WRITER'S GUIDE FOR ENGINEERS

Adapted from the Academic Writing in English Project for the Finnish Virtual University

Contents

Chapter 1

INFORMATION ORDERING

This chapter focuses on three essential principles that will make your writing more reader-friendly:

- According to the **given-new principle**(section 1.1), sentences should begin with something that has already been mentioned, or is otherwise familiar to the reader, before introducing new information. A given-before-new ordering makes it easier for readers to see how each new piece of information fits into what they already know.

- Writers should also aim to **create focus**(section 1.2.1) in their texts. Creating a focus requires writers to keep two things in mind. Firstly, they need to determine what the text is 'about' by selecting appropriate topics. Secondly, they need to use strategies to keep the text topic 'in the spotlight' as the text develops from sentence to sentence. This we call organising flow.

- The **light before heavy** (section 1.3) principle recommends that verbs should occur fairly soon in English sentences, before any long, complex noun phrases. In this way, the writer can make it easier for readers to process the message.

1.1   The given-new principle

As a writer, it is important that you are aware of your reader's expectations.

Readers expect that any new information will be presented within the context of something which is familiar to them. Familiar information consists of 2 types of information. The first is something that has already been mentioned fairly recently in the text above (even if not in the same words!). The second type of information is that which is familiar to the readers from their general or specialist knowledge about the subjects discussed in the text.

What this all means is that **good writers generally place familiar information** (or at least what they assume to be familiar!) **before new information** in the sentence. This ordering (**given-before-new**) makes it easier for readers to see how each new piece of information fits into what they already know. Just as students expect their professors to schedule the 'Introduction to physics'

course before the course in 'Quantum physics', readers expect that writers will first provide them with an orientation to a subject before presenting unknown material.

If a writer begins sentences with new elements of information, readers may be unable to see what the text is really about and relate the new information to what has come before, or what they already know. For that reason, it is essential that you know the mechanics of the given-before-new principle.

What makes a text easy to read?

Here are two versions of a text. Which do you find easier to understand?

> **Text A:**
>
> [1]The application of science to the creation of useful devices to meet the needs of society is called mechanical engineering. [2]The design, manufacture, operation and maintenance of a wide variety of machinery are the focus of a mechanical engineer's work. [3]Jet engines and minute instruments for use in medicine are amongst the products designed by mechanical engineers. [4]Engineering drawings of the devices which are to be produced are created by mechanical engineers. [5]Manual work was the normal means of creating drawings before the late 20th century, but computer-aided design (CAD) programs have been used to create drawings and designs since the use of computers became widespread. [6]Three-dimensional models can be used directly for manufacturing the devices thanks to modern CAD programs.

> **Text B:**
>
> [1]Mechanical engineering is the application of science to the creation of useful devices to meet the needs of society. [2]Mechanical engineers focus on the design, manufacture, operation and maintenance of a wide variety of machinery. [3]The products of their work range from jet engines to minute instruments for use in medicine. [4]Mechanical engineers usually create engineering drawings of the devices which are to be produced. [5]Before the late 20th century, drawings were usually made manually, but the widespread use of computers has now enabled the creation of drawings and designs using computer-aided design (CAD) programs. [6]Modern CAD programs allow engineers to produce three-dimensional models, which can be used directly in the manufacture of the devices depicted.

Most people prefer text B. Why? Although both texts introduce the same information, the order in which the information is presented is different.

Text A is less effective because it is difficult to see what the paragraph is about. Each sentence starts with **new information** which at first sight does not appear to be related to what has come before. This is why you may have found this version more difficult to understand. In fact, Text A appears to be about seven different topics (in bold below), making it hard to see what point the writer wants to make.

> **Text A:** 🥴 [1]**The application of science** to the creation of useful devices to meet the needs of society is called mechanical engineering. [2]**The design, manufacture, operation and maintenance** of a wide variety of machinery are the focus of a mechanical

engineer's work. [3]**Jet engines and minute instruments** for use in medicine are amongst the products designed by mechanical engineers. [4]**Engineering drawings** of the devices which are to be produced are created by mechanical engineers. [5]**Manual work** was the normal means of creating drawings before the late 20th century, but **computer-aided design (CAD) programs** have been used to create drawings and designs since the use of computers became widespread. [6]**Three-dimensional models** can be used directly for manufacturing the devices thanks to modern CAD programs.

A framework for hanging new information

Text B is more effective because each sentence (apart from the first one) begins with something that has already been mentioned, or is otherwise familiar to the reader (**given** information). In this text, the **new** information is placed at the end of the sentence. This **given-before-new** ordering makes it easier for readers to see how each new piece of information fits into what they already know. Thus, **given information** provides a context that helps us make sense of what is new.

> **Text B:** 🤓 [1]**Mechanical engineering** is the application of science to the creation of useful devices to meet the needs of society. [2]**Mechanical engineers** focus on the design, manufacture, operation and maintenance of a wide variety of machinery. [3]**The products of their work** range from jet engines to minute instruments for use in medicine. [4]**Mechanical engineers** usually create *engineering drawings* of the devices which are to be produced. [5]Earlier, **drawings** were usually made manually, but the widespread use of computers has now enabled the creation of drawings and designs using *computer-aided design (CAD) programs*. [6]**Modern CAD programs** allow engineers to produce three-dimensional models, which can be used in the manufacture of the devices depicted.

In the diagram below, you can see how given information is consistently placed at the start of the sentence. Note also how information that is *new* in one part of the text becomes **given** later.
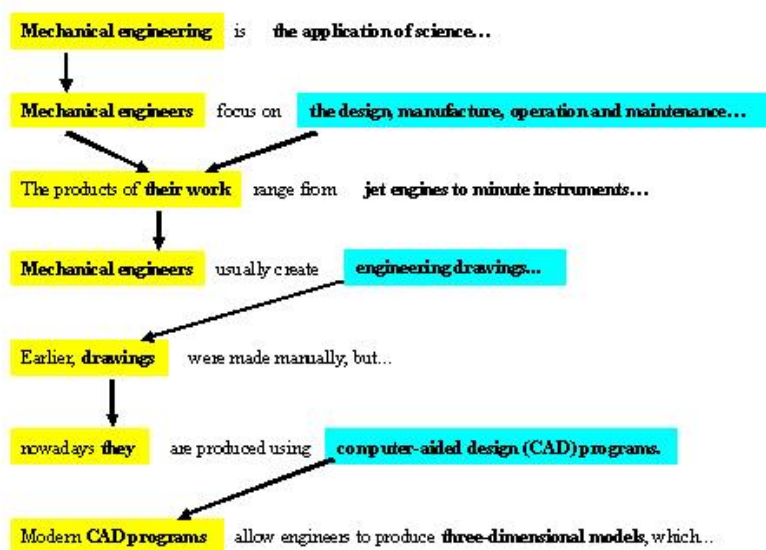
Just as a coat rack provides pegs on which to hang your jackets to keep them in order, the given-before-new principle helps readers to keep their thoughts in order.

1.2 Organizing flow

As we have seen in the module on the given-new principle, it is important to put familiar information at the start of sentences, and save until the end any new ideas, or ideas that we want to bring to the readers' attention. This sequencing of information can give a sense of **flow** (also often called **cohesion**) to your writing. However, flow alone is not enough. Your text must also have a sense of **unity** (coherence), that you are discussing something, not simply introducing or briefly touching on a list of ideas.

We can imagine **cohesion** (given-new) as a river of ideas, **full of movement**, flowing smoothly in a single direction from one idea to the next. Like rivers, texts also have deeper stretches (akin to Finnish *suvannot*) where there is less movement in the onward flow. Although these stretches are part of the same flow, they allow the writer to develop and deepen the discussion within a particular theme. It is this conscious focus on a theme that creates the unity or **coherence** of a text.

This module shows you how you can improve the coherence in your texts. The following pages highlight the importance of choosing which information you place in the **given** position at the start of the sentence (creating a focus) and explore the typical patterns (topical progression) used to maintain and develop topics. The module also provides you with language strategies that help you to shift items around in your sentences in order to keep the focus on the right topic.

1.2.1 Creating focus

Topic and comment

Topic and **comment** are very closely connected to the concepts of **given** and **new** information. These concepts will be helpful to us in the rest of this module. More precisely, we can define topic and comment as follows.

The **topic** is the matter or idea currently being discussed in the text. Like given information, the topic is usually placed at the beginning of a sentence or clause (*sivulause*) and often comprises an idea which is already familiar to or anticipated by the reader. It has the important function of helping readers to follow the development of the text. Often, the topic may be a repetition, synonym or paraphrase of an idea mentioned earlier. The writer puts an idea in topic position in order to focus the reader's attention on what is being discussed.

The **comment** is what is being said **about** the matter or idea currently being discussed. The comment is normally found towards the end of a sentence or clause. It usually provides the reader with new information related to the topic, or information that otherwise needs to be brought to the reader's attention.

Topic(Given)	Comment (New)
The **comment** ↓	is **what is being said** about the matter or idea currently being discussed.
The **comment** ↓	is normally found towards the end of a sentence or clause.
It	usually provides the reader with **new information** related to the topic, or information that otherwise needs to be brought to the reader's attention.

Let's now look at how choice of topic affects the way a reader perceives the writer's message.

In addition to ensuring that the **given-new** ordering (*cohesion*) of your information is preserved, it is also important to give your writing a **focus** (*coherence*). You can do this by carefully choosing your topic at the beginning of each sentence.

To understand why, look at the example paragraph below.

> **Good cohesion, but no coherence:**
>
> [1]Romance languages descend from *a Latin parent*, and **many words based on Latin** are found in other modern languages such as *English*. [2]**English** has become the lingua franca, the learned language of science and trade. [3]**Science** is based on experimentation, *description*, and categorisation. [4]**Descriptions of the 'northern lights', or Aurora Borealis,** often incude the words 'twinkle' or 'flicker' to explain the movement created when solar ions collide with the Earth's atmosphere.

The paragraph has excellent **cohesion** of *given* and *new* information between sentences, but it still makes no sense, because it seems to 'jump around' from one topic to the next. **What is the topic of this paragraph? What is it about?** The writer just doesn't seem to be able to **'stick to the point'**. The paragraph has no *focus*, because it completely lacks a single unifying **topic**.

Choosing a focus

The position at the beginning of the sentence, especially that of the grammatical *subject* is important to the reader, since it tells the reader what the sentence is **about**, that is, the **topic**. Therefore, once you have decided on what will be the focus of your paragraph, aim to place this in topical subject position at the beginning of the sentence.

However, how do you decide which *given information* should be placed at the beginning of the sentence as your topic? This can be a problem, as there can be more than one potential candidate for the *topic*. The example below lacks topical focus. **What should be the topic?**

> **What is the topic of this paragraph? What is it about?**
>
> [1]Since 1957, when IBM introduced the first disk drive, **information in computers** has primarily been stored on the magnetic disk drive. [2]**Semiconductor random access memory** is not as effective as magnetic disk drives for long-term storage of information in the absence of electrical power. [3]**The disk format and the relatively short access time** make magnetic disk drives ideal for storing online information. [4]Although sometimes taken for granted because of its long history of continual advancement, **magnetic disk drives** have been critical to the information technology revolution we have been experiencing.

The above paragraph lacks both **cohesion** (linking of given and new information) and coherence (topical focus). It is hard to tell because the writer seems to jump around and can't make up his mind about what the main idea. In fact, the paragraph contains 4 separate topics.

So, which of these should be promoted as the **topic** into subject position?

> **A.information**
>
> **B.semiconductor random access memory**
>
> **C.disk format and access time**
>
> **D.magnetic disk drive**

The best alternative as the topic of this paragraph is **information**.

If we look at what is hidden among the **comment** (new information) information, we can find two possible candidates for the topic. Both *magnetic disk drives* and **information** seem to appear repeatedly as **comment**, thus making them more likely candidates for the topic of this paragraph.

> [1]Since 1957, when IBM introduced the first disk drive, **information in computers** has primarily been stored on *the magnetic disk drive*. [2]Semiconductor random access memory is not as effective as *magnetic disk drives* for long-term **storage of <u>information</u>** in the absence of electrical power. [3]The disk format and the relatively short access time make *magnetic disk drives* ideal for **storing online <u>information</u>**. [4]Although sometimes taken for granted because of its long history of continual advancement, *magnetic disk drives* have been critical to the information technology revolution we have been experiencing.

Which would make the better topic for this paragraph? What is it really about?

Choose the text below that you feel best reflects what this paragraph is really about!

TEXT A	TEXT B
[1] Since 1957, when IBM introduced the first disk drive, INFORMATION **in computers** has primarily been stored on the magnetic disk drive. [2] In the absence of electrical power, **long-term storage of INFORMATION** can be provided by magnetic disk drives, but not semiconductor random access memory. [3] **Online INFORMATION** is typically stored on magnetic disk drives, because of the disk format and the relatively short access time, which disks provide for data. [4]Although sometimes taken for granted because of its long history of continual advancement, *magnetic disk drives* have been critical to the information technology revolution we have been experiencing.	[1]**The magnetic disk drive** has been the primary means of storing information on computers since 1957 when IBM introduced the RA-MAC, the first disk drive. [2]Unlike semiconductor random access memory, **magnetic disk drives** can provide long-term storage of information in the absence of electrical power. [3]Because of the disk format and the relatively short access time, which disks provide for data, **they** are typically used for online storage of information [4]Although sometimes taken for granted because of its long history of continual advancement, **magnetic disk drives** have been critical to the information technology revolution we have been experiencing.

Note: You wouldn't have been completely wrong even if you had chosen the other text, **text A**. Often writers use a General-Specific pattern to organise their sentences when describing a concept.

Just as in text A, such a pattern first introduces general information at the beginning of the text, and then narrows the topic down as you progress through the text until it reaches a final focus (what the text was really about).

1.2.2 Topical progression

Let's now take a look at the conventional patterns of topical progression used to maintain and develop topics.

We have seen that writers need to keep the topic of discussion clearly in focus if they want to create a text which flows onwards smoothly and logically.

Moreover, writers also need to be aware of the way in which topics change and move on through a paragraph in English academic writing. The development of topics through a paragraph or longer pieces of text is called **topical progression**. Topical progression creates **bridges** from one part of your text to the next.

Sometimes, the topic is the same from one sentence to the next, but the topic changes usually at some point as the writers message progresses and the 'story' moves on.

