Wise Up by Guy Claxton and Research Tips

NIL Seminar[a]

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[a]Claxton (1999)

Introduction

- Learning involves the discovery of relevance: "Part of learning to learn is learning the relevance of your strategies – their appropriate domain of application."

- Learning tools are in the world as well as in the mind: "In all areas of life, people's accomplishments are a joint function of their inner and outer resources."

Problems, not Solutions

- There are many learning predicaments in which the search is not for a new way of solving problem as conceived, but for a new way of conceiving the problem.

- Professionals find themselves in the lowlands, in which the view is foggy, the ground boggy and the problem ill-defined.

Soft Thinking

- Limitation of language and logic.

- "... words are totally absent from my mind when I really think ..."

- "thoughts die the moment they are embodied in words"

Insights, Hunches, and Complete Guesses

- First comes the insight, and then the figuring out: not the other way around.

- "... access to the workings of our own minds is increased when we are relaxed and 'not trying' ..."

- Backward masking is weakened when one does not try to identify the first stimulus (the masked stimulus).

- Guesses, even with low confidence, could be helpful.

Trying too Hard: How to Squash Creativity

- Makes us less sensitive to subtle sources of information.

- Makes us worry about appearance and performance, thus making us feel anxious and under pressure. Such pressure leads to self-consciousness, pressure, and a loss of expertise.

- Pressure pulls us back into hard thinking.

- It seems not to matter whether the feeling of effort is induced by a threat or a positive incentive: the effect on creativity can be just as bad.

- "... effort and pressure tend to narrow the focus of attention ..."

- Make the search for a solution too intense, and you cannot afford to adopt this broader attitude.

- "It is by logic that we prove, but it is by intuition we discover."

Learning to Think Softly

- "... there is evidence that soft thinking can be regained and developed."

- "... cultivate states of mind that are relaxed and patient, yet quietly attentive and receptive to impressions, patterns and associations."

- "... just slow down."

- "... hold a problem in mind without actively, purposefully deliberating on it ..."

- "... allow time at the front end of the learning process, before becoming focused on analysis, planning, and execution ..."

The Conditions of Creativity: Boredom, Anxiety and Rotting Apples

- "The child who has learnt to play, and who has sufficient resources and sufficient space to be bored in ... has the unique opportunity to be bored in a productive way. Out of this boredom comes, eventually, play."

- Don't make up your mind as quickly as possible – it results in behavioral rigidity.

- YC: don't sit in front of your computer all the time (it provides constant stimulus, so you don't get bored).

Listening to the Body: Learning to Focus

- Shift focus of attention from the head to the body.

- Feel of a gradually developing photographic print: an image slowly forming, not an argument being assembled or a story being told.

- "Whether to take a new job, get married, have children or accommodate an elderly parent: all such issues and decisions involve feelings, values and perceptions that are not easy to put into words, and time devoted to gently examining the non-verbal signals that attend them is time rationally spent." (YC: A good advice in general.)

The Voices of Intuition

- Feelings, insights, images and dreams, guesses: inklings, fleeting thoughts that flash across the edge of consciousness and are often gone before we can get a good look at them.

- Hunches and promptings.

- Aesthetic sense: e.g., *elegant* proof.

The Resistance to Soft Thinking

- Too much emphasis on information, speed, logic, analysis. (YC: add performance, optimization, etc.)

- Intuition is disdained as lazy, sloppy, and primitive.

- We need to remind us of the resources of ingenuity that are available if we make time and space for them.

Random Research Tips (by YC)

How to Succeed in Research

- **You** are the main player. No one will tell you what to do.

- You have to look for ideas, problems, solutions, etc.

- Be proactive. Don't treat research as some kind of obligation. If it is so, you're in big trouble.

- Make daily progress. Do research-related stuff everyday, even when it's as short as 30 minutes.

- Whenever you bump into a roadblock, immediately consult your advisor. Don't wait a week for the weekly meeting.

- Try to learn how to evaluate: Is this paper good/bad, is this idea good/bad, are these results good/bad. Reading book reviews and review articles help a lot. Read journals with open commentary, such as Behavioral and Brain Sciences.

- Become an independent thinker. Be a (constructive) skeptic.

