Tray - WO#8 = 1
3/26/99 " WO#20 - 1 H_2O pots ~450 ml w/ plants, ~300 ml for ungerminated acorns
3/29/99 1 CO#6 in Green Tray
3/30/99 Tues H_2O all pots Battery died on data logger
4/5/99. Some starting 2nd flush Stalled growth measures
Fertilize seedlings 200 ml/pot
4/6/99 Finished growth measures (Leaf # + QMI)
4/8/99 Thurs - Light watering 7 seedlings died probably from H_2O stress

Lab notebook entry of observations made while watering planted oak acorns in greenhouse

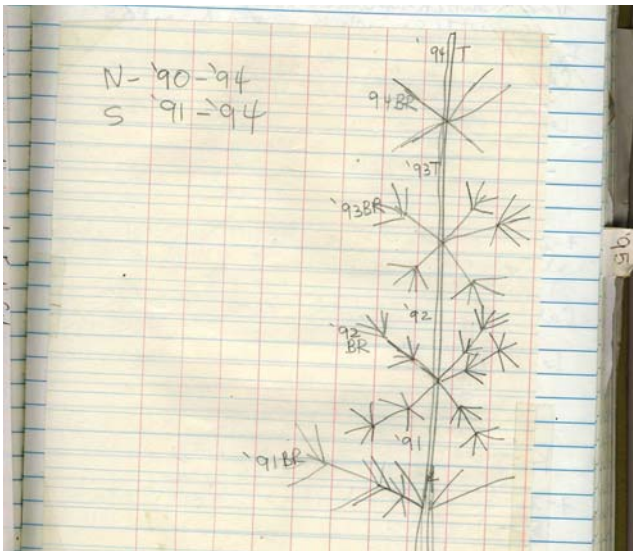
5. **Don't worry about neatness**. It's a personal record of your work. Do not re-do your lab notebook because it looks sloppy. Think of the lab notebook as your

"Dear Diary" for science fair. It's not just for recording data during the experimental phase of your project and it's not just for your teacher.

6. **It should be used during all phases of your project**, jotting down ideas or thoughts for a project, phone numbers, contacts or sources and prices of supplies, book references, diagrams, graphs, figures, charts, sketches, or calculations.



Sketch of layout of sample points inside shade tents



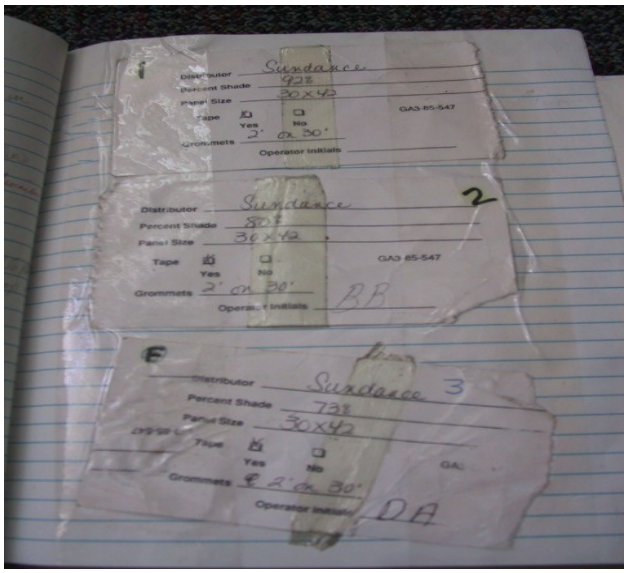
Hand drawing showing different ages of tree branches that were sampled during an experiment

Log entries should include your brainstorming, calculations, library/internet searches, phone calls, interviews, meetings with mentors or advisors, notes from tours of laboratories, research facilities and other related activities.

Remember that it's documentation of your work.

7. **Use it regularly and write down everything**, even if it seems insignificant, it could later be extremely useful. For example, it's the middle of the night and you're frantically preparing that final report but you can't find the title of that crucial reference. Make sure that you describe things completely, so that when you read your notes weeks or months later you will be able to accurately reconstruct your thoughts and your work.

8. **Glue, staple or tape any loose papers**, photocopies of important items. Loose papers or other unsecured items are prohibited as they tend to fall out and can end up missing.



9. **Organize your lab notebook**. Make a table of contents, index, and create tabs for different sections within your lab notebook. This helps keep you organized for different activities. For example, have a data collection section, a section with contacts, sources, etc. and a section of schedule deadlines.