There are **four basic patterns** that writers can use to create a focus and develop topics in English texts. However, the patterns found in academic writing are rarely as simple as presented in the following page! Normally, texts are a mixture of the four patterns.

Pattern 1: Constant topic

Here, the writer uses the same topic in a series of sentences. Often, the actual word(s) used in the topic of the first sentence may be repeated using identical wording or reduced wording (**ceramic ink** → **ink**) in the topic of a later sentence. However, a **synonym** or **pronoun** (*it, they, this, these*) may also be used to refer to the same topic. Although this is the most common of the four patterns, the same topic cannot be continued endlessly. We also need the **progressive pattern** to move the text forward from a static description of one item to a new topic.

Table 1.1: Constant topic

topic	comment	
A	B	On the basis of the study, **a ceramic ink** was formulated for multilayer printing.
↓		
A	C	**It** contained submicron TiO_2 with dispersant and resin addition such that the ceramic powder occupied 60 vol.% based on the dry weight.
↓		
A	D	**The ink** was diluted with ethanol such that the ceramic occupied 3.99% volume.
		Reprinted from Journal Of Materials Processing Technology, Vol 137, Blazdell P, Solid free-forming of ceramics using a continuous jet printer, pp 52-53, Copyright (2003), with permission from Elsevier.

Pattern 2: Step-wise topic

In this pattern, an element of the comment of the previous sentence becomes the topic of the next. Sometimes, the actual word(s) used in the comment of the first sentence may be repeated in the topic of a later sentence, or a synonym or closely related word or phrase may be used. This pattern allows the writer to form *bridges* between parts of the text, while the message develops in a logical way. This pattern is the second most common of the four.

Table 1.2: Step-wise topic

topic	comment	
A	**B**	Solid organic waste is fed into a coarse **shredder** and cut into pieces.
B	C	**The shredded pieces** are more finely ground into a paste before being **mixed** with manure and bio-sludge.
C	D	**The mixture** is transported to a primary mixing tank where it is undergoes a homogenization process.

Reprinted from International Journal of Heat and Fluid Flow, Vol 24, Naylor D, Recent developments in the measurement of convective heat transfer rates by laser interferometry, p 347, Copyright (2003), with permission from Elsevier.

Pattern 3: Hypertopic

In this pattern, the first sentence introduces a general topic, the **hypertopic**, using a superordinate term. The topics of the following sentences form sub-topics (e.g., *car, bicycle, train, bus*) of the hypertopic (e.g., *vehicle*). Often, the relationship of the sub-topics to the hypertopic is common general knowledge, but other times the relationship between these may be understood only by expert readers in a particular field.

Table 1.3: Hyper topic

topic	comment	
A	B	**An number of different APPROACHES** can be used to protect your children from accessing unsuitable material on the Internet.
A$_1$	C	**Software filters** help manage online access and block inappropriate content.
A$_2$	D	**Configuring your browser** enables you to block access to sites labelled with improper terms.
A$_3$	E	**Monitoring software** allows you to keep track of your children's online activities.

Pattern 4: Split topic

In this pattern, two or more elements of the **comment** in the first sentence are picked up as the topics of the following sentences. Sometimes, the actual word(s) used in the comment of the first sentence may be repeated using identical wording or reduced wording in the **split topics** that follow, though a synonym may also sometimes be used.

Table 1.4: Split topic

topic	comment	
A	B	As in classical interferometry, a beam splitter initially divides the laser light into **two beams**.
B$_1$	C	**One beam**, called the reference beam, by-passes the model and strikes the holographic plate.
B$_1$	D	**The other beam**, called the object beam, passes through the test section prior to reaching the plate.
		Reprinted from International Journal of Heat and Fluid Flow, Vol 24, Naylor D, Recent developments in the measurement of convective heat transfer rates by laser interferometry, p 347, Copyright (2003), with permission from Elsevier.

When you are unable to maintain focus and topica progression, use connectors (Chapter 5 p. 85), such as *therefore*, *in addition*, and *however*.

1.3   The light-before-heavy principle

Writers can help readers to grasp their message more quickly and easily by paying attention to how they order information in their sentences.

It seems that readers can process sentences which begin with a short, simple subject fairly quickly. On the other hand, readers may have trouble with sentences that begin with a long, complex, multi-word subject. In general, writers can make their readers job easier by making sure that the main verb occurs relatively close to the beginning of English sentences.

In order to explore these ideas, this unit takes a closer look at the light-before-heavy principle: the convention of starting sentences with a short, simple subject and placing long, complicated concepts after the verb.

What's wrong with this sentence?

[1]Numerous government agencies have requested new technologies for use in government-certified Explosive Detection Systems (EDS) that screen checked luggage for aircraft [2]**We**

have shipped the Environmental Protection Agency's National Homeland Security Research Center in Cincinnati, Ohio, an EDS system.

Unfortunately, there are limits to the amount of information that a human being can store in their short-term memory. Studies have shown that **7 ± 2 items** can be retained for only a short amount of time. This becomes more problematic in academic writing where writers tend to pack a lot of information into single sentences. As you can see below, the main problem with the sentence above is that by the time the reader has exceeded the **7 ± 2 limit**, they still will have not reached the most important information that was actually sent.

1	2	3	4	5	6	7	8	9
We	**have**	**shipped**	the	Environmental	Protection	Agency's	National	Homeland

10	11	12	13	14	15	16	17	18
Security	Research	Center	in	Cincinnati ,	Ohio,	AN	EDS	SYSTEM.

In the improved version below, notice how much easier it is to quickly take in the information. This version orders the information in a more user-friendly way, because it places **lighter information** (*an EDS system*) before **heavy** (*the Environmental Protection Agency's National Homeland Security Research Center in Cincinnati*): Thus, by the time readers get to the ninth item, they already know the anwer to **what was shipped?** as well as a bit about **to whom it was shipped?**

1	2	3	4	5	6	7	8	9
We	**have**	**shipped**	AN	EDS	SYSTEM	to	the	Environmental

10	11	12	13	14	15	16	17	18	19
Protection	Agency's	National	Homeland	Security	Research	Center	in	Cincinnati ,	Ohio.

Let's now look at how you can order your phrases to create more balanced, reader-friendly sentences.

EXAMPLE 1: When writers begin sentences with a short noun phrase, this helps to make the sentence relatively easy to read.
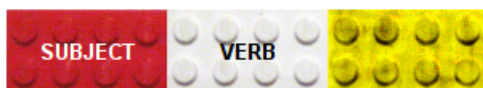
Advanced production processes WERE INTRODUCED in 2003.

EXAMPLE 2: When the sentence begins with a longer noun phrase, the reader has to process a greater mental load.

These advanced ferrochromium and stainless steel production processes WERE INTRODUCED in 2003.

EXAMPLE 3: An even more complex noun phrase at the start of the sentence makes the readers job very tough!

These advanced ferrochromium and stainless steel production processes at the Pyykki Steelworks in Northern Ostrobothnia WERE INTRODUCED in 2003.

EXAMPLE 4: The readers task is harder still when the prepositional phrase of time is shifted to the start of the sentence! Here, readers have to get through 17 words before they find out what 'happens' when they finally reach the verb.

In 2003, these advanced ferrochromium and stainless steel production processes at the Pyykki Steelworks in Northern Ostrobothnia WERE INTRODUCED.

BALANCING INFORMATION ELEMENTS

English prefers sentences that contain a short subject, come quickly to the verb and then can go as long as needed. However, what is most undesirable are sentences that are *top-heavy*. In other words, you should avoid overloading your reader by placing heavy elements at the beginning of the sentence. Instead, English prefers *heavy-bottomed* sentences, those that place most of the information at the end of the sentence after the verb.
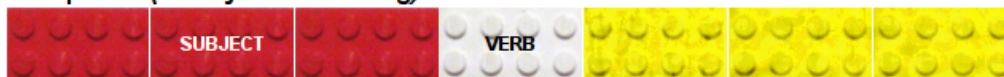
Let's now move on to look at how you can avoid putting heavy sentence elements before light ones.

1.4   Repairing problems

What can writers do to avoid putting heavy elements before light ones?

In this unit, we examine three principles for ordering information at the sentence and paragraph level: *given-new*, *organising flow* and *light-heavy*.

It helps if you can keep the three principles in mind from the beginning of creating your text. However, since unity involves a process of constantly reviewing what you write, the principles can also be useful for revision once you have already produced some kind of first draft. With the aid of the principles, you are able to take a critical look at the structure and ordering of your text, and do a lot to improve the cohesion and readability of your text. Ideally, we should aim to apply all three principles to all the texts we write. In practice, we may, however, need to compromise! Sometimes, our efforts to satisfy one principle make it impossible to use another. All writers are faced with choices, and some choices exclude others.

The following pages provide you with **eight strategies** that can be used to patch up problems once you begin to revise your text. Take a look at each one in turn.

1. Use synonymous repetition

2. Use pronouns (*it, they / this these*)

3. Use topicalising phrases

4. Use the active-passive shift

5. Use the equative shift

6. Use the animate-inanimate shift

7. Use the personal-impersonal shift

8. Use introductory *it* (dummy subject)

9. Use existential *there* (dummy subject)

1.4.1   Strategy 1: use synonymous repetition

FIRST-AID for: **given-new** and **organising flow**

Place **given information** into topic position as the grammatical subject using either **identical wording, synonyms, or superordinate terms** related to the given concept.

Identical wording

Because academic writing requires **precision** in the use of terms, it is not surprising that **direct repetition** of the same term is the most common means of keeping the focus on a particular topic. Unlike the use of **pronouns** (*it, they, them, this, these*) which can easily refer back to more than one item in the text, **repetition ensures** that your reader cannot misinterpret which item you are referring to. However, direct repetition has one drawback. It becomes monotonous and boring if overused. Thus, you should try to vary your strategy using other techniques listed on the following pages. Note how all the examples below require **the definite article *the*** to signal that this is **given information**. This is an important **grammatical clue** that helps your reader determine whether you are introducing a new topic or simply referring to a previous topic.

> Catalytic hydrocracking is **a refining <u>process</u>** that uses hydrogen and catalysts at relatively low temperatures and high pressures to produce high-octane gasoline, jet fuel, and/or high-grade fuel oil. **The <u>process</u>** uses one or more catalysts, depending on product output, and can handle high sulfur feedstocks without prior desulfurization.

Synonyms

One way to introduce some variation into your text while maintaining topical focus is to use **synonyms** for your topical information. English is rich in synonyms derived from **Latin and French**. For example, after the first mention of the word **idea**, you could thereafter refer to this as the **concept**, **notion**, **thought**, **belief**, **view**, or **opinion**.

> The European Mars Express space probe has sent back highly detailed **images** of the surface of the Red Planet. The **pictures**, taken with its High Resolution Stereo Camera, show craters, a volcano and features thought to be created by flowing water.

Superordinate terms

Superordinates are words that describe a class of objects. For example, the superordinate term for *bicycle*, *car*, *bus*, *airplane*, and *train* is **vehicle**, while the superordinate for *cat*, *dog*, *horse*, *tiger* could be **animal**. Superordinates are also important for writing definitions (e.g., *The cat is an animal that hunts at night.*) and when **listing examples** (e.g., *Cats, dogs, and other animals*)

> **The Mars Exploration Rovers** are six-wheeled robotic vehicles that will be used to explore the surface of Mars. **The ROVERS**, powered by solar panels, are robotic 'field geologists' that will examine Martian rocks and soil for signs of the presence of liquid water in the past of Mars. The top speed of **the VEHICLES**, which are about the size of a golf cart, is five centimeters (2 inches) per second.

Closely-related concepts

Another way to keep your readers' attention on the topic is to **integrate your topic** into closely related terms. In science and technology, this is primarily achieved using three strategies:

1. 'Piling up' nouns to create **noun compounds** (e.g., *carbon dioxide concentrations*)

2. *of*-**genitive** forms (e.g., *concentrations of carbon dioxide*)

3. **Postmodification by relative clauses** (e.g., *carbon dioxide (which has been) created by humans*).

Note in the example below how *carbon* is the concept that binds these sentences together as a whole.

Records from Antarctic ice cores indicate that **the CARBON cycle** has been in a state of imbalance for the past 200 years, with **emissions of CARBON DIOXIDE to the atmosphere** exceeding absorption. Consequently, **CARBON DIOXIDE concentrations** in the atmosphere have been steadily rising. According to the IPCC, before 1750, **the atmospheric carbon dioxide concentration** was around 280 10 parts per million for several thousand years. The IPCC goes on to say that **the current CARBON DIOXIDE concentration** has not been exceeded during the past 420,000 years, and likely not during the past 20 million years.

1.4.2 Strategy 2: use pronouns (*it, they / this these*)

FIRST-AID for: **given-new** and **organising flow**

Use a **pronoun** either to **replace (*it, they*)** or in **combination (*this, these, such*)** with given information.

Personal pronouns (*it, they*)

The benefits of process control are many. **THEY** include achieving reduced variability and higher quality, safety enhancement, reduction of process upsets, and in many cases, environmental improvements due to achieving mass balance in processes with material in/product out.

Demonstrative pronouns (*this, these*)

In the 19th century, Poul la Cour discovered that **fast rotating wind turbines with fewer rotor blades generate electricity more efficiently than slow moving wind turbines with many rotor blades**. **THIS** opened the door to **a number of wind turbine advances** during the 20th century. **THESE** included the introduction of AC generators, electromechanical yawing to ensure that the rotor always faces directly into the wind, and stall controls to keep the rotor from turning too fast in very strong winds.

This / these + repetition of given term

The installed capital COST of a wind farm includes planning, equipment purchase and construction of the facilities. **This COST**, typically measured in $/kW, **has DECREASED** from

more than \$2,500/kW in the early 1980s to less than \$1,000/kW for wind farms in the U.S.

This / these + superordinate term

> With the Kyoto Protocol, commitments were made not to actions but to results that were to be measured after a decade or more. **This APPROACH** has several disadvantages. An obvious one is that it is difficult determine, until close to the target date, which nations are on course to meet their goals

See also section 8.3 *Third-person pronouns* (*it, they*) p. 126.

1.4.3   Strategy 3: use topicalising phrases

Sometimes you have to put information that is not topical into subject position. At times like this, you can use **a topicalising phrase** before subject to link back to previous (old) information. A topicalising phrase is an introductory prepositional phrase placed in **topic position** (at the start of a sentence), which links what is to follow with what has already been mentioned.

