All slides were provided by Prof. Kristin Sainani (http://online.stanford.edu/course/writing-in-the-sciences)

SCIENTIFIC WRITING

Steps to becoming a better writer:

- In addition to taking this class, other things you can do to become a better writer:
  - Read, pay attention, and imitate.
  - Write in a journal.
  - Let go of "academic" writing habits (deprogramming step!)
  - Talk about your research before trying to write about it.
  - Write to engage your readers—try not to bore them!
  - Stop waiting for "inspiration."
  - Accept that writing is hard for everyone.
  - Revise. Nobody gets it perfect on the first try.
  - Learn how to cut ruthlessly. Never become too attached to your words.
  - Find a good editor!
  - Take risks.

The big picture

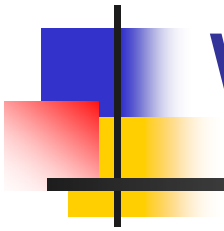
- What information should be included in the proposal /grant application?

The 4MAT system

- **Why** is this proposal important?
- **What** is the proposal (you) planning to do?
- **How** are you planning to do it?
- Which are the **consequences** of the proposal?

Analysis of one proposal

- When we look at a crowded scene we have an immediate subjective impression of seeing every object in front of us. However vivid this impression might be, it is unclear how conscious we are of it. Some experiments have shown that we have poor memory of stimuli in a scene, suggesting that our impression is an illusion and that we are only conscious of those stimuli that are fixated on and attended to. Other experiments, however, have shown that we can encode more than what falls in the center of attention, suggesting that our impression is not an illusion but instead truly reflects sensory consciousness. Deciding which of these incompatible theories is true is one of the most critical issues in understanding how consciousness functions in natural vision. We will directly test this by recording the neural activity in epileptic patients while they freely explore natural scenes. My experiments promise new insights to put an end to this long lasting and central debate in consciousness research.



Writing in the Sciences

Module 4.2: Overview of the Writing Process

Steps in the writing process:

1. Prewriting

- Collect, synthesize, and organize information
- Brainstorm take-home messages
- Work out ideas away from the computer
- Develop a road map/outline

2. Writing the first draft

- Putting your facts and ideas together in organized prose

3. Revision

- Read your work out loud
- Get rid of clutter
- Do a verb check
- Get feedback from others

What does your writing process look like now?

Proportionally, how much time do you think you spend on each step?

1. Prewriting
2. Writing
3. Revision

What I think it should be (roughly!):