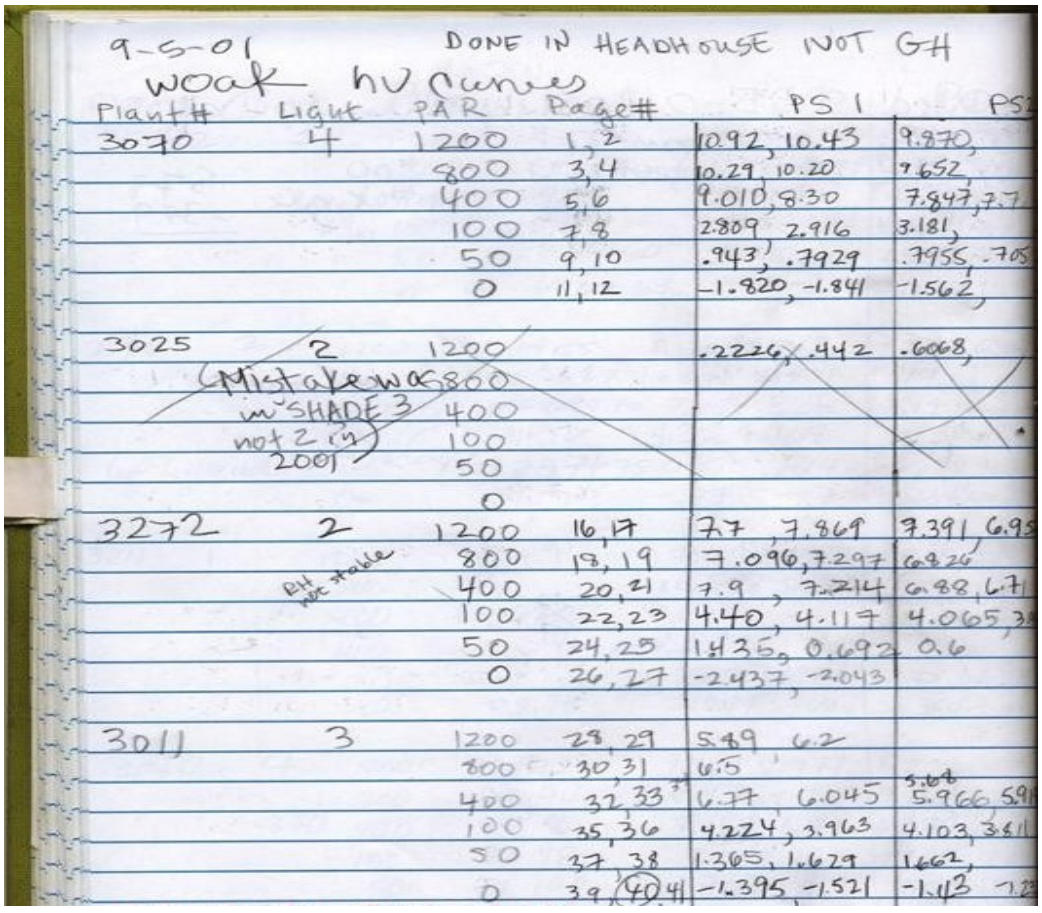
Table of Contents	Tab color	Page #
Deadline Schedule	Red	1
Daily Notes & Reflections	White	2
Background Research Library & Internet	Blue	20
Information Contacts, Supply sources	Green	26
Experimental Setup	Yellow	35
Data collection	Purple	40
Results (pictures, graphs, summary tables)	Orange	50
Reflections	Light blue	60

10. **Include a reflections section in your lab notebook.** For example, what, if anything would I do differently next time? What part of the experiment could be changed to improve the experimental procedure?