FIRST-AID for: **given-new** and **organising flow**

> Finland has spent a considerable amount of money on cleaning the Baltic Sea. **Despite these efforts,** the beaches along the southern coast of Finland are still plagued by blue algae every summer.

Here are some examples of frequently used topicalising phrases which can be adapted for use in different text contexts:

COMPARISON-CONTRAST
- Similar to [GIVEN], . . .
- Unlike [GIVEN], . . .

MEANS
- Using these methods, . . .
- With this framework, we . . .

TIME
- After the solution was treated, . . .
- Before analysing samples, . . .

PURPOSE
- To solve this problem, . . .
- In order to analyse this problem, . . .

LOGICAL CONNECTION
- Because of this problem [GIVEN], . . .
- Despite this problem [GIVEN], . . .
- In addition to [GIVEN], . . .

1.4.4   Strategy 4: use the active-passive shift

FIRST-AID for: **given-new** and **organising flow**

Fennotek supplied the prefabricated timber units.

The prefabricated timber units were supplied by **Fennotek**.

Here, an active verb becomes passive (or vice versa) and the rest of the sentence modified accordingly. In this way, an idea under discussion can sometimes be moved to topic position and stronger links created with previous sentences. See also section 6.1 *Rules for forming the passive* p. 95.

1.4.5   Strategy 5: use the equative shift

FIRST-AID for: **given-new**, **organising flow** and **light-heavy**

The difficulty is the large particle size.

The large particle size is **the difficulty**.

The equative shift allows you to move an idea at the end of the sentence into topic position (beginning of sentence) This works when two equal ideas, signalled by the verb to be, are exchanged. This shifting of information helps to strengthen weak bonds between sentences because it keeps familiar information in topic position, at the start of a sentence. Note that this strategy cannot be used blindly! For example, when **A** is a subclass of **B**, you can say:

	A		**B**
🙂	Finns	are usually	good ice-hockey players.
	(subclass)		(class)

However, you cannot logically reverse the order, since the class **B** can also include subclasses other than only **A**:

	B		**A**
🙂	Good ice-hockey players	are usually	Finns.
	(class)		(subclass)

BEWARE! A common problem for Finnish writers of English is overuse of the verb **to be**. Academic English prefers **action verbs** instead of **weak verbs**, such as *to be*, *to have* or *there is/are* (See 3.2.2 Avoid weak verbs p. 49).

There are two major cases when the verb **to be** is appropriate as the main verb. See Using the verb to be to find out more about when you can use to be as the main verb.

1.4.6   Strategy 6: use the animate-inanimate shift

FIRST-AID for: **organising flow** and **light-heavy**

In this paper, systems that use speech recognition <u>are described</u>.

This paper <u>describes</u> systems that use speech recognition.

Here, a passive construction is made active, with a non-human subject taking a verb often associated with human activity. This strategy can also be used to move a familiar idea into topic position at the start of a sentence.

Other subject-verb combinations of this type include:

- **This paper** presents . . .

- **Figure 2** illustrates . . .

- **These graphs** show . . .

- **This section** addresses . . .

- **The latest studies** focus on . . .

1.4.7   Strategy 7: the personal-impersonal shift

FIRST-AID for: **given-new**, **organising flow** and **light-heavy**

The application of conventional controls IS DISCUSSED for flow, level and pressure in the distillation columns.

WE DISCUSS **the application of conventional controls** for flow, level and pressure in the distillation columns.

Here, the order of information is changed by **avoiding a passive construction** instead of putting the personal pronoun **we** into topic position. This strategy can improve text cohesion and readability by:

- manoeuvring *we* into theme position when the *we* connects back to a familiar element and the 'application of conventional controls' doesn't

- moving new information into the expected place towards the end of the sentence.

Before deciding to make use of *we*, **you should scan the literature in your own field to check whether this personal pronoun is used**. Although it is considered acceptable to use we in some fields of science and technology, other fields tend to avoid its use altogether.

1.4.8   Strategy 8: use introductory *it* (dummy subject)

FIRST-AID for: **light-heavy**

CREATING interfaces between humans and technology that feel natural and include the entire set of sensory interactions would be **difficult**.

IT would be **difficult TO CREATE** interfaces between humans and technology that feel natural and include the entire set of sensory interactions.

The **dummy it** can be used to replace a heavy subject and allow it to be moved to a position after the verb. This strategy, however, is only limited to three types of structures:

- those with a special adjective as the object of the sentence

- those with a special noun as the object of the sentence, and

- those using a reporting verb.

1.4.9   Strategy 9: means-purpose shift

FIRST-AID for: **light-heavy**

The humidity ratio was determined **(by) using** Equation 8.

Equation 8 **was used** to determine the humidity ratio.

Below you will find a list of words expressing **means** (Finn. *keinot*).

on	by using	through	through the use of
by	using	by means of	with the aid/help of
with	via	by the use of	with the use of

Chapter 2

ORGANIZING THE PARAGRAPH

2.1 Patterns of organization

Another way you can ensure a reader-friendly text is to construct your paragraphs and texts using patterns of organization that are familiar to your readers. Most of the writing in Engineering and science can be described in terms of seven organizational patterns:

1. Definition

2. Description

3. Classification-Division

4. Comparison/Contrast

5. Enumeration

6. Situation-Problem-Solution-Evaluation

2.1.1 Definition

Definition uses words to narrow down the meaning of a concept or object by excluding other closely related things of the same class. The short definition (a single sentence or paragraph) is essential to technical writing. For instance, both *Mechanism Descriptions* and *Process Descriptions* typically begin with a **sentence definition**. A definition answers the question *what is it?* Good definitions employ the following structure:

TERM	=	CLASS	+	DEFINING CHARACTERISTICS
An object	is	**a** software **bundle**	THAT	consists of related variables and methods.
Civil engineering	is	**an** engineering **field**	WHICH	deals with the design, construction and maintenance of the physical and naturally built environment.
An astronaut	is	**a person**	WHO	has been trained by a human spaceflight program to command, pilot, or serve as a crew member of a spacecraft.
A university	is	**an institute**	WHERE IN WHICH	research and teaching is performed by scientists.

Term = thing to be defined **Class** = group to which the thing belongs **Characteristics** = Specific details that separate it from others in the same class.

In science, definitions are often much longer than one sentence. This type of definition is known as an **Extended Definition** Regardless of its size, definitions always seek to answer *what is it?* but will use most of the other patterns to help answer it: you can define, for example, by *describing, classifying,* and *comparing.* Sentence definitions are usually expanded into *Extended definitions* using the following strategies:

1. Etymology (*What is the origin of its name?*)

2. History (*What is its origin and background?*)

3. Negation (*What does it not mean?*)

4. Operating principles (*How does it work?*)

5. Analysis of parts (*What are its parts?*)

6. Images (*What does it look like?*)

7. Comparison (*Can it be compared to anything familiar?*)

8. Requirements (*What is needed to make it work?*)

9. Applications (*How is it used or applied?*)

Example: Extended definition

[1]An organic light-emitting diode (OLED), also light emitting polymer (LEP) and organic electro-luminescence (OEL), is any light-emitting diode (LED) whose emissive electroluminescent layer is composed of a film of organic compounds.	**DEFINITION**
[2]The layer usually contains a polymer substance that allows suitable organic compounds to be deposited. [3]They are deposited in rows and columns onto a flat carrier by a simple "printing" process. [4]The resulting matrix of pixels can emit light of different colors.	**OPERATING PRINCIPLES**
[5]Such systems can be used in television screens, computer displays, portable system screens such as PDAs, advertising, information and indication.[6]OLEDs can also be used in light sources for general space illumination, and large-area light-emitting elements. . [7]OLEDs typically emit less light per area than inorganic solid-state based LEDs which are usually designed for use as point-light sources.	**APPLICATIONS**
[8]A significant benefit of OLED displays over traditional liquid crystal displays (LCDs) is that OLEDs do not require a backlight to function. [9]Thus they draw far less power and, when powered from a battery, can operate longer on the same charge. [10]Because there is no need for a backlight, an OLED display can be much thinner than an LCD panel. [11]OLED-based display devices also can be more effectively manufactured than LCDs and plasma displays. [12]However, degradation of OLED materials has limited their use.	**COMPARISON (ADVANTAGES)**

Source: Wikipedia. Organic light-emitting diode. Available at <http://en.wikipedia.org/wiki/OLED>.
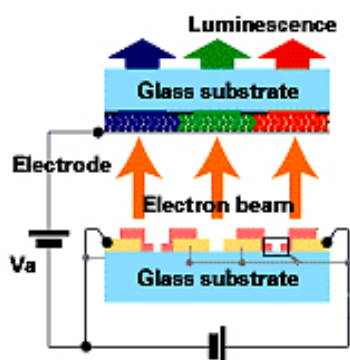
2.1.2 Mechanism description

A **mechanism description** uses a **spatial ordering** to describe and explain the components of a physical object. Although your description can also describe the *movement* of the device, describing the motion would more closely approach a *process description* (see below). Mechanism descriptions typically include the following information:

1. Definition (*What is it?*)

2. Purpose (*What is its function?*)

3. Appearance (*What does it look like?*)

   - Location and mode of attachment

   - Dimensions (height, width, weight, length, depth, thickness)

   - Materials

   - Number/amount

   - Colour

   - Shape

   - Form (*design, pattern, texture*)

4. Function (*How does it work?*)

5. Composition (*What are its main parts?*)

   - Identify and describe each part in detail.

   - If needed, provide a mechanism description for each of these parts.

Example: Description of the Mars Rover

Mars Exploration Rover
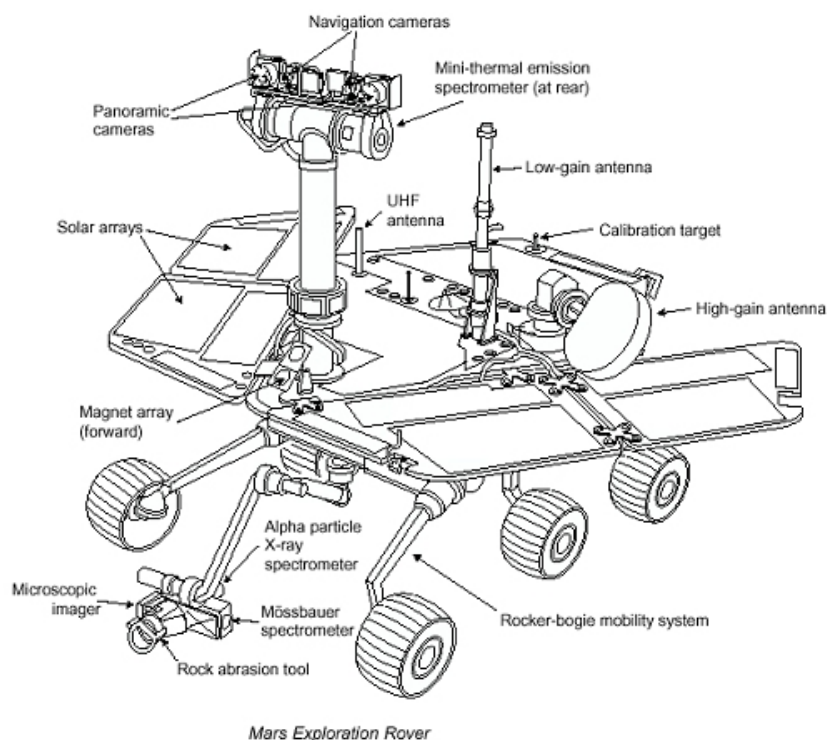
[1]At the heart of each Mars Exploration Rover spacecraft is its rover. [2]This is the mobile geological laboratory that will study the landing site and travel to examine selected rocks up close. [3]The Mars Exploration Rovers differ in many ways from their only predecessor, Mars Pathfinder's Sojourner rover. [4]Sojourner was about 65 centimeters (2 feet) long and weighed 10 kilograms (22 pounds).[5]Each Mars Exploration Rover is 1.6 meter (5.2 feet) long and weighs 174 kilograms (384 pounds). [6]Sojourner traveled a total distance equal to the length of about one football field during its 12 weeks of activity on Mars. [7]Each Mars Exploration Rover is expected to travel six to 10 times that distance during its three-month prime mission. [8]Pathfinder's lander, not Sojourner, housed that mission's main telecommunications, camera and computer functions. [9]The Mars Exploration Rovers carry equipment for those functions onboard and do not interact with their landers any further once they roll off.

[10]On each Mars Exploration Rover, the core structure is made of composite honeycomb material insulated with a high-tech material called aerogel. [11]This core body, called the warm electronics box, is topped with a triangular surface called the rover equipment deck. [12]The deck is populated with three antennas, a camera mast and a panel of solar cells. [13]Additional solar panels are connected by hinges to the edges of the triangle. [14]The solar panels fold up to fit inside the lander for the trip to Mars, and deploy to form a total area of 1.3 square meters (14 square feet) of three-layer photovoltaic cells. [15]Each layer is of different materials: gallium indium phosphorus, gallium arsenide and germanium. [16]The solar array can produce nearly 900 watt-hours of energy per martian day, or sol. [17]However, by the end of the 90-sol mission, the energy generating capability is reduced to about 600 watt-hours per sol because of accumulating dust and the change in sea-son. [18]The solar array repeatedly recharges two lithium-ion batteries inside the warm electronics box.

In the example mechanism description, notice how the writer first defines what a rover is (sentence 2), and then proceeds to describe the rover in terms of its physical features: **dimensions** (sentence 5), **requirements** (sentence 7), **components** (sentence 9), **materials** (sentence 10), **shape** of core body (sentence 11), **location** and **dimensions** of parts (sentences 12-14), **materials** (sentence 15), and **function** of the solar panels (sentences 16-18).

2.1.3   Process description

A **process description** pattern uses **chronological ordering** to explain a sequence of events over time. Examples of processes include the sequence of events leading to the movement of a robot's arm, the treatment of sewage, or the landing of the rover on Mars. All of these consist of a series of actions or events that must occur in an expected sequence over time in order to be successful.

Unlike *mechanism descriptions* (see above), which guide the reader **part-by-part** through the description, a *process description* proceeds **step by step**. Nevertheless, process descriptions and mechanism descriptions do share much of the same information:

- Definition (*What is it?*)

- Purpose (*What is its function?*)

- Location in time (*Where and when does it take place?*)

- Agent or 'doer' (*Who or what performs it?*)

- Operating principles (*How does it work?*)

- What are its main steps?