1. Prewriting (70%)
2. Writing the first draft (10%)
3. Revision (20%)

1. Prewriting tips

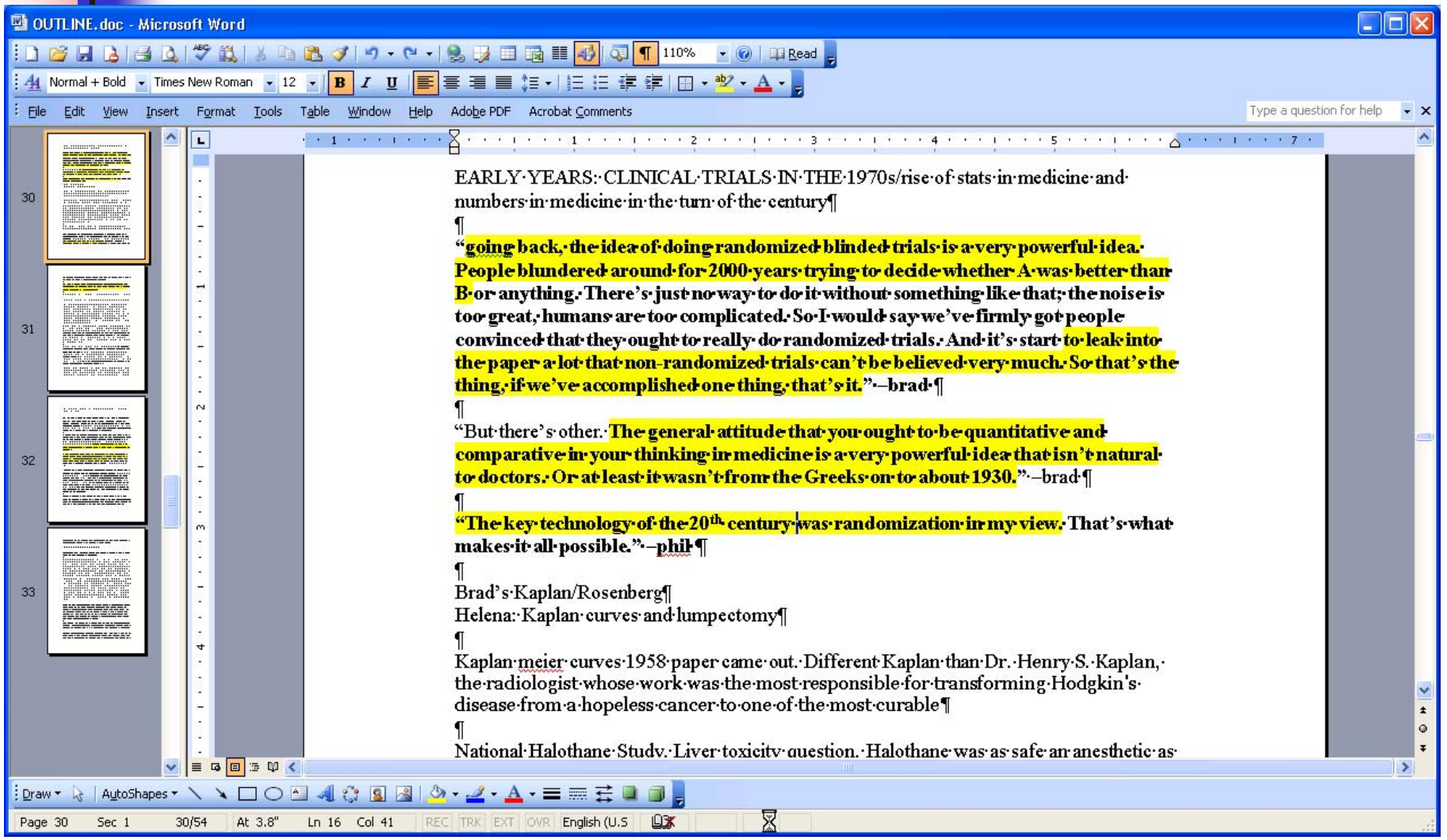
<u>Get organized first!</u>

- Don’t try to write and gather information simultaneously!
- Gather and organize information BEFORE writing the first draft.

Develop a road-map

- Arrange key facts and citations from the literature into a crude road map/outline BEFORE writing the first draft.
- Think in paragraphs and sections…

Example "road-map"



Brainstorm away from the computer

- Write on the go!
  - While exercising (Turn off that ipod!)
  - While driving alone (Turn off the radio!)
  - While waiting in line (Put down the magazine!)
- Work out take-home messages
- Organize your paper
- Write memorable lines

Compositional organization:

1. Like ideas should be grouped.
2. Like paragraphs should be grouped.
3. Don't "Bait-and-Switch" your reader too many times.

    When discussing a controversy, follow:

        arguments (all)

        counter-arguments (all)

        rebuttals (all)

Tips for writing the first draft:

- Don’t be a perfectionist!
- The goal of the first draft is to get the ideas down in complete sentences in order.
- Focus on logical organization more than sentence-level details.

- Writing the first draft is the hardest step for most people. Minimize the pain by writing the first draft quickly and efficiently!

Example of first-draft writing:

It's also difficult to study the biology because the brain is so inaccessible. Cancer scientists can take out a tumor and look directly at the cells, but autism researchers cannot directly study brain cells (except on autopsy), let alone developing brain cells. Stanford is on the cutting edge of solving this problem—in fact, Dolmetsch's solution is so innovative it seems straight out of a science fiction novel.

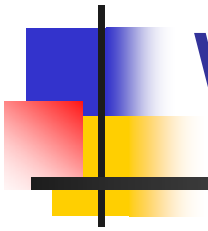
Revised version:

It’s also difficult to access the brain. Scientists can slice cancer cells out of a tumor and directly study them, but they can’t just scoop cells out of the brain, let alone the developing brain. Stanford is on the cutting edge of solving this problem—in fact, Dolmetsch’s solution seems straight out of a science fiction novel.

