



**ENGINEERING
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Cohesion, Flow

Managing subjects in sentences

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Cohesion, a sense of flow

Managing subjects in sentences

Engineers often mismanage subjects in their sentences because the information they are reporting is familiar to them, but not to readers.

Engineers should follow two principles when managing subjects in sentences to achieve better cohesion or flow:

- 1) place only familiar or old information in subjects (new information goes in the predicates)
- 2) keep subjects and introductory clauses short; arrive at the verb quickly.

The annotated sample below shows these two principles in a simple paragraph.

Subject (vegetation) is short, arrives to the verb (covers) quickly.

The subject of the next sentence contains old information from the previous sentence, "plants," which is another word for vegetation.

Predicates contain new information and can be long.

Vegetation covers the earth, except for those areas continuously covered with ice or utterly scorched by continual heat. Plants grow in richly fertilized plains, river valleys, as well as at the edge of perpetual snow in mountains. Dense vegetation grows not only in and around lakes and swamps, but under and along oceans. Plants even grow in the cracks of busy streets and in seemingly barren cliffs. Vegetation existed here on earth before man appeared and it will continue here long after evolution has swallowed us up.

The subjects alternate between "vegetation" and "plants," ensuring strong cohesion. Each subject is short; predicates are long and contain new information.

Williams, Joseph M. *Style: Ten Lessons in Clarity and Grace*, 5e, 1997. p112.

In the paragraph above, good cohesion would still exist if any sentence after the first one contained information that was introduced in any of the previous predicates.

For example, "continual heat" was introduced in the predicate of the first sentence; that phrase could then be used as a subject in another sentence in that paragraph, if needed. The cohesion would still be strong.

A second sentence could read as follows:

Old information, because it was introduced in the predicate of the previous sentence.

The continual heat of deserts explains why plants cannot survive there unless they are accompanied by nearby water sources such as springs, rivers, lakes, and rain.

These two principles applied

The column below contains the first two paragraphs of an article in *Scientific American*, “High Robot,” (May 2017, p. 21) that shows good management of subjects. The subjects of each sentence are underlined; comments on these subjects are shown in red, at right.

Robots are notoriously lousy jumpers. Some can jump high, but not repeatedly, over a short period.

“some” refers to “robots” of the previous sentence

And vice versa. Duncan Haldane, a roboticist and Ph.D. student at the University of California, Berkeley, realized one implication of this shortcoming—many existing bots cannot maneuver large gaps and high hurdles at, say, a disaster site where they are doing rescue work. So Haldane turned to the animal kingdom to study nature’s best jumpers, hoping to select one as a model for a more agile, autonomous machine.

“Duncan Haldane” is new information, but is immediately qualified by “roboticist” to link the name to previous sentences. Thus, “Duncan Haldane” is old or familiar information and cohesion is maintained.

In this independent clause, “bots” (short for “robots”) is the subject, and is old information.

“Haldane,” is old information, introduced earlier.

Haldane started by creating a measure to assess both how high and how rapidly an animal could jump. His further research determined that nature’s best continuous jumper is the galago, or bush baby, a nocturnal primate native to Africa. The galago’s agility metric was twice that of any contemporary jumping robot. The results were detailed in a recent issue of *Science Robotics*.

“His” refers to “Haldane,” then adding “research.” Good cohesion.

Note this new information in the predicate, “galago,” becomes the subject of the next sentence, an excellent example of using previous information (old) to introduce new information.

“Results” here is familiar information in the context of the “measure to assess” and “research” in the first two sentences of this paragraph.

In the excerpt above, all of the information is familiar to the author who has researched and gathered it over time. The challenge for the author—and for engineers in similar situations—is to consider the readers who are seeing this information for the first time. The author, and engineers, do not accumulate all of their information at one time, and must realize that readers need help in learning the information in a short time (while reading) compared to the author—and engineers—who have had much more time in learning the topic and the information they are presenting. Engineers help this understanding by using old or familiar information in the subject to introduce new information in the predicate.

Good management of subjects compared to bad management of subjects

The two columns below compare the good cohesion (left) of the *Scientific American* article on page 4 and the bad cohesion (right) of the same information. The column on the right contains the same information as the column on the left, but the subjects are mismanaged, as if the text were an early draft whose author is familiar with all of the information but is not considering the readers.

good, same text as on page 2

Robots are notoriously lousy jumpers. Some can jump high, but not repeatedly, over a short period. And vice versa. Duncan Haldane, a roboticist and Ph.D. student at the University of California, Berkeley, realized one implication of this shortcoming—many existing bots cannot maneuver large gaps and high hurdles at, say, a disaster site where they are doing rescue work. So Haldane turned to the animal kingdom to study nature’s best jumpers, hoping to select one as a model for a more agile, autonomous machine.

Haldane started by creating a measure to assess both how high and how rapidly an animal could jump. His further research determined that nature’s best continuous jumper is the galago, or bush baby, a nocturnal primate native to Africa. The galago’s agility metric was twice that of any contemporary jumping robot. The results were detailed in a recent issue of *Science Robotics*.

bad

A notoriously lousy jumper is a robot. Over a short period, but not repeatedly, high jumps can be performed by robots. And vice versa. For example, at a disaster site where rescue work is being performed by robots, large gaps and high hurdles cannot be maneuvered by many existing bots—an implication of this shortcoming was realized by University of California Ph.D. student and roboticist Duncan Haldane. Hoping a more agile, autonomous machine that can serve as a model could be selected, a turning to the animal kingdom to study nature’s best jumpers was done by Haldane.

An assessment of both how high and how rapidly an animal could jump was created by Haldane first. That a nocturnal primate native to Africa, called a bush baby or a galago, is nature’s best continuous jumper was determined by his research. Compared with any contemporary jumping robot, the galago’s agility metric was double. Science Robotics, in a recent issue, is where details of these results can be found.

A common problem: old info in the predicate

Engineers often place old information in the predicate when that information should instead be the subject of the sentence. In the sample paragraph below, the second sentence contains new information in the subject, but old information is in the predicate. That old information should precede the new information, as shown in the second, revised, paragraph.

from a proposal on smart refrigerators

Smart refrigerators have been on the market for the past five years; however, they have had little to no success because they are not practical. **Features such as food-quantity tracking, food expiration dates, and usage patterns** are desirable in a smart refrigerator, but they are not available today's mass-produced smart refrigerators.

new information is in the subject

old info in the predicate

revised:

Smart refrigerators have been on the market for the past five years; however, they have had little to no success because they are not practical. **Mass-produced smart refrigerators** today do not have desirable **features such as food-quantity tracking, food expiration dates, and usage patterns.**

old info now as the subject

new info moved to the predicate

"This" as a subject: the unsupported "this"

The demonstrative pronoun "this" often can be a subject of a sentence. Writers can help readers clarify what "this" refers to from the previous sentence by placing a noun after "this." The first sentence of the sample below contains four possible referents for the "this" of the following sentence.

Furthermore, the level of LN_2 in the Dewar decreased during the experiment from the evaporation of LN_2 and subsequent formation of droplets on the surface above the sphere near the opening. **This** influenced the sting . . ."

does "this" refer to "decrease" "evaporation," or "formation," or all three? Readers may not quickly determine the referent of "this."

revised:

Furthermore, the level of LN_2 in the Dewar decreased during the experiment from the evaporation of LN_2 and subsequent formation of droplets on the surface above the sphere near the opening. This **decrease** influenced the sting . . ."

the noun "decrease" added for clarity