2.1.4 Example: process description
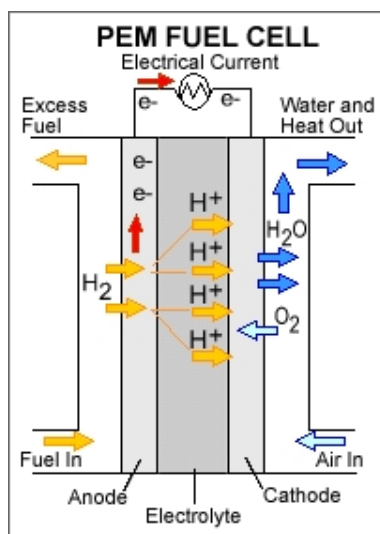
[1]A proton exchange membrane (PEM) fuel cell transforms the chemical energy liberated during the electrochemical reaction of hydrogen and oxygen into electrical energy, as opposed to the direct combustion of hydrogen and oxygen gases to produce thermal energy. [2]A stream of hydrogen is delivered to the anode side of the membrane electrode assembly (MEA). [3]At the anode side, it is catalytically split into protons and electrons. [4]The newly formed protons permeate through the polymer electrolyte membrane to the cathode side. [5]The electrons travel along an external load circuit to the cathode side of the MEA, thus creating the current output of the fuel cell. [6]Meanwhile, a stream of oxygen is delivered to the cathode side of the MEA. [7]At the cathode side, oxygen molecules react with the protons permeating through the polymer electrolyte membrane and the electrons arriving through the external circuit to form water molecules.

Source: Wikipedia. Proton exchange membrane fuel cell. Available at <http://en.wikipedia.org>

In the diagram below, you can see how topical information (*given*) is consistently placed at the start of the sentence. Note also how information that is *new* in one part of the text becomes *given* later.

[1]…(PEM) fuel cell… the electrochemical reaction of **hydrogen** and **oxygen** …

[2]A stream of **hydrogen** is delivered to **the anode side** …

[3]At the **anode** side, the **hydrogen** is catalytically split into **protons** and **electrons**.

[4]The newly formed **protons** permeate …to the **cathode** side.

[5]The **electrons** travel … to the cathode side of the MEA…

[6]Meanwhile, a stream of **oxygen** is delivered to **the cathode side** of the MEA.

[7]At the **cathode** side, **oxygen** molecules react with the protons …to form water molecules.
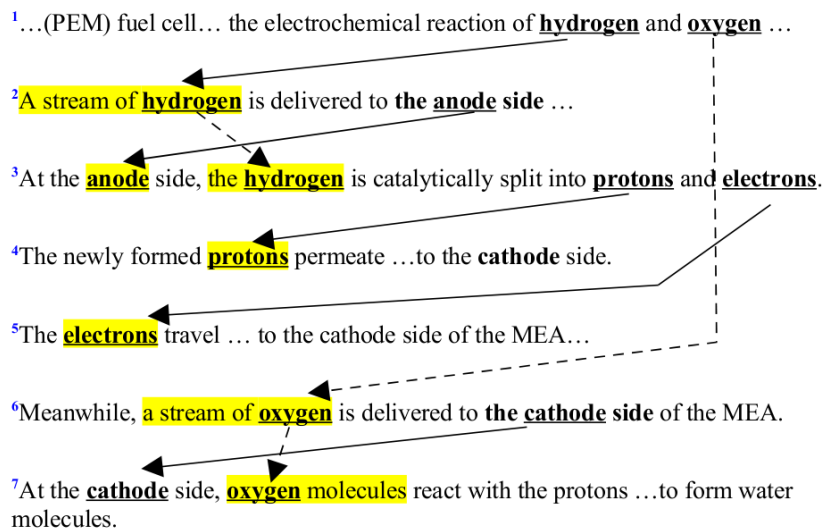
The language used in process descriptions is characterized by five features:

1. more extensive use of **intransitive** and **active verbs**,

2. the **present tense**,

3. the sentences in the description occur in **chronological order**,

4. **step-wise** topical progression, and

5. signaling of **given and new information** through use of the **definite and indefinite articles**, respectively.

Two other types of writing of process description are **instructions** and **procedures**. Both lead the reader through the step necessary to carry out a task. However, you should write instructions or procedures only if you expect your reader to perform the process you describe. Keep separate these two concepts: *How to do something* and *How something happens* The first calls for *instructions or procedure*; the second, for a *process description*.

Example: Instructions

RECORDING MOVIES

You can record movies in either the HDV or DVD format. Before recording, follow steps 1-7 in Getting Started (p. 9-17). Movies will be recorded along with stereo sound.

1. Open the shutter of the lens hood.
2. Open the LCD panel and adjust the angle.
3. While pressing the green button, set the power switch to camera. The HDV lamp lights up and your camcorder is set to .recording standby, the default setting.
4. Select the recording format.
5. Press REC START/STOP.

2.1.5 Classification-division

The **classification-division** pattern is actually two rather than one pattern. Both patterns are similar in that they aim to organize information into logical categories but differ in how they do this.

Use the **classification** pattern to categorize **many separate *things*** and ***concepts*** together according to similarities and differences. This pattern demands that the writer creates new categories to describe a phenomenon. For example, in a *marketing report*, students might categorize consumers into categories according to their age, income, and buying behavior.
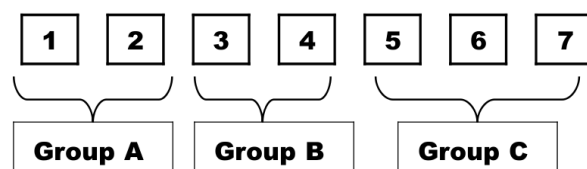
Example: classification

> **FILE FORMATS** [1]Some file formats are designed to store very particular sorts of data: the JPEG format, for example, is designed only to store static photographic images. [2]Other file formats, however, are designed for storage of several different types of data: the GIF format supports storage of both still images and simple animations, and the QuickTime format can act as a container for many different types of multimedia. [3]A text file is simply one that stores any text, in a format such as ASCII or UTF-8, with few if any control characters. [4]Some file formats, such as HTML, or the source code of some particular programming language, are in fact also text files, but adhere to more specific rules which allow them to be used for specific purposes.

Use the **division** pattern (also known as **partition**) to divide a single thing or concept into its parts. In technical writing, the division pattern forms an essential part of **mechanism descriptions** and **process description**. The division pattern could be **spatial** (how each part looks) or **functional** (how each part works).
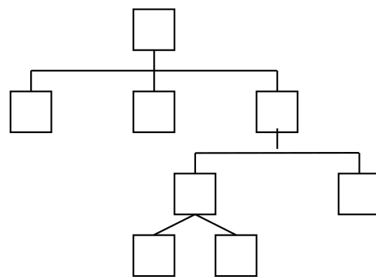
3.3 LINEAR HYDRAULIC ACTUATOR

[1]A **hydraulic actuator** is a device which converts hydraulic energy into mechanical force or motion. [2]Actuators **may be divided into those with** linear movement (sometimes called rams, cylinders or jacks), **and those with** rotary movement (rotary actuators and motors). [3]Linear actuators **may be further sub-divided into those** which apply hydraulic pressure to one side of the piston only (single acting) and are capable of movement only in one direction, **and those** which apply pressure to both sides of the piston (*double acting*) and are therefore capable of controlled movement in both directions.

[4]Linear actuators **may also be classified as** single-ended, in which the piston has an extension rod on one end only, or the double-ended type, which have rods on both ends. [5]Single-ended actuators are useful in space constrained applications, but unequal areas on each side of the piston results in asymmetrical flow gain which can complicate the control problem. [6]Double-ended actuators have the advantage that they naturally produce equal force and speed in both directions, and for this reason are sometimes called *symmetric* or *synchronizing* cylinders.

Source: Wikipedia. Actuators. Available at <http://en.wikipedia.org/wiki/Actuators>

2.1.6   Comparison-contrast

The **Comparison-Contrast (CC)** pattern analyzes two or more things, based on established criteria. This pattern is very useful in technical situations where we are looking at ideal vs. actual

results, or calculated vs. measured values. To make the pattern work, the **things must be comparable**, and the **criteria must be valid for both**.

Example: Comparison-contrast

[1]Compared with other types of fuel cells, the alkaline variety offered the advantage of a high power to weight ratio. [2]This was primarily due to intrinsically faster kinetics for oxygen reduction to the hydroxyl anion in an alkaline environment. [3]Therefore, alkaline fuel cells were ideal for space applications. [4]However, for terrestrial use, the primary disadvantage of these cells is that of carbon dioxide poisoning of the electrolyte. [5]Carbon dioxide is not only present in the air but also present in reformate gas, the hydrogen rich gas produced from the reformation of hydrocarbon fuels.

2.1.7   Enumeration

Enumeration is useful when you want to list or state a number of *reasons, purposes, causes, benefits, advantages, disadvantages*, or other factors that you want to report. Enumeration offers you a more effective alternative to using additive connectors (e.g., *In addition, Moreover, Furthermore*). Paragraphs organized as **lists** are often introduced by topic sentences that contain include **quantifiers**, such as *numerous, several, many, much*, and *a number of*. The **controlling ideas** (underlined below) in enumerated lists is formed from **superordinates** (see pp. 129), such as r*eason, cause, difference*.

Example: Enumeration

There are a number of good <u>reasons</u> for immigrating to Finland. **First,** everyone speaks English (though they're not very talkative). **Second,** Finland has a superior, free health system (if you don't mind the long lines) and all education is free (and you get what you pay for). In addition, most public transport is free (except if you get caught). **A third <u>reason</u> is that** Finns are friendly, outgoing people (when they're intoxicated). Finns also value equality between the sexes (so, no opening of doors for the fairer sex). **Finally,** where else except in Finland can you swim outside during the winter (through a hole in the ice).

Notice how much less effective this text would have been if the writer had simply used **additive connectors** without a topic sentence.

In Finland, everyone speaks English (*though they're not very talkative*). Finland has a superior, free health system (*if you don't mind the long lines*) and all education is free (*and you get what you pay for*). **In addition,** most public transport is free (*except if you get caught*). **Moreover,** Finns are friendly, outgoing people (*when they're intoxicated*). Finns also value equality between the sexes (so, no opening of doors for the fairer sex). **Furthermore,** where else except in Finland can you swim outside during the winter (*through a hole in the ice*).

2.1.8 Situation-problem-solution-evaluation

Engineering could not exist without problems to solve. No pattern is more essential to communicating ideas in engineering than the **problem-solution** pattern. Nevertheless, many engineers fail to exploit this effective way to communicate complicated engineering topics to outsiders of the field.

The problem-solution pattern is an effective strategy to quickly orient a reader who is unfamiliar with your field of work, and is commonly used to organize the beginnings in numerous engineering documents, including *technical reports, lab reports, abstracts* (tiivistelmät), spoken presentations, and thesis introductions. Present the components of the pattern in this order:

1. SITUATION

    - What is the current situation?

    - What is the relevance of the topic to your readers?

    - Why is this topic important or topical? Why should they care?

2. PROBLEM

    - What problem did you aim to solve?

    - Why was it a problem?

    - What would be the criteria (requirements) for a good solution?

3. SOLUTION

    - What solutions have been attempted earlier by other people?

    - What is your solution to the problem?

4. EVALUATION

    - How do we know that yours was a good solution?

In the last step, if the evaluation is negative (i.e., that the solution is not effective), then you will also need to consider what further/future work might be necessary (perhaps research or testing) in order to reach a satisfactory solution.

Example:Situation-problem-solution-evaluation

[1]The world-wide industrial markets have changed rapidly in the last ten years. [2]To compete globally, manufacturers seek methods to produce low-cost, reliable and high-quality products with shorter delivery times. [3]One response to this has been to build new, innovative assembly systems.	**SITUATION** Note the use of the present perfect in English to show past as well as present relevance of the topic.
[4]However, most manufacturers have managed this with only varying degrees of success. [5]Furthermore, the existing systems tend to provide incomplete and unreliable solutions.	**PROBLEM** Note how a negative evaluation of the present situation is signalled through the use of negative language.
[6]This thesis describes a new approach to building flexible assembly systems enabling the continuous production of varying mixes of products and quick changes in production requirements.	**SOLUTION** The proposed solution is your thesis (diplomityö)!
[7]This proposed solution offers a flexible assembly system that encompasses a series of different operations including assembly, material handling, and storage. [8]Furthermore, the new 3D conveyor model as well as the object-oriented software control tools have been successfully implemented and validated using experimental conveyor modules or objects. [9]The generic system architecture created offers an integrated and flexible platform for the development and/or modification of new and/or existing conveyor systems.	**EVALUATION** Note how a positive evaluation of the writer's solution is signalled through positive language.

2.2 Topic sentences

One easy way for engineers to improve their writing is to begin their paragraphs with topic sentences that summarize the purpose and content of a paragraph. Topic sentences present the **main idea** or a **claim** that controls the rest of the paragraph. A good topic sentence has four characteristics:

1. The topic sentence is usually (but not always!) the **first sentence** in the paragraph.

2. It makes a **general statement** that is wider in its scope than the rest of the sentences in that paragraph. In other words, the topic sentence should be general enough so that it can be supported by specific details in later sentences.

3. Topic sentences should always contain both a **topic** and a **controlling idea**. The **topic** typically occurs before the verb and is *what the paragraph is about*, while the **controlling idea** is *what you want to say about the topic.*

4. The **controlling idea** should be repeated (preferably, in subject position) in each of the sentences that follow the topic sentence.
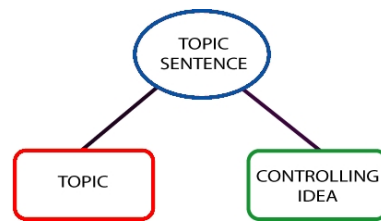
2.2.1 New topic

Writers often use topic sentences as a means to introduce the main idea as a new topic that has not been discussed earlier. In the example below, notice how the topic sentence (the first sentence) serves as a bridge in the transition from an earlier discussion of primary and secondary education to the new topic concerning *universities* and *polytechnics*.

The **TOPIC** (shown in small capitals below) typically occurs before the verb and is 'what the paragraph is about', while the **controlling idea** (underlined) is 'what you want to say about the topic'. In this case, the topic sentence contains two controlling ideas.