Final version (after outside editing!):

Another impediment: access to the brain. Scientists can slice cancer cells out of a tumor and study them directly, but they can't just scoop cells out of the brain. Stanford is on the forefront of solving this problem—in fact, Dolmetsch's solution seems straight out of a science fiction novel.

TOOLS FOR EDITION



Writing in the Sciences

Module 3.4: Paragraphs

Paragraph-level tips

- 1 paragraph = 1 idea
- Give away the punch line early.
- Paragraph flow is helped by:
  - logical flow of ideas
  - parallel sentence structures
  - *if necessary*, transition words
- Your reader remembers the first sentence and the last sentence best. Make the last sentence memorable. Emphasis at the end!

Paragraph-level tips

logical flow of ideas:

- Sequential in time (avoid the *Memento* approach!)
- General→ specific (take-home message first!)
- Logical arguments (if a then b; a; therefore b)

Example (from *The New Yorker*)

Usually, when a defendant absconds, a bondsman hires a bounty hunter to find and arrest him within the grace period (which, in California, is six months). If that fails, the bondman tries to seize any collateral that the defendant put down to secure the bond, or sues the defendant's "indemnitors," who signed the bail application as guarantors. But Zabala hadn't put down any collateral, and so far Green—one of the few bondsmen who always do their own bounty hunting—had found neither him nor his indemnitors. The grace period was nearly up. Soon, Green would have to pay the court thirty-one thousand dollars.

organized by: time sequence and general→ specific

1. First, a bondsman hires a bounty hunter to find and arrest the defendant within the grace period.

2. Then, if that fails, the bondman seizes collateral or sues indemnitors.

3. Now, in this specific case, the defendant (Zabala) is AWOL and has no collateral or available indemnitors

4. Conclusion: the bondswoman (Green) is out of options.

Notice how the author didn't need to write "first," "then," "in this specific case," or "conclusion"→ the organization of sentences and context gives readers these clues without spelling them out

Overview: Principles of effective writing

- 1. Cut unnecessary words and phrases; learn to part with your words!
- 2. Use the active voice (subject + verb + object)
- 3. Write with verbs: use strong verbs, avoid turning verbs into nouns, and don’t bury the main verb!

Common clutter:

- 1. Dead weight words and phrases
  - As it is well known
  - As it has been shown
  - It can be regarded that
  - It should be emphasized that
- 2. Empty words and phrases
  - basic tenets of
  - methodologic
  - important
- 3. Long words or phrases that could be short
  - muscular and cardiorespiratory performance

"Some words and phrases are blobs."
-- William Zinsser in *On Writing Well*, 1976

Common clutter, continued:

- 4. Unnecessary jargon and acronyms
  - muscular and cardiorespiratory performance
  - Gliomagenesis
  - miR
- 5. Repetitive words or phrases
  - studies/examples
  - illustrate/demonstrate
  - challenges/difficulties
  - successful solutions
- 6. Adverbs
  - very, really, quite, basically, generally, etc.

Long words and phrases that could be short…

Wordy version	Crisp version
A majority of	most
A number of	many
Are of the same opinion	agree
Less frequently occurring	rare
All three of the	the three
Give rise to	cause
Due to the fact that	because
Have an effect on	affect