Coming Up with a Research Idea

1. Find a topic that interests you. What makes you curious?

2. Don't compete with the computer: Pick things humans do well but computers don't (e.g., perception, cognition, etc.).

3. Review the major research questions in the field.

4. Evaluate if the research questions themselves are valid (question the questions).

5. If you are interested in "X", ask "what is the nature of X?".

6. Ask why biology/evolution gave rise to such a thing.

7. Read papers, book, web pages, while looking for fragments of your idea. Piece them together and you've got a nice problem.

8. Don't get caught in detail: "how do I improve performance by 0.1%?"

9. When stuck, talk to your advisor. While tossing your ideas with him/her a new synthesis arises. Take time to make your advisor understand what you're talking about. Only then he/she will be able to help you.

Speeding Up Research

- Use existing implementations (simulation environment, etc.).

- Test out the working example. Make modifications, and test again.

- Do not reinvent the wheel!

- You may still have to write your own code nonetheless.

- Be meticulous: Before running long simulations, meticulously check all parameters.

- Make daily, weekly, monthly progress. Set up a goal and plan.

- Use a post-it note to write down "To-do" items with check boxes. Check the items that you have done. Take the note off and stick it on your lab note as you go along, to keep it always on top of your note.

- Read other peoples' dissertations to see what is expected.

Reading and Organizing Papers

- Save pdf files as: Author.MediumYEAR-topic.pdf. For example, choe.aaai06-sida.pdf. Save all these in a single directory ($\sim$/epapers, for example).

- When you print out hard copies, make a "subject" folder and put them in there, according to the subject.

- You will tend to see a particular persons name over and over. In this case, make a separate folder with that person's lastname and make it a new folder.

- When reading a book, cut up post-it flags and stick them on the margin where you would normally underline.

- Keep up your interest, and keep on reading, day and night, weekdays and weekends. Bring your book to bed.

- When you go to the library to look for a book, look at other books in that section as well.

Marking Books: Examples
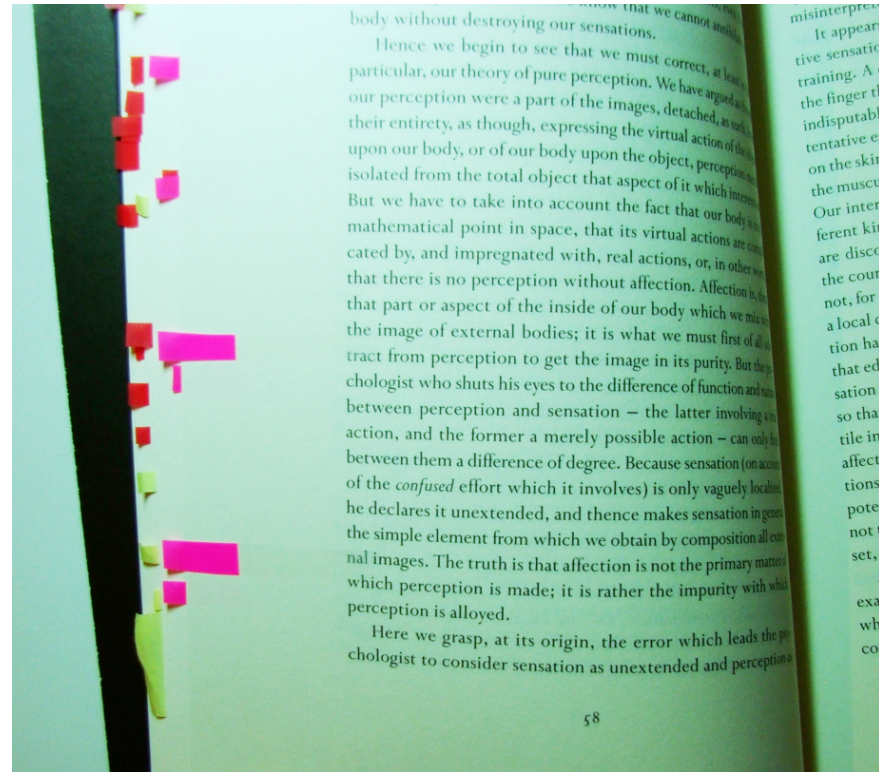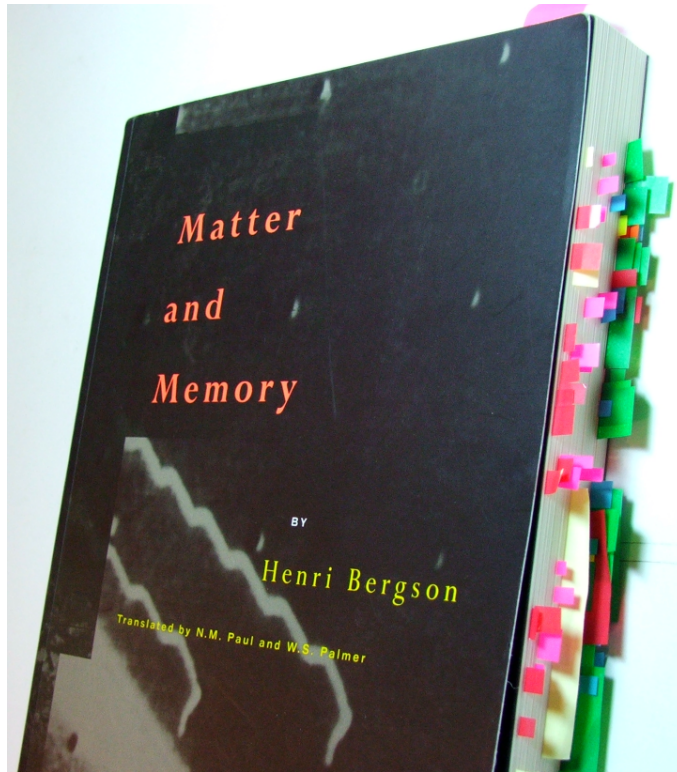
Mark the beginning of sentences, paragraphs, whole pages, etc.