> THE FINNISH HIGHER EDUCATION SYSTEM consists of universities and polytechnics. The universities stress the connection between research and teaching. **The basic purpose of** the universities is to carry out scientific research and to provide teaching in related subjects. **Students at** universities may take a lower (Bachelor's) or higher (Master's) academic degree, as well as academic further education, consisting of licentiate and doctoral degrees. Universities also arrange further education and open university teaching. In contrast, polytechnics emphasize a connection with working life, and the degrees offered are higher education degrees with a professional emphasis. Located throughout Finland, universities and polytechnics aim to ensure that all prospective students have equal opportunities for study, regardless of where they live.

2.2.2 Enumeration

In science, topic sentences are often used to introduce a **list of items**. Such paragraphs, based on a **pattern of enumeration**, have topic sentences that typically include **quantifiers**, such as numerous, several, many, much, and a number of.

Often the **controlling idea** (underlined) in such lists consist of superordinates, such as *reason*, *cause*, and *difference*.

> **There are a number of good reasons for immigrating to Finland**. **First,** everyone speaks English (though they're not very talkative). **Second,** Finland has a superior, free health system (if you don't mind the long lines) and all education is free (and you get what you pay for). In addition, most public transport is free (except if you get caught). **A third reason is that** Finns are friendly, outgoing people (when they're intoxicated). Finns also value equality between the sexes (so, no opening of doors for the fairer sex). **Finally,** where else except in Finland can you swim outside during the winter (through a hole in the ice).

In the above **paragraph of enumeration**, notice how each item is presented using **enumerators** (e.g., *first, second, another..., finally*). The same information could have also been expressed as a numbered list:

> There are a number of good <u>reasons</u> for **immigrating to Finland**:
>
> 1. All Finns speak English (*though they're not very talkative*).
>
> 2. Finland has a superior, free health system (*if you don't mind the long lines*) and all education is free (*and you get what you pay for*). In addition, most public transport is free (*except if you get caught*).
>
> 3. Finns are friendly, outgoing people (*when they're intoxicated*).
>
> 4. Finns also value equality between the sexes (*so, no opening of doors for the fairer sex*).
>
> 5. Where else except in Finland can you swim outside during the winter (*through a hole in the ice*).

2.2.3 Claims

Topic sentences can also introduce the main idea of the paragraph as a claim. Claims are opinions that that are not introduced by the pronoun **I**. In the example below, the topic sentence makes the **claim** about *how easy* it is to learn Finnish. Notice how this claim is **explained**, **developed** and **supported** by evidence in the sentences that follow the topic sentence .

The topic (shown in small capitals below) typically occurs before the verb and is 'what the paragraph is about', while the controlling idea (underlined) is 'what you want to say about the topic'.

> **FINNISH** is an <u>easy</u> language to learn. It is written the way that it is pronounced. Finnish has no articles (i.e., *a, an, the*), nor does it distinguish between masculine and feminine forms, as do other European languages, such as Spanish, French and German. Thus, Finnish makes no distinction between she and he; one word **hän** serves for both sexes. Another feature that makes Finnish easy to learn is that words are formed from common 'roots', thus learning the the word **kir**ja (*book*) quickly opens the way to learning other related words, including **kir**jasto (library), **kir**je (*letter*), and **kir**joittaa (to *write*). Furthermore, Finnish has no separate preposition words (e.g., *to, from, on, in*). Instead, they are all simply added to the end of words.

In outline form, this text would have looked like this:

> Finnish is an easy language to learn.
>
> 1. easy to write because it is phonetic
>
> 2. easy because it has no articles, no masculine and feminine forms, and only one word *hän* serves for both sexes.
>
> 3. easy because words are formed from common 'roots'
>
> 4. easy because it needs no separate prepositions.

A carefully thought out topic sentence will serve two important functions. First, it will provide you, the author, with the means to stay focused on your objective. It is far easier to write if you know what you are going to write about! Second, a clearly stated topic sentence will provide readers with the tools they need to quickly understand what you have to say.

Chapter 3

STYLE

Style is something that we learn as part of the process of acquiring the culture of a particular society or group. Most educated members of the group can take a look at a text, and readily identify the **text type** by the style in which it is written. Style is based on a wide range of language features, including the choice of vocabulary and grammatical structures, as well as the degree of **author objectivity**. These features characterize a text as belonging to a certain **genre** (i.e., text type) and are often used as criteria for evaluating the 'success' of a text. When writers select an appropriate style for a text they are about to produce, they must be aware of their purpose in writing, the intended audience, and the subject matter.

Academic style

The style of academic English differs from that of the everyday spoken form in four fundamental ways. It tends

- to follow conventions for reporting research according to particular schemata which are explicit in their organisation. There are often discipline-specific variations in these conventions.

- to use strategies for signalling the writer's distance and attitude to claims and arguments.

- to consist of sentences which are longer and more complex than in everyday texts.

- to require more formal vocabulary and grammatical structures.

Further reading:

Andy Gillett, 'Using English for Academic Purposes: Features of academic writing',
Available HTTP: <http://www.uefap.co.uk/writing/feature/featfram.htm>

Amanda Graham, 'Coming to Grips with Reading and Writing Academic Articles',
Available HTTP: <http://www.yukoncollege.yk.ca/ agraham/guides/guidec.shtml>

3.1 Vocabulary choice

A writer's choice of individual words plays a significant role in the creation of a text which both sounds academic and communicates the writer's message clearly to the readers. Three of the most important factors are described below.

Formality

The most notable feature of academic writing style is the preference for a more formal alternative when choosing a **verb**, **noun**, or other parts of speech. The most difficult problem facing you as a learner of academic English is to recognise the difference between formal and informal vocabulary. To understand these differences, it is important to understand a bit about the history of English.

Modern English has been strongly influenced by both French (the language of the elite during the 12th–15th centuries) and Latin (the language of science during the Renaissance and the Enlightenment). The spoken form of the language heavily consists of a core of Anglo-Saxon vocabulary, with Latin and French equivalents or *synonyms* being favored as the educated form seen in the formal written language.

Certainty and strength

Another feature of an academic writing style is the need for writers to express their commitment to their own claims and those of others. This can be generally seen in the choice of vocabulary that signals the degree of confidence (certainty) that writers have towards claim with his research.

> Other preliminary results **demonstrate** (certain) / **suggest** (less certain) that blue light (460 nm) is more efficient than white light in resetting the human circadian pacemaker.
>
> Recent tests have **generally** (weak) / **clearly** (strong) shown DVD-R to be slightly more compatible than DVD+R.

Attitude

Novice writers often overlook the importance of providing adequate evaluative commentary. Far too often they believe that by simply listing data, the facts will speak for themselves. However, this is rarely the case. Notice how using evaluatory language (the second example below) allows the writer to guide the reader in correctly interpreting the facts—that option X is the better solution. To avoid misinterpretation, choose words that signal your attitude.

> Option X requires installation of a LAN, **and** Option Y requires the installation of new software on each individual work station.

> Option X **only** requires installation of a LAN, **while** Option Y **relies on** the installation of new software on each individual work station.

It is possible to show your attitude using a range of verbs, adjectives and adverbs, as you will see in the following pages. The examples and exercises in this section aim to help you distinguish between vocabulary choices in terms of **formality**, **certainty**, and the **attitude** signalled by your words.

3.1.1 Verbs

Many of the most common English verbs also tend to be replaced by Latinate verbs having a more precise meaning. As can be seen from the list below, these common Anglo-Saxon verbs can have many meanings.

Table 3.1: Vocabulary shift: avoid weak verbs

Informal 🥴		Formal (Written) 🤓
be		be situated, be located, be placed, be positioned; be outlined, be listed, be described; serve as
do	→	perform, implement, execute, complete, conduct, function, operate
get	→	become, acquire, procure, receive, gain, obtain, achieve, attain
give	→	provide, offer, supply, transfer, yield; allow, permit, enable; contribute
go	→	proceed, pass, process, transfer, transmit
happen	→	occur
have	→	possess, include, incorporate, contain, involve, consist of, be composed of, comprise
make	→	produce, generate, create, assemble, build, construct, erect, fabricate, fashion, forge, form, frame, manufacture, mold
mean	→	denote, indicate, imply, suggest, signify
put	→	place, attach, insert, apply, connect, join, link, unite; adhere, anchor, secure, implant, imbed

Avoid phrasal verbs

Most phrasal verbs are formed from a small number of common verbs (such as **get, go, come, put, do, take, make,** and **set**) and a small number of adverbs and prepositions (such as **away, out, off, up** and **in**). However, for written academic style, a single-word Latinate verb is preferred whenever possible. This is one of the most dramatic shifts from informal to formal style.

Phrasal verb:	🥴	The aim of this study is to **look at** the growth dynamics and to **find out** the microbial populations living in the C140 prototype hydraulic system.
Latinate:	🤓	The aim of this study is to **examine** the growth dynamics and to **determine** the microbial populations living in the C140 prototype hydraulic system.

Table 3.2: Vocabulary shift: avoid phrasal verbs

Informal 🤢		Formal (Written) 🤓
bring up	→	raise, present
build up	→	accumulate
come up with	→	devise, invent, develop; produce, supply
do away with	→	eliminate, obviate
find out	→	determine, develop; detect, observe;
get rid of	→	eliminate
go down/up	→	decrease, decline, diminish / increase, rise, augment
take care of	→	manage, operate

3.1.2 Nouns

Many nouns used in everyday spoken English tend to be less appropriate for academic writing. This is especially true for those nouns that have recently entered the language and hyphenated forms (See 4.4.1 *Compound nouns* p. 78) derived from phrasal verbs. Some of these are listed below.

Table 3.3: Vocabulary shift: nouns

Informal 🤢		Formal (Written) 🤓
know-how	→	expertise
a trade-off	→	a compromise
trouble	→	difficulty
a way (to do sth)	→	an approach, a means, a method, a technique, a procedure
an idea	→	a concept, a plan, a notion, a view
the meaning (of…)	→	the purpose, aim, objective, goal, target
an answer	→	a solution
a thing	→	a device, an object, an item, an entity, a structure, a tool, an instrument
stuff	→	material, a substance, a liquid, a gas

3.1.3 Adverbs

Many of the most common, everyday English adverbs have a more formal equivalent. Some of these are listed below. A thesaurus or a search engine, such as Google, can help you to search for more formal equivalents.

Adverbial connectors

Although you may frequently see in magazines and newspapers sentences beginning with *but*, *and*, *also* and *so*, this is not considered appropriate style in academic writing. Avoid beginning sentences with these conjunctions in academic writing. Instead, choose from a variety of *contrastive*, *additive* and *causative sentence connectors* (See section 5 Connectors p. 85).

Table 3.4: Vocabulary shift: adverbs

Informal 😟		Formal (Written) 🙂
often	→	frequently
sometimes	→	occasionally
always	→	typically
nowadays	→	currently, presently
a little bit	→	somewhat
a lot	→	much, greatly, dramatically, drastically, considerably
more and more	→	increasingly
fast	→	rapidly

Informal:	😟	There is enough coal in the US to power America's electrical plants for another 250 years. **But** burning coal releases greenhouse gases that cause global warming.
Formal:	🙂	There is enough coal in the US to power America's electrical plants for another 250 years. **However**, burning coal releases greenhouse gases that cause global warming.

Similarly, the adverb **besides** is replaced by its more formal equivalent **in addition to**, and **too** by **also** or **as well**.

3.1.4   Adjectives

Many of the most common English adjectives sound childish when used in a formal text. When in doubt, use a thesaurus or a search engine, such as Google, to search for more formal equivalents.

Informal:	😟	Such precision signals a **big** advance in mechanical engineering.
Formal:	🙂	Such precision signals a **major** advance in mechanical engineering.

Table 3.5: Vocabulary shift: adjectives

Informal 😟		Formal (Written) 🙂
a lot of, lots of	→	many, numerous, a large number of
big	→	large, great, high, major
small, tiny	→	minute, insignificant
hard	→	difficult, arduous, laborious
good	→	suitable, appropriate, effective, efficient, beneficial, advantageous
bad	→	poor, inappropriate, unsuitable, ineffective, inefficient, unsatisfactory, defective

Avoid colourful language

Other adjectives may seem inappropriate because they are too dramatic, colorful or idiomatic, and are therefore more appropriate in spoken rather than in formal, academic English. The table below lists some common examples of informal adjectives and their more formal equivalents.

Slang: Impact occurred at a **huge** velocity.

Formal: Impact occurred at a **high** velocity.

Prepositions

English avoids consecutive repetition of the same preposition. Luckily, more than one preposition can typically provide the same meaning.

As a result **of** a previous phase **of** the analysis **of** the different solutions, numerous changes had to made to the prototype before it could be tested.

Due to a previous phase **in** the analysis **of** the different solutions, numerous changes had to made to the prototype before it could be tested.

Many prepositions used in everyday spoken English tend to sound less appropriate for academic writing. Some of the most common formal alternatives are listed below.

Table 3.6: Vocabulary shift: prepositions

Informal		Formal (Written)
about (sth)	→	concerning, on, regarding
after	→	subsequent to
before	→	prior to
in	→	within
on top of	→	above, after
during (the last 5 years)	→	over

3.2 Sentence structure

Academic conventions

Disciplines vary in how strictly they follow the stylistic features outlined in this course. Some fields such as medicine and biotechnology tend to demand a higher degree of formality than in many fields of engineering. Moreover, the more relaxed English used in newspapers and magazines is increasingly influencing the writing style in many disciplines. For example, the informal use of *and* and *but* as sentence connectors at the beginning of sentences, though still considered very informal, can be frequently seen sneaking into many academic journals. Nevertheless, this course only aims

to help you to recognize which forms are formal and characteristic of academic English in its most strict form. This is not to dictate which conventions you should use.

An awareness of these distinctions will enable you to decide for yourself how formal your text needs to be, as well as to give you the tools to continue the learning process outside the classroom. Because of this variation, it is important that you check the guidelines from your own field to confirm how closely your field follows these conventions, if at all. Important sources include online style guides such as those provided by journals in your field. One example is provided below.

Further reading: American Institute of Physics (AIP) Style Guide, [Online document], [cited 2003 Sept 4], Available HTTP: http://www.aip.org/pubservs/style/4thed/sec3.pdf

3.2.1   Avoid contractions

Contractions are shortened forms (e.g., *auxiliary verbs* (See p. 133) and the negative *not*—does not → doesn't) in which one or more letters have been omitted. Contractions are always added to the end of another word. They are widely used in spoken english and very informal writing, such as comics or postcards. While they are perfectly suitable for spoken English, contracted forms are not suitable for academic or scientific English; do not use them in your writing at school or at work.

