Keeping a Laboratory Notebook

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Le Monnier, the eighteenth-century astronomer, observed Uranus twelve times, but decided that it was a fixed star, not a planet. The great discovery fell to Herschel, who identified Uranus correctly in 1781. Historians have since decided Le Monnier's mistake was due at least in part to his habit of writing measurements on scraps of paper—including a paper bag originally containing hair powder (*1*).

The keeping of good records is essential in a laboratory: a second example is provided by the case of Daniel Drawbaugh v. Alexander Graham Bell. Bell filed a patent application for the telephone in 1875; Drawbaugh sued, claiming the invention for his own and producing at court witnesses who testified he had discussed a crude telephone with them. But this personal testimony did not convince the Supreme Court, which rejected Drawbaugh's claims largely on the basis of his inability to produce a single properly dated piece of paper describing the invention (*2*).

A third, contemporary instance of the importance of laboratory notebooks is provided by the case of Gordon Gould, who as a young physicist filed an application for a basic laser patent in 1959. Gould failed to get the patent, which was awarded instead in 1960 to Charles Townes and Arthur Schawlow. Gould went to court, claiming he was the true inventor. His challenge was based in part on his research notebook which showed, among other items, a sketch, a statement of the main idea, and a derivation of the acronym LASER—Light Amplification by Stimulated Emission of Radiation (*3*).

In October 1977, after a series of litigated oppositions, Gould was granted a patent for optically pumped laser amplifiers. The world market has been estimated at between 100 million and 200 million dollars.

As these examples suggest, well-kept notebooks are valuable documents. They provide complete, accurate records of ongoing work. In the event of litigation or contests for patent rights, they are submitted as evidence. They serve the important role of corroboration should the researcher or inventor have to prove origin or substantiate statements and conclusions. They are valuable documents to validate a company's claims to funds spent for research, particularly in support of tax deductions.

The uses of laboratory notebooks are not limited to legal issues. They are vehicles for organizing and focusing the thinking of the writer, as well as being receptacles for detailed procedural information that might not be available in highly compressed journal articles. Finally, they may serve not only the researcher or inventor but also the public. If properly maintained, they are a record of success and failure, a safeguard against error and carelessness in such important areas as the testing of drugs and chemicals.

General Rules for Notebook Format

The notebook should reflect a daily record of work. It is best to make entries explaining the results expected from each stage of the investigation. Entries should be in chronological order, and so thorough and comprehensive that they can be understood by the corroborating witnesses. Each page should be signed by the inventor or researcher below the last entry, and by one or preferably two witnesses. Full names should be used and the signatures dated.

Of course, each company has its own style of notebooks, its own way of keeping records. Any new employee may need to alter habits to conform to the practices of a particular laboratory. However, there are general guidelines that one can follow. These are as follows:

1. Use a *bound* notebook, if possible.
2. If a loose leaf notebook is preferred, the pages should be numbered in advance and a record kept of the numbered pages given to each laboratory worker. The point is to rebut any inference that a worker may have inserted a page at a later date (*4*).
3. Do not remove any pages, or any part of a page. Pages missing from a notebook will seriously weaken a case in the Patent Office, or in cases that go to court for litigation.
4. Record all entries directly and legibly in solvent-resistant black ink.
5. Define the problem or objective concisely. Make entries consistently as the work is performed.
6. All original work, including simple arithmetical calculations, should be performed in the notebook. If you make a mistake, recalculate—**do not erase.**
7. Never use correction fluid or paste-overs of any kind. If you decide to correct an error, place a single line through the mistake, sign and date the correction, and give a reason for the error. Take care the underlying type can still be read. However, even the practice of drawing a line through numbers entered in error is discouraged in many companies. Instead, workers are asked simply to make a new entry, correcting the error when possible.
8. Do not leave blank spaces on any page. Instead, either draw diagonal lines or a cross through any portion of the page you don't use.
9. Date and sign what you have written on the day of entry. In addition, have each notebook page read, signed, and dated by a qualified witness—someone who is not directly involved in the work performed, but who understands the purpose of the experiment and the results obtained.
10. Extra materials such as graphs and charts should be inserted, signed, and witnessed in the same way as other entries.
11. All apparatus should be identified. Schematic sketches should be included.
12. Head each entry with a title. If you are continuing on the next page, say so at the bottom of the page before you continue.

These rules have received a popular formulation as, "Record it. Date it. Sign it. Have it witnessed." They have also been stated formally in many documents, among them the important "Good Laboratory Practice" (GLP) regulations of the Food and Drug Administration (*5*).

> All data generated during the conduct of a nonclinical laboratory study, except those that are generated by direct computer output, shall be recorded directly, promptly, and legibly in ink. All data entries shall be dated on the day of entry and signed or initialed by the person entering the data. Any change in entries shall be made so as not to obscure the original entry, shall indicate the reason for such change, and shall be dated and signed or identified at the time of the change.

