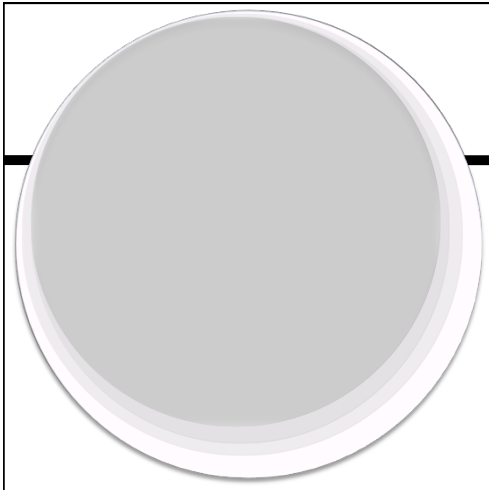

Research Methods in CS

Actors and Actions in Scientific Writing

Actors and Actions

Principles:

1. **Put actions in verbs**
2. **Put actors in subjects**
3. **Keep subjects near verbs**

Acknowledgement:

- **Slides based mostly on Duke University Graduate School Scientific Writing Resource at https://cgi.duke.edu/web/sciwriting (Subjects and Actions)**

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Principle 1: Put actions in verbs

- **Nouns are words for things –** *chair, table*
- **Verbs are action words –** *to observe, to analyze*
- **Verbs can be turned into nouns –** *observation, analysis*
  - **Called** *nominalizations* **–** *concept nouns* **or** *abstract nouns*
  - **Hide action within a thing**
- **Scientific writers often use "clunky" (awkward) abstract nouns instead of "spunky" (strong, interesting) verbs**
  - **Don't misuse abstract nouns to convey action**

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Put actions into verbs

Action	Nominalization
to observe	observation
to analyze	analysis
to occur	occurrence
to understand	understanding
to investigate	investigation
to perform	performance
to compile	compilation
to execute	execution
to allocate	allocation
to improve	improvement

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Put actions in verbs

- Readers expect sentence's main action in verb (predicate)
- Scientific writers often use abstract nouns to convey main action, use weak verbs
- This disconnects meaning from expected structure

Clunky abstract noun; bland, weak verb: *We performed an analysis on the data.*

Spunky verb: *We analyzed the data.*

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Put actions in verbs

Revision technique for sentences:

- Underline all nominalizations (concept/abstract nouns)
- Should each be changed to verb?

Alternative technique:

- Underline all verbs
- Does each verb capture main action of sentence?

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Put actions in verbs

- Nominalizations not always bad – can provide useful link backwards to actions

  We analyzed the data. This analysis demonstrates the need for additional experiments.

  Summary of Principle 1:

  Use "spunky" verbs instead of "clunky" nouns to convey action

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Principle 2: Put actors in subjects

Readers expect main actor to be found in sentence's subject

✖*The analysis of the data from the experiment was performed by the team's statistician using a suite of R programs.*

Above uses abstract noun for subject, weak verb, 20 words

✔*The team's statistician analyzed the data from the experiment using a suite of R programs.*

Above extracts action from abstract noun, makes main verb, moves actor to subject, 15 words

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Put actors in subjects

✔*The team's statistician analyzed the data from the experiment using a suite of R programs.*

What about the following alternative?

✔*The team's statistician used a suite of R programs to analyze the data from the experiment.*

Which is better?

It depends upon whether "to use R" or "to analyze data" is more important in the context

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Put actors in subjects

- **Grammatical subject of sentence answers: What is this sentence about?**
- **Scientific writing often exhibits *subject shifting*: subjects change erratically throughout a paragraph**
- **Subjects should shift only when the topic shifts**
- **Paragraphs effective when they discuss**
  1. **a single topic**
  2. **series of related topics that build logically on one another**

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Put actors in subjects

✔ *To understand human evolution, genomes from related primates are necessary. For example, several primate genomes are needed to identify features common to primates or unique to humans. Fortunately, such genome-wide exploration is now a reality; in the past 5 years, genome sequences of several nonhuman primates have been released.*

Subjects and main actors are "primate genome sequences"

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Put actors in subjects

✖ *To understand human evolution, genomes from related primates are necessary. For example, identification of features common among primates or unique to humans will require several primate genomes. Fortunately, scientists can now do such genome-wide exploration; in the past 5 years, the community has released several nonhuman primate genome sequences.*