Contraction		**Full form**
🙁		🙂
does**n't**	→	does not
they**'re**	→	they are
we**'ll**	→	we shall/will
it**'s**	→	it is

> ⚠️ **Beware!** The possessive form of **it** uses <u>no</u> apostrophe before **s**.
>
> | it**'s** | = | it is |
> |---|---|---|
> | it **of** it | = | **its** |

3.2.2   Avoid weak verbs

Don't overuse weak verbs, such as *to be*, *there is/are*, or *to have* because this way you will hide actions in noun phrases. When readers try to find out what is happening or being done, they naturally looking the action in the verbs. If you hide actions in noun phrases, you make your readers work harder to interpret your meaning.

Overuse of the weak verb *to be* forces the action to become expressed as a noun phrase (see p. 123) rather than as a verb. To correct this problem, analyse the noun phrases to find noun (= *nominalized*) forms of verbs.

TO BE

🙁 The **analysed** characteristics **were** the dry weight (DW), the loss on ignition (IL), as well as concentrations of total phosphorus (P_{tot}), total nitrogen (N_{tot}) and total carbon (C_{tot}).

🙂 The following characteristics **were analysed:** the dry weight (DW), the loss on ignition (IL), as well as concentrations of total phosphorus (Ptot), total nitrogen (N_{tot}) and total carbon (C_{tot}).

THERE IS/ARE

🙁 **There is** no harm using cellular phones inside the hospital.

🙂 Using cellular phones **causes** no harm inside the hospital.

TO HAVE

🙁 This **has** the **tendency** to make log browsing a tedious and ineffective process.

🙂 This **tends** to make log browsing a tedious and ineffective process.

3.2.3 Put topical info in subject position

Often novice writers mistakenly believe that to sound academic they need to write using the passive verb form. This often leads to sentences that place the topic into an introductory prepositional phrase, and often end up placing totally new information in subject position, the place usually reserved for *given or old information* (See section 1.1 The given-new principle p. 11). Although this structure may be acceptable in Finnish, it produces sentences that are very difficult to read in English.

To solve this problem, follow these three steps. First, remove the topic from the prepositional phrase and get rid of the prepositional clause completely. Then, place the **topic** into the grammatical **subject** position. Finally, go back and change that passive verb to its active form. Notice how much easier it is to read the revised version in the examples below.

Overuse of IN + passive

🙁 **Topic hidden in a prepositional phrase:**
In LOGISTICS, simple transaction data and averaging **are** often **used** to allocate direct costs.

🙂 **Topic in subject position:**
LOGISTICS often **uses** simple transaction data and averaging to allocate direct costs.

The same principle also holds true when the introductory element is formed with a relative pronoun, such as **where** *(= in which).*

Top heavy, verb at the end:
In addition to each separate variable, a forecasting model was built, **where** *the interactions between the variables* **were considered**.

New information at the end after the verb:
In addition to each separate variable, a forecasting model was built, WHICH **considers** into account *the interactions between the variables*.

Overuse of BY + passive

When the intoductory element is **by** or **with** expressing the **means** for accomplishing an action, you can use the verbs **enable**, **allow** or **permit** as the main verb to move new information to a position after the verb.

Topic hidden in prepositional phrase:
By COLLECTING **more data**, a much deeper understanding of the cost behaviour of an activity and products **can be achieved**.

Topic in subject position:
COLLECTING more data **enables**/ **allows**/ **permits** a much deeper understanding of the cost behaviour of an activity and products **to be achieved**.

Headless horseman

Unlike Finnish, all sentences in English demand a **subject** (a **'doer'**), even if it might be a dummy subject, such as *it* (It is hoped that. . .) or *there* (there is/are. . .). Thus, there is always someone (or something) that gets the blame when things go wrong.

Even natural phenomena seem to require a supernatural 'doer':

Finnish: Ulkona ∅ sataa lunta.
Outside ∅ is snowing.

It is snowing outside.

Finnish: Huoneesa ∅ on 20 oppilasta.
In the room ∅ are 20 students.

There are 20 students in the room.

The most common type of **subjectless** sentences not only lacks an explicit subject but usually hides the real subject of the sentence in a prepositional phrase at the beginning of the sentence. Moreover, such sentences are typiclly weakened even further by having the verb in the passive form. (See also 3.2.3 *Put topical info in subject position*).

Note in the example below how this **headless horseman** can often be corrected by simply deleting the preposition (*in*) and then replacing the passive verb (*can be found*) with a more suitable verb in the active form (*contains*):

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> In the literature ∅ **can be found** several studies that have developed media delivery platforms and video streaming for the Internet [1, 13, 34].

> **The literature contains** several studies that have developed media delivery platforms and video streaming for the Internet [1, 13, 34].

Alternatively, the situation or context may suggest a logical **inanimate agent** where your language might prefer a prepositional phrase + passive form. Note, however, that some languages (e.g., Finnish, Japanese, and Korean) cannot use inanimate subjects:

> **Finnish:** Kuvassa 2 ∅ esitetään työmotivaatioon yhteydessä olevat tekijät.

> In figure 2 ∅ **is presented** the factors associated with work motivation.

> **Figure 2 presents** the factors associated with work motivation.

3.2.4 Put action into verb

When readers try to find out what is happening or being done, they naturally search for the verbs. However, in science and technology, many writers tend to place the action into nouns rather than the verb. Misplacing action in this way is commonly known as **nominalization**. If you hide actions in noun phrases (See p. 123), you make your readers work harder.

To correct this problem, search for noun phrases that have the nominalized form of a potential verb. Nominalizations generally end in -**tion** and less often in **-ing**.

Overuse of do, make, perform, achieve, accomplish

The most common way to hide action is to use the nominalized form of a verb with the verbs **do, make, perform, achieve, accomplish, carry out,** or **conduct**.

> **Action hidden in noun:**
> **Verification of** THESE PROPERTIES can be DONE using linear algebraic techniques.

> **Action put into verb:**
> THESE PROPERTIES can be VERIFIED using linear algebraic techniques.

Hiding action in *There is. . .*

Another common way to hide action is to introduce a nominalized form of a verb after the dummy subject **There is/are**.

Action hidden in noun:
There has been **continuous improvement** in economic performance since 2002.

Action put into verb:
Economic performance **has continuously IMPROVED** since 2002.

Alternatively, the action may be hidden in a relative clause. (See also 3.2.2 *Avoid weak verbs* p. 49)

Action hidden in relative clause:
There are **several factors that can INCREASE** the complexity and number of components within a product.

Action put into verb:
Several factors can INCREASE the complexity and number of components within a product.

3.2.5   Avoid ending with a verb

Ending clauses and sentences with a verb creates top-heavy sentences that seem badly imbalanced. Instead, good writers try to place the verb as soon as possible after the subject of the sentence. This can clearly be seen in the example below. There is such a strong need to avoid placing the verb at the end that native speakers feel compelled to place either a *noun phrase* (i.e., **a swim**) or adverb after the verb in order to create a sentence that feels more balanced.

The children **are swimming**.

The children **are taking A SWIM**.

One common strategy to avoid ending a sentence with a verb is to invert the order of the subject and verb in the clause *scientists originally believed* using **by**:

The West Antarctic Ice Sheet probably contained less ice than **SCIENTISTS** had originally **believed**.

The West Antarctic Ice Sheet probably contained less ice than originally **believed BY SCIENTISTS**.

Among the elements typically included in the Materials and Methods Sections of research papers are the **means** of performing procedures, as well as the **justifications** or **purpose** for making certain methodological choices.

Doubling the sampling density *can be accomplished* **BY interpolation**.

The parameters for Inmarsat GEO satellite network *were used*, **SINCE the effect of call drops is significant when working under a long delay network**.

A miniaturized planar inverted-F antenna *is proposed* **FOR dual-band mobile phone application in the 900-and 1900-MHz bands**.

Several experiments *were performed* **TO optimize the temperature and the tool pressure**.

3.2.6 Avoid run-on expressions

When listing examples, avoid ending your list with such expressions as **etc, and so forth,** or **and so on.** Instead, academic english prefers to use a a **superordinate term** (e.g., **natural causes** below)(See also 8.6 *Superordinates* p. 129) followed by **including, such as,** or the verb **to include** .

Scientists theorize that global temperature change may be induced by *volcanism, solar activity, etc*.

Scientists theorize that global temperature change may be induced by **natural causes**, **SUCH AS** *volcanism* and *solar activity*. .

Punctuate *e.g.* correctly

Note that the abbreviation *e.g.* is mainly used to present examples given in parentheses (= sulkumerkit), and should not be used as a substitute for *for example* or *for instance* in normal academic texts. Use two periods (**.**) to punctuate *e.g.* in American English, whereas they may be unpunctuated (*eg*) in British English. Surround this abbreviation with commas to separate it from the rest of the text.

Scientists theorize that global temperature change may be induced*, e.g.,* by *volcanism* or *solar activity*.

Scientists theorize that global temperature change may be induced by **natural causes, e.g.,** *volcanism* or *solar activity*.

Scientists theorize that global temperature change may be induced by **natural causes (e.g.,** *volcanism* and *solar activity*).

Formal structures for listing

Replace **run-on expressions** with one of the four more academic equivalents shown below. All four of these structures require a **superordinate term** (shown in bold below), while the structure using **INCLUDING** requires a quantifier and using a colon [**:**] requires a number.

1. [superordinate] + **SUCH AS** + [**examples**]

    Scientists theorize that global temperature change may be induced by <u>natural causes</u>, **SUCH AS** *volcanism and solar activity.*

2. [superordinate] + **INCLUDE(S)** + [**examples**]

    Scientists theorize that the <u>factors</u> leading to global temperature may **INCLUDE volcanism and solar activity**.

3. [quantifier] + [**superordinate**] + **INCLUDING** + [**examples**]

    Scientists theorize that global temperature change may be induced by <u>a variety of</u> **natural causes, INCLUDING volcanism and solar activity**.

Table 3.7: Typical quantifiers

A variety of	A number of	Many	An array of
Various	Numerous	Much	Several

4. [<u>number</u>] + **superordinate** + [**:**] + [**examples**]

    Scientists theorize that global temperature change may be induced by **two natural causes: volcanism, solar activity, AND OTHER** <u>natural causes</u>.

BEWARE!   ⚠   Avoid using **like** to introduce examples. Like has the meaning of **similar to**, not *for example*!

Scientists theorize that global temperature change may be induced by natural causes, <u>like</u> **volcanism and solar activity**.

Scientists theorize that global temperature change may be induced by natural causes, **SUCH AS volcanism and solar activity**.

Use **Like** to make comparisons or to show similarities between two concepts:

LIKE volcanism, solar activity is also believed to induce global temperature changes.

Don't confuse *i.e.* with *e.g*

Many novice writers tend to overuse, abuse, and confuse the abbreviations **e.g.** and **i.e.**. While the abbreviation **e.g.** (Latin: *exempli gratia*) means *for example*, i.e. (Latin: *id est*) means that is to say and offers an **explanation**, not an example.

Introducing a noun phrase or list of nouns

When the the abbreviations **e.g.** and **i.e.**. introduce a noun phrase or list of nouns, always use two commas to separate the abbreviation from the rest of the sentence. The abbreviated forms are most often reserved for use in brackets/parentheses. Use the full form in running text (See the final section below). (See also 5 sentence connectors.)

INCORRECT: MISSING COMMA 😦

Punctuation is the act and result of punctuating, **i.e.** using punctuation marks.

Punctuation is the act and result of using punctuation marks, **e.g.** commas, semicolons, and apostrophes.

CORRECT: TWO COMMAS 🙂

Punctuation is the act and result of punctuating**, i.e.,** *using punctuation marks*.

Punctuation is the act and result of punctuating (**i.e.,** *using punctuation marks*).

Punctuation is the act and result of using punctuation marks(**, e.g.,** *commas, semicolons, and apostrophes*.

Punctuation is the act and result of using punctuation marks (**e.g.,** *commas, semicolons, and apostrophes*).

Introducing a noun phrase or list of nouns

Use a semicolon before introductory words such as *namely, that is, i.e., for example, e.g.*, or *for instance* when they introduce a **complete sentence**. Don't forget to also use a comma after the introductory word. (See also 4.3 Semicolon p. 76 before introductory words).

Incorrect: Use full form in running text 😦

The names of institutions are proper nouns and should therefore be capitalized**, i.e.,** *the initial letter of all nouns in the name should be written in upper case script*.

The names of institutions are proper nouns and should therefore be capitalized**, e.g.,** *the Helsinki University of Technology* requires capitalization of all the words in the name except for the preposition *of*.

Correct: With semicolon and final comma 🙂

The names of institutions are proper nouns and should therefore be capitalized**; THAT IS,** *the initial letter of all nouns in the name should be written in upper case script*.

The names of institutions are proper nouns and should therefore be capitalized**; FOR EX-AMPLE,** *Helsinki University of Technology* requires capitalization of all the words in the name except for the preposition *of*.

3.2.7 Avoid question forms

One common feature of academic English is that it avoids **direct questions**, allows **indirect questions** introduced by **how, why, what, which, whether**, but prefers to convert questions into noun phrases introduced by nouns such as *way, method, means, reason, type*, and *quantity*. The examples below outline some of the strategies you can use to avoid question forms.

Note how the order of the SUBJECT and the **verb** are not inverted in the indirect question forms below.

What questions

Direct question form:
This study aims to determine WHAT **are** the specific engineering properties that are required to maximize the service life of the product?

Indirect question form:
This study aims to determine WHAT the specific engineering properties **are** that are required to maximize the service life of the product.

Noun phrase:
This study aims to determine ~~what are~~ THE SPECIFIC ENGINEERING PROPERTIES ~~that are~~ required to maximize the service life of the product.

How questions

Direct question form:
This report aims to determine HOW **can** the department **lower** costs?

Indirect question form:
This report aims to determine HOW the department **can lower** costs.

Noun phrase:
This report aims to determine WAYS **for** the department **to** lower costs.
This report aims to determine WAYS **to** lower costs in the department.
This report aims to determine WAYS **of** lower**ing** costs in the department.
This report aims to determine METHODS **for** lower**ing** costs in the department.
This report aims to determine MEANS **for** lower**ing** costs in the department.

Why **questions**

Direct question form:
This report explains **WHY was** the MSM **built** on the Java 2 platform.

Indirect question form:
This report explains **WHY** the MSM **was built** on the Java 2 platform.