Keeping a Research "Ideas" File

- Keep an electronic research note. A simple ASCII text file is best (do not use MS Word or other complicated programs). For instance, I have a file called `ideas`.

- For each entry, timestamp it, and write whatever idea, URL, quotes, etc. that you come up with.

- When reading a book, if you find an interesting passage, type it up in this file and mention the page number. This becomes really handy later on.

- Occasionally review your notes.

- Do not use fancy applications (one is tempted to use various tools by google).

Example "Ideas" File

```
Tue Aug 16 09:44:48 CDT 2005

        YC: Cognition as internalized tool use.
        - The use of tools in some sense "extends" our motor
          primitives, upon which our understanding of the
          environment is based upon. Thus, tool use may have
          increased our degree of understanding of the natural
          worlds (which is somewhat obvious).


Mon Sep 12 10:34:06 CDT 2005

        Special issue on motor control and internal models
        - http://www.iop.org/EJ/toc/1741-2552/2/3


Mon Jun 19 11:41:29 CDT 2006

        jeannerod:book97
        - p 165: "In other words, the neuronal discharge corresponding to a
          motor representation in the sense used here should encode an
          internal goal, not a target and should relate to an intention,
          not to a movement."
```

Organizing Simulations and Plots

- For each simulation, create one subdirectory (usually something like 06sep05-v1, 06sep06-v2, ...).

- Save all data (in ASCII form, if possible), especially those from which you generated the plots.

- Save exact commands you used to generate the plots.

- When using plots in your paper, use the directory name as a prefix so that you know where the plot came from.

- **Always use vector graphics as opposed to bitmaps.**

Tips: Keeping a Lab Note

- Keep a single letter pad (or a composition book).

- Timestamp with the same simulation directory name.

- Occasionally, draw a table summarizing results from multiple simulations with different parameters, etc.

- Write down parameters that you varied in the table.

- No need to write down all parameters.

- Scribble other stuff that's hard to type in (drawings, diagrams, etc.).

Strogatz's Law

- Strogatz's First Law of Doing Math

  When you're trying to prove something, it helps to know it's true.

- Strogatz's Second Law of Doing Math

  To figure out if something is true, check it on the computer. If the machine agrees with your own calculations, you're probably right.

- The above applies to anything that involves simulations.