Above shifts subject twice, disconnecting it from the topic of the paragraph

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Put actors in subjects

✔ ***Technology often drives science. Among the most impressive recent technological advances is DNA sequencing. More efficient sequencing has reduced the cost of generating sequence data significantly. Cheaper data in turn enables more researchers to do data-intensive experiments, which results in a huge amount of data being released into the public domain. Dealing with data in such large quantity will require a new generation of scientists.***

Subject shifts, but flows logically to make an argument

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Put actors in subjects

Revision technique for paragraph:

- **Highlight subject of each sentence**
- **Does the structure of subjects match information meant to be conveyed?**
  a. **do subjects jump from one thing to another abruptly?**
  b. **do subjects shift only when intended topic shifts?**

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Principle 3: Keep subjects near verbs

- Confuses readers if who and what of sentence are far apart
- Often caused by long, complex subjects with verb at end
- Must reparse (reread) sentence to understand it.

✖*Farmers that understand the difference between the soil requirements of plants when they are seedlings and their requirements when they are mature are in high demand.*

✔Farmers are in high demand if they can understand the difference between the soil requirements of plants when they are seedlings and their requirements when they are mature.

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Keep subjects near verbs

- Long lists break link between subject and verb, forcing readers to reparse sentence
  - ✖ *Peanuts, shrimp, almonds, milk or anything else with lactose, and wheat or anything with gluten all represent foods that people are commonly allergic to.*
- Revise by establishing context before list
  - ✔ *People are commonly allergic to foods like peanuts, shrimp, milk or anything else with lactose, and wheat or anything else with gluten.*

Note: This uses weak "to be" verb, but sentence is understandable

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Keep subjects near verbs

Revision technique for sentences:

- **Identify the main subject and its verb**
- **If far apart, rephrase sentence to bring closer together**

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Keep subject near verbs

Consider example sentence:

✖ ***The TRANSFAC database has been subject to different improvements, modifications, and extensions in structure and content over the years.***

- **Uses list of abstract nouns to convey action**
- **Has awkward and meaningless verb "*has been subject to*"**

Possible revision:

✔ ***The TRANSFAC database has been improved, modified, and extended in both structure and content over the years.***

- **Do we need all the verbs? Does *improved* imply *modified*? imply *extended*?**
- **If implied, they are clutter. Cut the clutter!**

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Keep subject near verbs

Consider example sentence:

✖ ***Mapping of open chromatin regions, post-translational histone modifications and DNA methylation across a whole genome is now feasible, and new non-coding RNAs can be sensitively identified via RNA sequencing.***

- **Gives list before establishing context**
- **Has main action in nominalization "mapping"**

Possible revison:

✔ ***It is now feasible to map open chromatin regions, post-translational histone modifications and DNA methylation across a whole genome, and to sensitively identify new non-coding RNAs via RNA sequencing.***

- **Easier to understand**
- **Perhaps break two parts into two sentences (at *and*)**

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Keep subject near verbs

Consider example sentence:

✖ ***Significant positive correlations were evident between the substitution rate and a nucleosome score from resting human T-cells.***

- **Has main action in nominalization "correlation"**
- **Intended action probably not "were evident"**

Possible revision:

✔ ***In resting human T-cells, the substitution rate correlated with a nucleosome score.***

- **Perhaps add "positively" after "correlated"**
- **Straightforward, shorter**

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Keep subject near verbs

Consider example sentence:

✖ *The possibility that some termini have a base composition different from that of DNA simply because they are the nearest neighbors of termini specifically recognized by the enzymes can be checked by comparing the experimental results with those expected from the nearest neighbor data.*

- **Extreme case of subject verb separation**

Revision to bring *possibility* and *checked* nearer

✔ *If we compare the experimental results with those expected from the nearest neighbor data, we can check the possibility that some termini have a base composition different from that of DNA simply because they are the nearest neighbors of termini specifically recognized by the enzymes.*

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Keep subject near verbs

First revision (repeated from previous slide):

✔ *If we compare the experimental results with those expected from the nearest neighbor data, we can check the possibility that some termini have a base composition different from that of DNA simply because they are the nearest neighbors of termini specifically recognized by the enzymes.*

Second revision:

✔ *If we compare our expectations with experimental results, we identify any termini that differ in base composition simply because they are the nearest neighbors of those specifically recognized by the enzymes.*

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