Noun phrase:
This report explains **THE REASONS for** build**ing** the MSM on the Java 2 platform.

Which **questions**

Direct question form:
WHICH motherboard **is installed** on your computer?

Indirect question form:
The BIOS version string can be used to determine **WHICH** motherboard **is installed** on your computer.

Noun phrase:
The BIOS version string can be used to determine **THE TYPE OF** mother-board ~~is~~ **installed** on your computer.

Open questions

Unlike the other types of question forms listed above, most open-ended questions can best be expressed as **indirect questions** introduced with **whether**. Nevertheless, the version using the **noun phrase** below sounds more formal. Here, **feasibility** (possibility sounds too informal) would be appropriate because it expresses the same degree of uncertainty as **can** in the direct question form.

Direct Question form:
The purpose of the study was to determine **CAN** painted surfaces **BE MADE** slip-resistant?

Indirect Question form:
The purpose of the study was to determine **WHETHER** painted surfaces **can be made** slip-resistant.

Noun Phrase:
The purpose of the study was to determine **THE FEASIBILITY OF** mak**ing** painted surfaces slip-resistant.

> **BEWARE!**   ⚠️   You cannot use **if** in indirect questions. Instead, use **whether** in indirect forms.
>
> 🙁   This study aims to determine **if** painted surfaces **can be made** slip-resistant.
>
> 🙂   This study aims to determine **WHETHER** painted surfaces **can be made** slip-resistant.

3.3 Report functions

The use of language to realise a specific purpose is known as a **language function**. Writers of academic texts need to communicate a wide range of purposes linked to research activities. These *research functions* typically include tasks such as describing aims, referring to figures, comparing results, explaining procedures, and justifying methodological choices.

These research functions often differ from everyday social functions of communication. For example, the function used to *describe aims* could, when addressing another person face-to-face, be expressed as **I wanna tell you about...**, whereas the same function would be better expressed in an academic context as **This study aims to describe...**. Note how this academic version avoids direct reference to either the writer (I, we) or the reader (you) and prefers the choice of vocabulary particular to that field of study–*aims* instead of *wanna* and *describe* instead of *tell*.

Research functions vary from one field to another. Some functions are confined to specific fields, such as describing product yield in chemistry. Other functions, such as referring to figures, are common to all research fields.

Some functions are associated only with certain sections of research reports, while others, such as metatext, are important throughout the whole text. Metatext is especially important because it not only guides the reader in how to interpret the text but also signals the writer's attitude to both the text and to the reader.

3.3.1 Expressing means

A number of conventional patterns are available to the writer to **front** certain information elements in the sentence. This allows the writer not only to maintain the **topical flow** of information but also to satisfy the **light-before-heavy** requirements when structuring the text.

The methods section primarily consists of three basic information elements: **action, means,** and **purpose**.

Quantitative determinations

[VARIABLE]	[ACTION]	[MEANS]
The electrical properties of the capacitors	**were measured**	**using** a Hewlett-Packard impedance analyzer.

[MEANS]	[ACTION]	[PURPOSE]
A Hewlett-Packard impedance analyzer	**was used**	**to measure** the electrical properties of the capacitors.

[PURPOSE]	[ACTION]	[MEANS]
To measure the electrical properties of the capacitors,	**we used**	a Hewlett-Packard impedance analyzer.

[GOAL]	[ACTION]	[MEANS]
Measurements	**were performed**	**on** a Hewlett-Packard impedance analyzer.

Production pattern

Another important pattern is the **Production pattern**. This pattern introduces new characters as an **outcome** or **end-product**. It is often found at the beginning before the description of a process and is usually used to describe how an end-product was derived:

[PRODUCT]	[ACTION]	[MEANS]
The oligonucleotide primers	**were synthesised**	**by** phosphoramidite chemistry **on** a DNA synthesis device.
		[SOURCE]
The plasmid phGH-M13gIII	**was constructed**	**from** the hGH producing plasmid, pBO473 [8].

[MEANS]	[ACTION]	[PRODUCT]
Phosphoramidite chemistry	**was used**	**to synthesize** the oligonucleotide primers.

Of course, the two information elements **[PRODUCT]** and **[SOURCE]** can also be combined and even inverted to give the opposite orderings:

[PRODUCT]	[ACTION]	[MEANS]	[SOURCE]
Plasmid phGH-M13gIII	**was created**	**by** gel purifying	the lac fragment.

[SOURCE]	[ACTION]	[PURPOSE]	[PRODUCT]
The lac fragment	**was gel purified**	**to create**	the plasmid phGH-M13gIII.

3.3.2 Citing other researchers' work

A number of options are available to the writer in terms of (1) the form of the reference given to the author as well as (2) its position within the sentence.

Form of citation

The form of citation can be either *integral* or *non-integral*. An integral citation is one in which the name of the researcher occurs in the actual citing sentence as a grammatical element of the sentence; in a non-integral citation, the researcher occurs either in **parenthesis** (*sulkeet*) or is referred to elsewhere by a **superscript number** (*viitenumero*).

> 'We speculate that coyotes have reduced the carrying capacity of bobcats in eastern Texas by diminishing the availability of prey.'

Then any of the following forms could be used to report the authors original claim, depending upon your rhetorical intention.

For a full list of verbs used to report previous research, see http://sana.tkk.fi/awe/ > **Style** > **Research functions** > **Citing other work**

Integral citation

1. **Smith (2005)** suggested that coyotes may have reduced the carrying capacity of bobcats in eastern Maine by diminishing the availability of prey.

2. In a study of habitat partitioning in eastern Maine, coyotes were found by **Smith (2005)** to have reduced the carrying capacity of bobcats by diminishing the availability of prey.

Non-integral citation

1. Coyotes may affect the carrying capacity of bobcats by diminishing the availability of prey **(Smith, 2005)**.

2. Recently, it has been suggested that coyotes may affect the carrying capacity of bobcats by diminishing the availability of prey **(Smith, 2005)**.

3. In a study of habitat partitioning in eastern Maine, coyotes were found to have reduced the carrying capacity of bobcats by diminishing the availability of prey **(Smith, 2005)**.

4. Previous research suggests that coyotes may affect the carrying capacity of bobcats by diminishing the availability of prey **(Smith, 2005)**.

Location in the sentence

In integral citations, the name of the researcher occurs as a part of the actual text; it can be placed either at the beginning or the end of the sentence.

Sentence-initial position

1. **Smith (2005)** has reported that.. . .

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2. In a study of partridge by **Smith (2005)**, it was found that.. . . .

3. As was also shown by **Smith (2005)**, our results indicated that. . .

4. According to **Smith (2005)**,. . .

Sentence-final position

1. . . . has been reported by **Virtanen (2005)**.

2. . . . , as previously reported by **Virtanen (2005)**.

Chapter 4

PUNCTUATION

4.1 The Comma [,]

4.1.1 Combining sentences

Use a comma in front of *coordinating conjunctions* to combine two complete sentences

When combining two complete sentences, both Finnish and English agree that you should put a comma before **coordinating conjunctions**, such as **and, but, nor, yet, or**, and **so**. The subjects in the two separate sentences are underlined in the examples below.

> **SENTENCE 1 + [COORD. CONJ.] + SENTENCE 2:**
>
> As a result of global warming, the oceans will warm**, AND** glaciers will melt.
>
> NASA has used fuel cells to generate electricity in spacecraft since the 1960s**, BUT** more research is needed to make them durable and cost-effective for use in cars, homes, or businesses.
>
> Hydrogen is non-toxic and non-poisonous. It will not contaminate groundwater**, NOR** will a release of hydrogen contribute to atmospheric pollution.
>
> Hydrogen fuel cells are safe and effective**, YET** the technology is still too expensive for the mass market.
>
> Hydrogen is the most plentiful gas in the universe**, SO** there is no fear of this energy source ever running out.

When both sentences have the **same subject**, English tends to delete the second subject, and no comma is then placed before the coordinating conjunctions.

> **Without comma:**
> These schemes provide a solution to current traffic [no comma]   **AND** ∅ are easy to implement.
> **[subject]**   **[same subject]**

However, if one subject has two verbs, then no comma is placed before the coordinating conjunction of the second verb.

With comma:
These schemes provide a solution to current traffic problems**,**   **AND** they are easy to implement.
[subject]   **[reference to same subject]**

Different subjects:
Hydrogen fuel cells are safe and effective**,**   **BUT** this technology is still too expensive for the mass market.

Same subject:
Hydrogen fuel cells are safe and effective ∅   **BUT** ∅ still too expensive for the mass market.

Relative clauses

Use a comma to separate *non-defining relative clauses* from the main clause

English has two types of **relative clauses: non-defining** (also called: commenting, non-defining) and **defining** (also called: essential, restrictive) relative clauses. This distinction is important if you are to punctuate these correctly in English. Unlike Finnish, a comma is only needed when the relative clause contains non-defining information.

defining information

defining relative clauses provide information that defines and restricts the meaning of the word that comes before the clause, and is thus essential for understanding what we are talking about. In contrast to Finnish, defining relative clauses are never punctuated with a comma. Notice the different comma usage in English and Finnish in the examples below.

> The Carlson company offered cash to **SURFERS WHO** agreed to look at advertisements.
>
> Cybergold-yhtiöt tarjosi käteisrahaa **NIILLE, JOTKA** suostuivat katsomaan yhtiön mainoksia.
>
> *(The absence of a comma in the English version signals that only those surfers promising to look at advertisements were offered cash, not all surfers!)*

In **formal definitions**, the relative pronouns **which**, **that** and **who** are not usually introduced by a comma, because they are essential to the meaning and define the class:

> A catalytic converter is a **device** in the vehicle exhaust system **WHICH/THAT** chemically changes pollutants, such as carbon monoxide (CO), hydrocarbons (HC), and nitrogen oxides (NOx) into harmless substances.
>
> A scientist is a **person WHO** is expert in an area of science and uses scientific methods in research.
>
> A limited partnership is a **business structure IN WHICH** the liability of one or more of the partners is limited to the amount invested by him.

Non-defining information

Non-defining relative clauses comment or give extra details on the topic, and can thus be omitted from the sentence without losing the main meaning of the sentence. In fact, this is usually the best test of whether you are dealing with a non-defining or defining relative clauses. Non-defining relative clauses must also be separated from the rest of the sentence by punctuation–most commonly by commas. In the examples below, notice how these versions differ in meaning from the defining versions above.

> **DEFINING MEANING:**
>
> **My brother** **WHO** **lives in Germany** lives in Germany is an Engineer.
> *(I have two other brothers. The others live in the USA.)*
>
> **Mexican food** **THAT**/**WHICH** **is heavily spiced with chili** gives me indigestion.
>
> *(Not all Mexican foods are heavily spiced with chili. Only Mexican food containing chili give me stomach problems.)*
>
> **NON-DEFINING MEANING:**
>
> **My brother,** **WHO** lives **in Germany,** lives in Germany is an Engineer. *(I have only one brother. He just happens to live in Germany.)*
>
> **Mexican food,** **WHICH** **is heavily spiced with chili,** gives me indigestion. *(All Mexican food is heavily spiced with chili.)*

To make clear whether the information is necessary to describe the noun in an defining clause, use **that** or **which** with NO comma. To add extra information in a non-defining clause, use **which** and be careful to add a comma.

Which or *that*?

While **that** can only be used to introduce defining information, **which** is used to introduce **both** defining and non-defining information. Some grammarians still, however, insist on limiting which to only non-defining relative clauses.

Below you will find more details about the three special cases when *that* cannot be used and *which* is the only possibility.

4.1.2 Parenthetical information

Use a comma to signal *parenhetical* (non-defining) information within a sentence

Parenthetical comments present extra information and thus take the reader away from the normal flow of the text. Parenthetical information only adds extra comments or information, such as afterthoughts, that interrupt the normal flow of the sentence. As the name implies, a parenthetical can sometimes be punctuated with **parentheses (sulkeet)** instead of commas. We have already seen this parenthetical use of the commas with non-defining relative clauses.

Parenthetical comments function as **metatext** (text that talks about and points readers to other parts of the text). In the examples below, notice how leaving out the words enclosed in commas would not change the message.

> In the future, those non-energy sectors most dependent on energy will suffer the greatest loss in production**, as shown in table 1**.
>
> It has been divided between fourteen cousins, three of whom are of Corsican extraction and thus**, according to our French friends,** impossible to deal with.

Other alternatives

Alternative ways of indicating and emphasizing this kind of information are to use either **parentheses (USA) / brackets (UK)** or **dashes**. Parentheses provide a stronger, more noticeable mark than a pair of commas. Parentheses also tend to enclose a non-defining element that interrupts the normal flow of the sentence with information that has little grammatical relation to the rest of the sentence. Similar to parentheses, **dashes** enclose elements that syntactically or emotionally interrupt the normal flow of the sentence with additional, though non-defining, information. More importantly, dashes are considerably stronger than parentheses or commas, and are not used in all academic fields.

Table 4.1: Parenthesis vs. dashes

Parenthesis:
It has been divided between fourteen cousins, three of whom are of Corsican extraction and thus **(according to our French friends)** impossible to deal with.

Dashes:
It has been divided between fourteen cousins, three of whom are of Corsican extraction and thus**—according to our French friends—**impossible to deal with.

Appositives

Use a comma for *appositives* (to re-name something mentioned before)

An **appositive** is a noun or noun phrase that renames a previous noun by identifying, defining, or explaining it.

> The core of this paper is a case analysis of how **a large UK retailer, J. SAINSBURY,** used VCA to manage the supply chain in cooperative relationships with suppliers.
>
> **NOKIA, the world's top cell phone maker,** on Tuesday launched the first pre-commercial 3G network in Toulouse, France.

When you give a **title** or **label** to a person, concept, or thing, formal written English requires commas before and after its **descriptor**.

> During a recent visit by **the Finnish President**, Tarja Halonen, Japan experienced a very serious earthquake.
>
> **However:** During a recent visit by **President Tarja Halonen**, Japan experienced a very serious earthquake.

Appositives commonly present **examples, explanations, and definitions** that help to identify or explain a concept. In the examples below, notice how leaving out the words enclosed in commas would not change the message. Often the appositive is introduced by **namely, for example, that is, such as, including, i.e.**, or **e.g.** Examples in academic English are typically expressed as appositives which take a comma both before and after the example(s). (See also section 8.6 *Superordinates* p. 129)

> In the future, those **non-energy sectors** most dependent on energy, such as **the chemical and steel industries,** will suffer the greatest loss in production.
>
> Music has been used by other **community agencies**, including **a health center and church groups,** as a vehicle for promotion of community projects and events.

