

Responsible Conduct of Research

Scientific Record Keeping

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SCIENTIFIC RECORD KEEPING

(FL Macrina, Scientific Integrity, 3rd ed., (2005) ASM Press, Washington, DC; chap.11)

“Proper record keeping is crucial to scientific research”

Each investigator has a preferred way of keeping permanent laboratory records. There is no “one right way” to maintain scientific records, although there are many less than fully appropriate ways to do this. Today we will discuss one of those “right ways”.

NB: Electronic technology and scientific advances permit (and in some cases require) a variety of forms for data recording and storage. Our discussion here will refer mostly to “laboratory notebook” or to “data book” but is applicable to other methods of reliable data recording and storage.

Table 11-1 Data Book Zen

Useful data books explain

Good data books

What you did & Why you did it

How you did it

Where materials are

What happened (and what did not)

Your interpretation

The laboratory notebook represents not only a reliable and accurate record of your investigations but also serves as the basis for reports, formal presentations, abstracts, articles in scholarly journals, grant/patent applications, theses and dissertations.

“Good record keeping fosters the scientific norms of:
accuracy

replication

reliability

Data have “authenticity”--
based on

Data lose authenticity due to

Data have “integrity”, which depends on “results being collected using well-chosen
scientific methods carried out in the proper manner”.

Who owns the data you collect?

You?

Your supervisor?

???

Ultimately, who is responsible for the data in your notebook?

You?

Your supervisor?

???

Who keeps the notebook(s)

if/when you leave the lab?

Why?

if/when your supervisor leaves the lab?

Why?

How is the notebook to be treated?

With

NEVER EVER

How can you be expected to keep an accurate record of what you have done?

For “hard copy” laboratory notebooks (i.e., not those saved electronically) is there a type of “right” notebook?

Yes.

Are there “wrong” types?

If so, why are they “wrong”?

Are they always wrong?

Not if they are for information for general use,

or

NEVER write

If you are recording large #s of observations and an electronic print-out is not available, preparing a Table outline in the notebook ahead of time can greatly facilitate recording.

With what do you write?

Pencil?

Pens?

Are all types OK?

Format

T of C

Date of experiment

Title &/or purpose of experiment

Description of Methods, if not

If referring to such Methods,

NB: any modification to Methods must be described clearly.

Description of Materials, including

If using materials supplied by other investigators

Observations and Results Make sure there is sufficient writing surface available immediately accessible to the experimental area so there is minimal interference with recording the data. Record data directly. WRITE NEATLY!

Calculations, graphs and tables derived from analysis of the data should be entered in the notebook as soon as possible after data recording is complete.

Discussion of results should

Conclusion provides a proper finish to an experiment. This can include

What if you make a mistake in the notebook?

Erase it?

White it out?

Tear out the page(s)?

What do you do with the notebook if the experiment doesn't work?

What do you do if you don't discover a mistake until days or weeks after the experiment is complete?

Notebook miscellany (but still important)

Appending data

Adding printed material?

Correspondence with colleagues—letters & e-mail

Acknowledging who assisted in the experiment—

Witnessing (not a religious experience)

Electronic Record Keeping

Spreadsheets (e.g., Excel); data analysis programs (e.g. for statistics, sequence alignment); graphics packages; scanning; digital photography—all make electronic record keeping reasonable + you can store lots of data in a very compact space. This is especially valuable for large data sequences of the type common in molecular biology research.

"The CLOUD"

BUT, there are drawbacks and problems, as well.
You MUST maintain the integrity of the data.

Back up everything!!

Use a Flash Drive (and a back-up hard drive for all large data sets)

It may be difficult to always insert a date/time stamp that can't be altered.

Ownership of data is really and legally a form of property right (see Chapter 9 of Macrina's book). "Control of scientific data is tantamount to ownership".

If you have characterized a new gene sequence and someone inadvertently posts it prematurely on a public DNA database,

Miscellaneous Stuff (that can improve your lab experience)

Get to work on time

Be neat and organized (even if you usually aren't)

Learn the lab rules (lab phone, lab computers, cell phones, surfing, texting, head phones/ear buds, friends visiting, clean-up, chores)

Learn the safety rules (gloves, goggles, how to transport items between rooms, food, drink, open-toed shoes)

Learn how the equipment works before you use it

If you don't understand something (an assignment, a technique/procedure/process that you're involved in) ASK!! but,

Don't be a pest!!

THM

Rule #1

If it's not written down,

Corollary # 1

If it didn't happen,