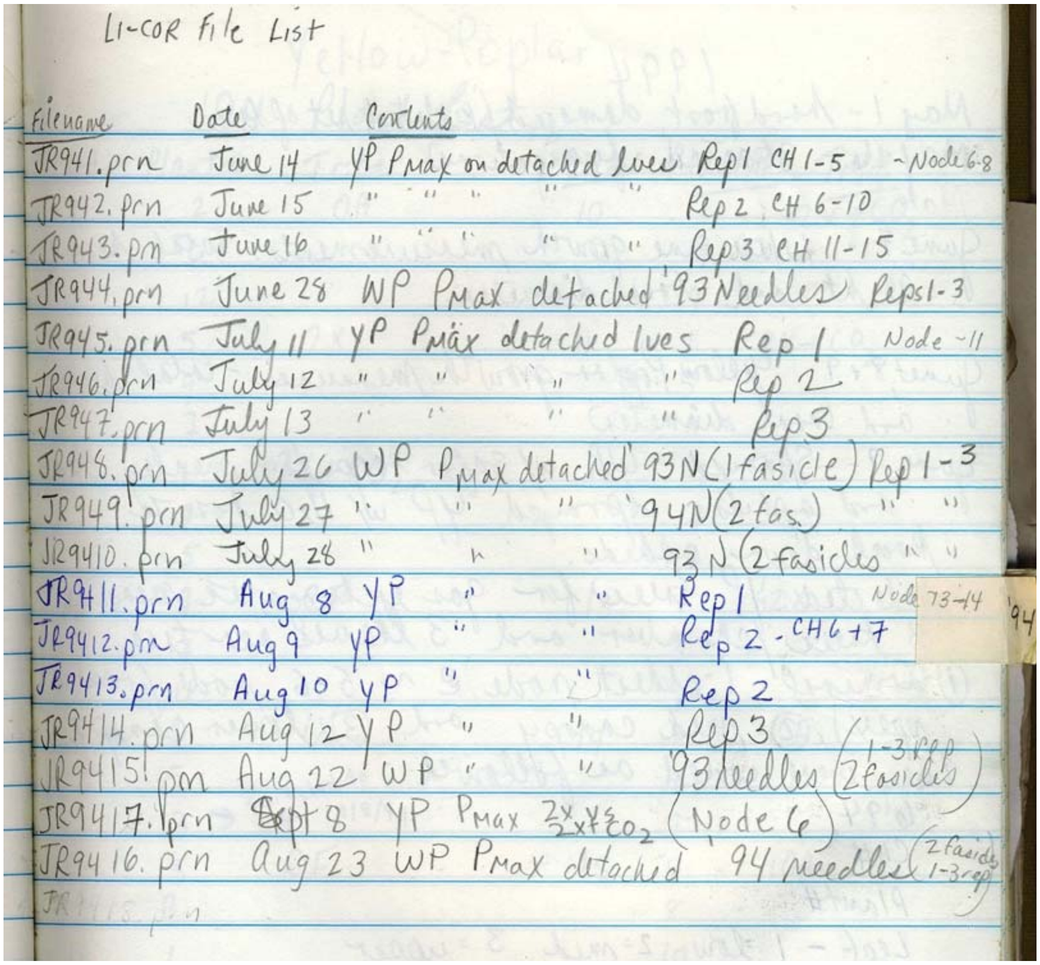
11. **Always include any changes made to procedures**, mishaps, failures, or mistakes. As human beings, all of us make mistakes!

1/4/05 my cat, Sheba scratched the pots of soil, and ate 4 of my 12 plants. I will have to replant everything! I need to protect plants from the silly cat. Maybe i should try putting a screen around the pots or keep cat outside!	2/5/05 Disaster in the lab this morning. Setup manure digoestors last night in incubators, temperature was set at 25°C but came into a real mess, samples heated up too much and caps blew off. I will need to try a lower temperature to avoid this accident from happening again!!!! HUGE MESS TO CLEAN UP.....

12. **Include any and all observations made during your experiment.** In other words, record ALL data directly in your lab notebook. If that is not possible, then staple photocopies of data in the lab notebook.



Entry of photosynthetic data from oak seedlings. Data files were also stored electronically on a computer as shown in the next example.



Li-COR File List

Filename	Date	Contents
JR941.prn	June 14	YP PMax on detached lves Rep1 CH 1-5 ~Node 6-8
JR942.prn	June 15	" " " " " Rep 2 CH 6-10
JR943.prn	June 16	" " " " " Rep 3 CH 11-15
JR944.prn	June 28	WP PMax detached '93 Needles Reps 1-3
JR945.prn	July 11	YP PMax detached lves Rep 1 Node ~11
JR946.prn	July 12	" " " " Rep 2
JR947.prn	July 13	" " " " Rep 3
JR948.prn	July 26	WP PMax detached 93N (1 fasicle) Rep 1-3
JR949.prn	July 27	" " " 94N (2 fas.) " "
JR9410.prn	July 28	" " " 93 N (2 fasicles " "
JR9411.prn	Aug 8	YP " " Rep 1 Node 13-14
JR9412.prn	Aug 9	YP " " Rep 2 - CH 6+7
JR9413.prn	Aug 10	YP " " Rep 2
JR9414.prn	Aug 12	YP " " Rep 3
JR9415.prn	Aug 22	WP " " 93 Needles (2 fasicles 1-3 rep)
JR9417.prn	Sept 8	YP PMax [illegible] CO_2 (Node 6)
JR9416.prn	Aug 23	WP PMax detached 94 needles (2 fasicles 1-3 rep)

A list of data files and description of contents stored on a personal computer

Remember, keeping up a great lab notebook throughout the entire duration of the science project really pays off later! Not only will a nicely maintained lab notebook impress your teacher and the judges at the fair, it will also help you stay out of trouble later when you need to look back and provide details of what you did.