  From: http://www.edge.org/q2004/page3.html#strogatz

Building and Using Tools

- Throughout your research career, you will be much better off if you make tool building your habit.

- There are many occasions where investing a small amount of time to write a script can save you a lot of time.

- Also, tools (analysis, plotting, etc.) allow you to engage the subject in ways that were not possible without them.

- Experiment with the tools.

- Learning a tool (plotting program, etc.) takes time. Don't bug your advisor with every detail. Your advisor may be able to give you a quick tour of the main features. Find it out yourself, and document what you've found. (You'll need it again later).

- Master at least one scripting language (perl, python, etc.)

Newton and Tools
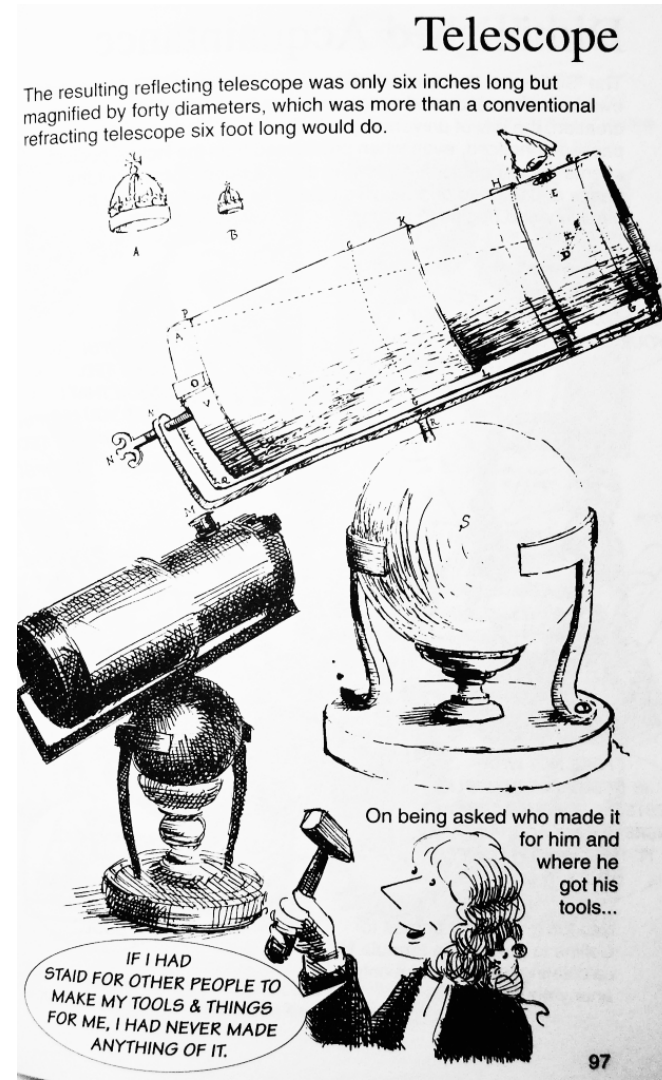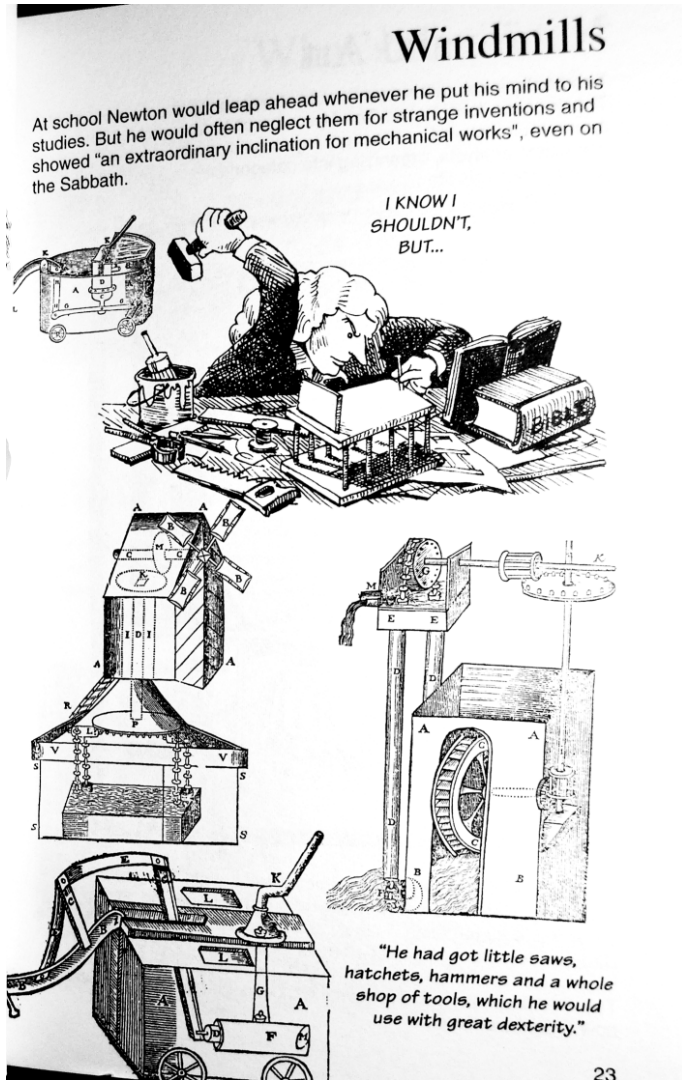
Rankin (1993)