Have It Witnessed

Many questions arise regarding the provision, "Have it witnessed." To many people, it is not clear that the inventor or co-inventor cannot under any circumstances serve as witnesses. Nor can a nearby office worker, notary public, or technician, solely because they happen to be conveniently at hand at the moment one needs a witness. Instead, witnesses must be those with the technical competence to understand the details of the subject matter. Further, they should be able

to read and understand the entries without receiving any oral instructions from the inventor. Finally, the witness must be an adult, preferably over 21, and preferably one who has actually witnessed the work performed.

The witnesses should sign their full names below a statement to the following effect: Disclosed to and understood by me this __day of _____, 19__.

The role of the witness may be crucial in cases of Interference Proceedings. These proceedings occur when two applications are filed in the United States Patent and Trademark Office disclosing similar inventions, and the Patent and Trademark Office acts to determine which of the inventors is entitled to the patent. There have been instances in Interference Proceedings where the inventor's own testimony, supported by thorough sets of notebooks unquestionably prepared and dated, did not alone serve to establish date of conception and reduction to practice of the invention. In these cases, the witnesses' backgrounds became crucial. It was necessary for the witnesses to have understood all the entries; *merely witnessing them on the date did not in and of itself suffice* in a contest where the other claimant also had properly substantiated testimony. "The point is that a witness is called upon to substantiate the facts and nature of the work performed at the date that the person signed as a witness, and not merely the fact that an entry was made by the inventor on that date" (*6*).

Conception and Due Diligence

Patent law places emphasis on "date of conception," "due diligence," and "reduction to practice." In terms of a notebook, this means the following:

1. Get the idea into the notebook as quickly as possible. If it is written down after some delay, relate the date and place of conception of the idea and the circumstances that stimulated the idea.
2. In this initial record, stress the newness, why the idea is novel. If you make notes on scrap paper at home or at work, the original of the notes should be preserved, but the contents transcribed into the permanent notebook as soon as possible. The dates are important in two ways: they may help refresh a recollection, and they may help substantiate a claim in the event of a subsequent dispute.
3. Continue to record every instance when you return to the idea so there is ample evidence of "due diligence," of not setting aside the idea.

Notebooks are particularly important in establishing due diligence. New York patent attorney Philip Furgang relates cases where an inventor who is first to have the idea and first to reduce it to practice still loses the patent for lack of properly signed, dated, and witnessed records demonstrating due diligence. Thus, inventor Smith may have the idea first, enter it properly in her notebook, and then set about reducing it to practice for two years. However, she is busy during these two years and keeps the notebook poorly: not a single entry after the one establishing the date of conception is properly witnessed. Then a second person, inventor Jones, has the same idea. He reduces it to practice and files his patent just before Smith. Between contesting inventors, the burden of providing who is entitled to the patent falls on the inventor *last* to file. Thus, in this instance the burden was on Smith to prove her right to the patent. She went to court, and there was no question of witnesses who could testify to origin; clearly Smith was first. Unfortunately, however, she could not prove due diligence because she did not have witnessed, signed notebook entries for the period in question, and thus Jones won the interference (*7*).

In a University Setting

If the notebook is kept with an eye to the preparation of a scientific paper, there should be statements on the purpose of each experiment and a summary of conclusions. Under no circumstances should the researcher succumb to the desire to keep notes on the backs of memos or other odd bits of paper.

Usually the first 10 or 20 pages of the research notebook is left blank, with the formal log commencing afterwards. These blank pages are used for a table of contents maintained each day or after a series of similar experiments is completed. The table of contents is a simple step that saves a great deal of time later when the search begins for a piece of information. In some research laboratories, the director and staff prepare an annual report based on the notebooks, with each person responsible for abstracting different major headings from the notebooks.

The notebook is not the spot for polished writing: data should be entered in primary form. In one laboratory, for instance, a worker had the habit of performing all the calculations separately and then entering only results. This made it difficult to detect error that was the result of digits transposed during calculation. Instead, be as detailed as possible so that someone else can duplicate what you've done by reading your account. This means putting in the contradictions, the unpromising experiments, the failures. If there is a conflict, enter a description of it rather than omitting it. The negative results may be important for another worker at another time.

Literature Cited

(1) Wilson, Jr., E. Bright, "An Introduction to Scientific Research," McGraw-Hill Inc., New York, **1952.**
(2) Furgang, Philip, "Memorandum, Rules for Keeping Invention Records," 437 Madison Avenue, New York, NY.
(3) *Laser Focus*, Vol. 13, No. 12, p. 14; *New York Times*, **2,** 5 (17 July 1979); **34,** 1 (21 July 1979).
(4) 1976 Patent Institute. "A Continuing Seminar of New Developments in Law and Practice," College of Business Administration, Fairleigh Dickinson University, Madison, NJ.
(5) "Good Laboratory Practice Regulations, Nonclinical Laboratory Studies," *Federal Register*, Vol. 43, No. 247, 22 December 1979, 58.185.
(6) 1976 Patent Institute, p. 131.
(7) Furgang, p. 3.