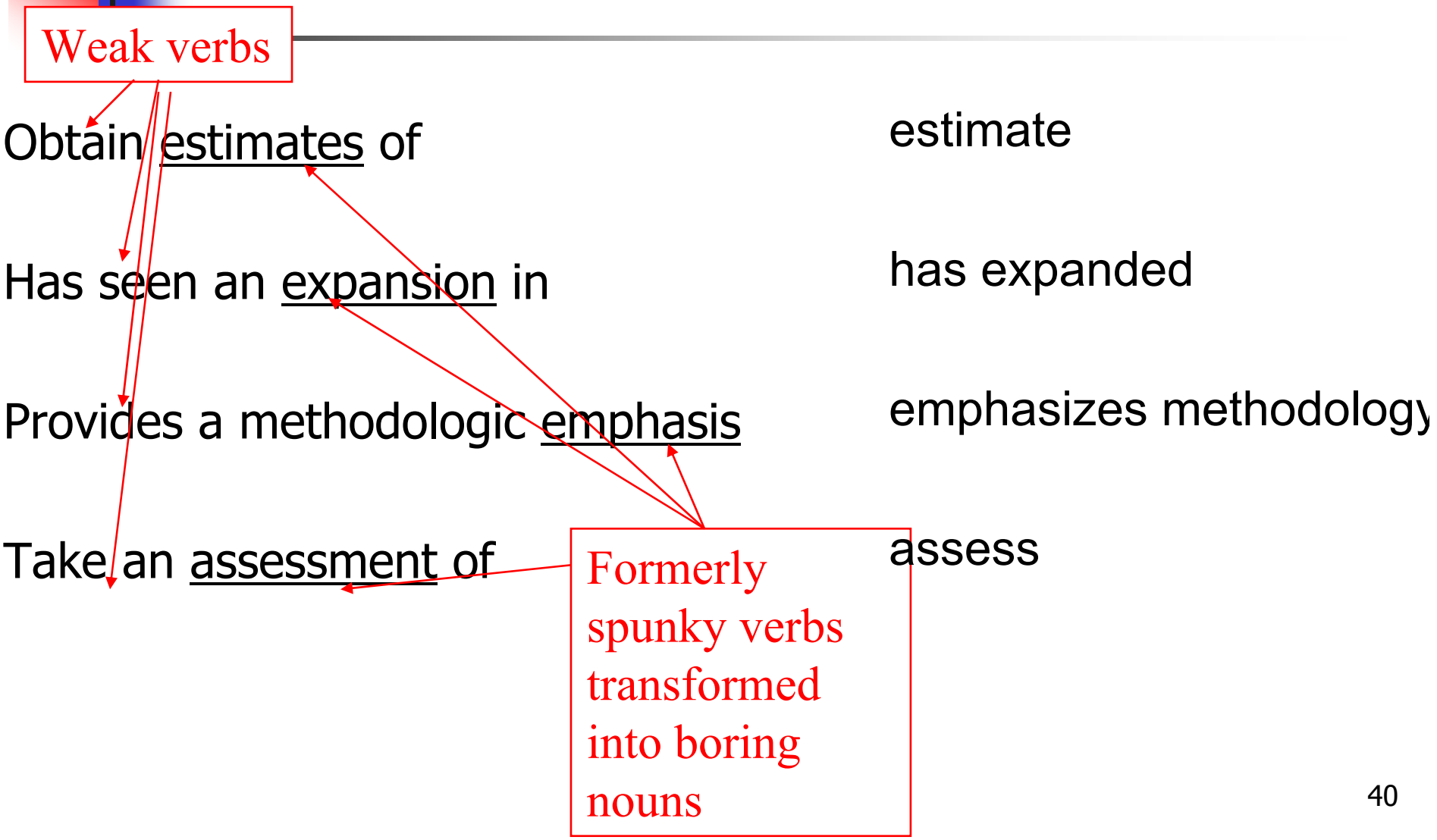
A few other small tricks…

- Eliminate negatives
- Eliminate superfluous uses of “there are/there is”
- Omit needless prepositions

Eliminate negatives

Not honest	dishonest
Not harmful	safe
Not important	unimportant
Does not have	lacks
Did not remember	forgot
Did not pay attention to	ignored
Did not succeed	failed

Don't turn verbs into nouns



Don’t turn verbs into nouns

Provide a review of	review
Offer confirmation of	confirm
Make a decision	decide
Shows a peak	peaks
Provide a description of	describe

Parallelism

Not Parallel:

If you want to be a good doctor, you must study hard, critically think about the medical literature, and you should be a good listener.

Parallel:

If you want to be a good doctor you must study hard, listen well, and think critically about the medical literature. (imperative, imperative, imperative)

Parallel:

If you want to be a good doctor, you must be a good student, a good listener, and a critical thinker about the medical literature. (noun, noun, noun)

Parallelism

Not Parallel:

This research follows four distinct phases: (1) establishing measurement instruments (2) pattern measurement (3) developing interventions and (4) the dissemination of successful interventions to other settings and institutions.

Parallel:

This research follows four distinct phases: (1) establishing measurement instruments (2) measuring patterns (3) developing interventions and (4) disseminating successful interventions to other settings and institutions.

THE END