Writing: Basic Language Mistakes

- **Part of speech:** Do not misuse adjective, noun, verb, adverb.

- **Number agreement:** Make singular noun go with singular verb, etc.

- **Pronouns:** Make sure it is clear what pronouns (this, that, it, ...) refer to.

- **Tense:** When referring to things done by you or other researchers in the past, use the past tense. "XYZ (1999) showed that ...". When referring to something in the figure, use the present tense. "The x-axis represents time, and the y-axis the error."

- **Equations:** Equations are part of a sentence. Use the punctuations as usual. Explain all terms used in the equation (variables, functions, constants) right after the equation.

- **Complete sentences:** Write in complete sentences, including the proper subject and verb. Make it clear what did what (to whom).

- **One concept in one sentence:** Do not put too many ideas in one sentence. Break it up.

- **Enumeration:** A, B, C, and D. Never omit the last comma.

Writing Tips

- Run a spell checker.

- **Proofread it twice before you give it to your advisor.**

- Manuscripts containing trivial errors (typographical errors, trivial grammatical errors) will be kindly returned without review.

- As a rule of thumb, you may have to read your whole manuscript over 10 times, back to back, before you send it anywhere.

Writing: Basic Structure

- Introduce the problem.

- Say why it is an important problem.

- What are the existing approaches and their limitations.

- What is your approach, and what is the motivation.

- Explain the technical part.

- Provide results and analysis.

- Discuss the contribution of your work and remaining issues. Discuss relation to other work. Discuss future directions.

- Conclude.

Presentation

- **Motivate:** Don't just show what you did. Say why. Why is it important? Why did you do it this way rather than that?

- **Make it simple:** Do not put too much text on any single page. Keep sentences short. Break down long winding sentences into several shorter sentences.

- **Illustrate:** Add illustrations, figures, etc. to convey your ideas more easily.

- **Slide title:** Use meaningful titles. Don't just say "Plot" or "Result" etc.

- **Evaluate and interpret:** For results/data slides, add at least one sentence saying what is significant (i.e., what is the important feature in the data).

Networking

- Before you go to a conference, review the conference program and identify potentially interesting talks. Study the paper in advance.

- At the talk, ask intelligent questions. After the talk, during the coffee break, introduce yourself to the person and have a chat.

- Look for people you've met before and join in in the conversation.

- Go to departmental colloquia. Do the same as above.

- Go to seminars at other departments. Do the same as above.

Backup!

- Whenever something is irreplaceable, back it up.

- At least copy those main files (programs, latex files, papers) to the CS account.

- `rsync` is a good command for doing this.

References

Claxton, G. (1999). *Hare Brain, Tortoise Mind: Why Intelligence Increases When You Think Less*. Hopewell, NJ: The Ecco Press.

Rankin, W. (1993). *Introducing Newton and Classical Physics*. New York: Totem Books.