In science, variables are often defined as appositives:

> By maintaining **a constant current**, I_o , through **an inductor**, L_I , a high overall input power factor can be obtained.
>
> Rogers, et al. [11] obtained all the electrical parameters using an aggregate model developed based on **two mechanical parameters**, slip and inertia constant, to optmise the step response match between the model and the actual subsystem.

4.1.3   Locating the subject

Sentences connectors

Use a comma to separate sentence connectors and other adverbs from the subject

To avoid confusion and to help the reader to quickly find the subject of a sentence, English uses the comma to clearly **mark and separate** any information that comes at the beginning of the sentence from the subject. Typical words that can come before the subject include **sentence connectors, attitudinal adverbs** (*words signalling the writer's attitude*), and **time adverbials**. However, almost any adverb used to start a sentence in English will need a comma to separate it from the rest of the sentence. Notice in the text below how easy it is to identify the subjects when the introductory elements have been separated from the rest of the text by a comma.

> **Sentence connector (e.g.,** *Therefore, Furthermore, Nevertheless***)**
>
> However, **there** is a reluctance to introduce new policies or tax regimes without additional information relating to the scale and nature of smaller firms working capital management routines.

Attitudinal adjunct (e.g., *Surprisingly, Undoubtedly, Clearly*)

UNFORTUNATELY, **what** is meant by the term varies according to the field of study.

Time adverbals (e.g., *Currently, Finally, Next, Second(ly)*)

RECENTLY, **engineering systems** have begun to have almost biological levels of complexity.

The **subject** of a sentence has special importance in English, because It tells you what the sentence is about. Unlike Finnish, every sentence in English must contain a subject. Even when no *agent* can be found for an *action*, English will create a **dummy subject** to fulfil this need. Thus, in the Anglo-American view of the world, things do not just happen, rather there is always someone or something to **blame** for any particular action.

Dummy Subjects:

Tänään sataa lunta. (who or what is raining?)   Huoneessa on kolme ikkunaa.
It is snowing today.   **There** are three windows in the room.

In addition to this cultural and grammatical need for a subject, English lacks specific markers to help readers recognise whether a word is noun or verb; whereas, these functions are often clearly signalled in Finnish through **case endings** (*sijamuodot*) or **verbal suffixes** (verbin päätteet).

The function of the sentence connectors is considered so important in English that even when they are used **within sentences**, they are specially emphasized and separated from the normal flow of the sentence by commas.

BEWARE! Unlike other adverbs, sentence connectors are not only separated by commas at the beginning of the sentence but also when they are placed within the sentence. The most common example of this is *however*. Compare the two examples below.

HOWEVER, the evidence shows that this variable does have a significant influence on useability.

The evidence shows, HOWEVER, that this variable does have a significant influence on useability.

The same is not true for other adverbs:

RECENTLY, engineering systems have begun to have almost biological levels of complexity.

Engineering systems have RECENTLY begun to have almost biological levels of complexity.

Introductory phrases and clauses

Use a comma to separate an introductory phrase from the subject

As with sentence connectors, any **introductory phrases** that hinder the reader from immediately seeing the subject are marked off by a comma to show the reader where the subject begins. Typically, these groups of words include **prepositional phrases** (those that begin with a preposition of **time, place, manner**) or **infinitive phrases** (those that begin with an **to + verb**).

> **Introductory prepositional phrases (In, On, At, Of, With, For)**
>
> **IN firms of all sizes,** a basic aim of management accounting routines is to control vital areas and to monitor performance.
>
> **Introductory infinitive phrases (To analyse)**
>
> **TO examine these issues**, we adopt transaction cost economics (TCE) as our basic frame of reference.

BEWARE! No comma is needed when the phrase comes after the subject. Compare the two examples below.

Before subject: requires comma

In Figure 10, the difference between tamper-proofing and other techniques is characterized.

To send data, IR remote controls use a sequence of light bursts with different delays.

After subject: no comma necessary

The difference between tamper-proofing and other techniques is characterized ∅ **in Figure 10**.

IR remote controls use a sequence of light bursts with different delays ∅ **to send data**.

Subordinate clauses

Use a comma before and after subordinate clauses to mark the beginning of the subject

Subordinate clauses are introduced by subordinators such as contrastive or causative subordinators. Such clauses depend on the rest of the sentence for their meaning, since they do not express complete thoughts and thus cannot stand alone. They are sometimes called **dependent clauses** because they **depend** on a main clause to give them meaning and must therefore always be attached to a main clause.

Because subordinate clauses always express **additional, less important ideas** than those in the main clause, they always require a comma when placed at the beginning of the sentence, **before** the subject of the main clause, but **not** when placed **after** the main clause. (Note that *Finnish always separates subordinate clauses with commas, regardless of their position in the sentence*.)

Table 4.2: Subordinate conjuctions

Function	Subordinate conjuctions	Example
TIME	after, before, when until, since, when	**AFTER the United States withdrew its support from the Kyoto Accord,** there has been little hope of diminishing global emissions of greenhouse gases in the near future.
PLACE	where, wherever	**WHEREVER you go,** Bluetooth wireless technology connects your devices without adding clutter to your desktop...
MANNER	as, as if	**AS you enter the room,** you will notice immediately that...
CAUSE	because, since, as	**BECAUSE CH$_4$ is also a greenhouse gas,** it can be regarded as making both a direct and an indirect effect on the greenhouse effect.
CONDITION	if, unless	**IF you enter the factory,** you are required to wear a hard hat.
PURPOSE	so that, in order that, in order to, for	**IN ORDER TO stabilise concentrations of nitrous oxide at present day levels,** an immediate reduction in global emissions by 80% would be needed.
CONTRAST	although, while, whereas	**ALTHOUGH there are dozens of greenhouse gases,** a handful of dominant ones have attracted the most attention.

BEFORE MAIN CLAUSE: ALWAYS USE A COMMA

AFTER Finland refused to yield to Russian demands concerning areas of Finnish territory, the Soviet Union attacked Finland on November 30, 1939.

AFTER MAIN CLAUSE: USUALLY WITHOUT A COMMA

The Soviet Union attacked Finland in the 'Winter War' of 1939-1940 ∅ **AFTER Finland refused to yield to Russian demands concerning areas of Finnish territory.**

BEWARE! A common exception to this rule are the contrastive and causative subordinators, and more specifically **while**, **since**, and **as** because only the use of the comma distinguishes them from their other meanings expressing **Time** of **silloin kun**, **jstk lï¿$\frac{1}{2}$htien**, and **samalla kun**.

There is no universal agreement among scientists and climatologists on the potential impacts of an increase in the average temperature of the Earth**, although it has been hypothesized that it could lead to changes in the global climate.**

4.1.4   Listing

Items in a list

Use a comma to separate items in a list

In **British English, and** and **or** are usually not preceded by a comma before the final item in a list, whereas in **American English** a comma before the final **and/or** is compulsory. Both Finns and the British punctuate lists in the same way.

The Family Filter blocks all harmful **image files, video files, SPAM** ∅ and **internet pages** from your children's computer.

The Family Filter blocks all harmful **image files, video files, SPAM,** and **internet pages** from your children's computer.

However, the British way of punctuating lists runs into trouble when these lists become more complex, as is common in science and technology. For example, the two first items in the list above, *image files* and *video files*, would most likely be expressed as *image and video files* in academic writing. In Finnish, you would simply use a hyphen to show this relationship: *kuva- ja videotedostot*. However, English can only use this type of hyphenation if both of the connected words are written as one word. (see hyphenation: closed form noun compounds)

The Family Filter blocks all harmful **image AND video files, AND SPAM** ∅ **AND internet pages** from your children's computer.

At first sight, it looks like might be a better version. However, what about **SPAM and Internet pages**? Did the writer really mean *SPAM pages and Internet pages* or *SPAM and Internet pages*?

If the latter were intended, then the following would make a better version:

The Family Filter blocks all harmful **image AND video files, SPAM** ∅ **AND internet pages** from your children's computer.

In order to avoid any confusion, however, modern usage puts a comma in front of the final *and* even in British English. This may be used, for example, when the list items include internal *and*s or the final item has two parts.

The Family Filter blocks all harmful **image AND video files, SPAM, AND internet pages** from your children's computer.

There is, nevertheless, one other strategy that can help to get around this problem. That is to use the connector *as well as*. Note in the next example, how difficult it is to read the text due to the overuse of *and*.

> In Europe, **individual AND small-group** researchers as well as **industrial AND national** laboratories for specialized topics have established a strong position in the **synthesis AND assembly** of nanoscale **building blocks AND catalysts**, **AND** in **polymeric AND biological** approaches to nanostructured materials.
>
> The process must integrate the human activity, the tools, **AND** the intermediate **AND** final work products into a coherent flow of actions.

Compare the above example with the improved version that uses *as well as* to avoid confusion.

> In Europe, **individual AND small-group** researchers as well as **industrial AND national** laboratories for specialized topics have established a strong position in the **synthesis AND assembly** of nanoscale **building blocks AND catalysts**, **AS WELL AS** in **polymeric AND biological** approaches to nanostructured materials.
>
> The process must integrate the human activity, the tools, **AS WELL AS** the intermediate **AND** final work products into a coherent flow of actions.

Coordinate adjectives

Use a comma to separate two or more equivalent adjectives

Many languages, including Finnish, feel comfortable using *and* between two adjectives that are considered to be equivalent. Although this use might be heard in spoken English, the written form totally avoids this use of *and*.

> Kuten monen muunkin alunperin **eksoottisen ja kalliin** tekniikan kohdalla on käynyt, kirjoittavasta CD-asemasta on tullut tavallisen käyttäjän arkinen apuväline.

> Similar to many other initially **exotic, expensive** technologies, CD-Recordable drives have become everyday tools for most users.

Two types of adjective groups

Adjectives (the words that describe nouns) can be divided into two types: **coordinate** and **cumulative** adjectives. Coordinate adjectives are those that need a comma between two or more adjectives, whereas cumulative adjectives require no comma. In neither case would ***and*** be appropriate in academic writing, so we only need to worry about whether or not the adjective group requires a comma. Luckily, a **two-step test** exists to help you to distinguish between coordinate and cumulative adjectives.

Coordinate adjectives

Coordinate adjectives can pass both parts of the *two-step test* and should therefore be separated by commas.

---

1. Can you put 'AND' between the adjectives?

. . . exotic and expensive technologies. . . → YES!

2. Can you reverse the order of the adjectives without changing the meaning?

. . . exotic expensive technologies. . . (original) → YES!

. . . expensive exotic technologies. . . (reversed) → YES!

Notice that the adjectives can each modify the noun *technologies* separately. They cannot be separated by the conjunction *and* or placed in any order without affecting the meaning of the sentence. All three versions say the same thing, so the adjectives *exotic* and *expensive* must be coordinate adjectives and should therefore be separated by commas.

Cumulative adjectives

Cumulative adjectives are those adjective pairs that fail the two-step test and should therefore appear in the same **fixed order**, **without a comma**, and **without *and***.

---

1. Can you put 'AND' between the adjectives?

. . . modern **and** electronic **devices**. . . → NO!

2. Can you reverse the order of the adjectives without changing the meaning?

. . . modern electronic **devices**. . . (original) → YES!

. . . electronic modern **devices**. . . (reversed) → NO!

Notice that the adjectives can each modify the noun *devices* separately. They can <u>not</u> be separated by the conjunction *and* or placed in any order without affecting the meaning of the sentence. The adjectives *modern* and *electronic* fail the two-step test and should therefore appear in the same fixed order, without a comma, and without *and*.

> Almost all <u>modern</u> ∅ <u>electronic</u> **devices** have internal clocks.

4.1.5 Resultative -ing clauses

Use a comma before a resultative -ing clause

A common way to indicate the *result* of an action is to use a causative verb in the -ing form separated by a comma.

> USING -ING CLAUSE OF RESULT

Any significant greenhouse warming could cause a rapid melting of polar ice**, RESULTING in a rise in sea level and the consequent flooding of coastal areas**.

The fields of nanoscience and nanoengineering have developed in recent years**, LEADING to unprecedented understanding of the fundamental building blocks of all physical things**.

The same meaning could be expressed in less academic language as the following:

WITHOUT -ING CLAUSE OF RESULT

Any significant greenhouse warming could cause a rapid melting of polar ice**, WHICH** would result in **a rise in sea level and the consequent flooding of coastal areas**.

Any significant greenhouse warming could cause a rapid melting of polar ice **AND** result in **a rise in sea level and the consequent flooding of coastal areas**.

When the result is expressed using verbs that are not causative, writers tend to reinforce the cause-effect relationship by inserting either **thus** or **thereby** before the verb:

NON-CAUSATIVE VERBS:

Design activities are often interdisciplinary, **THUS BRINGING together concepts from the arts, mathematics, and sciences**.

Our industrial civilization burns enormous quantities of fossil fuels**, THEREBY STEADILY RAISING** the **concentration of CO2 in the atmosphere**.

4.2   Colon [:]

4.2.1   Introducing a list

Use a colon after an *independent clause* to introduce a list

The most common use of the colon is to introduce both unformatted and bulleted lists. To use the colon correctly in American English, you must make sure that sentence that comes before the colon is a **complete, grammatical sentence**. One way to test whether you have used a colon correctly is to delete the information after the colon. If what is left can stand alone as a complete thought, then you have a grammatical sentence and have used the colon correctly. In British English, this practice is not always followed, and a colon may be used, even though the sentence before the colon is incomplete.

Complete sentence → colon

The lab report consists of six sections: introduction, background, engineering theory, experimental setup, procedure, and analysis.

Notice in the above example (*The lab report consists of six sections*) that you could easily put a period after sections, and everyone would understand the statement as a full sentence. On the other

hand, if the information that comes before the colon cannot stand alone, then you shouldn't use a colon there.

Incomplete sentence → NO colon!

The six main sections of a lab report `ARE:` introduction, background, engineering theory, experimental setup, procedure, and analysis.

The lab report consists `OF:` introduction, background, engineering theory, experimental setup, procedure, and analysis.

The six main sections of a lab report `ARE` the introduction, background, engineering theory, experimental setup, procedure, and analysis.

The lab report consists `OF` introduction, background, engineering theory, experimental setup, procedure, and analysis sections.

A second important requirement for using a colon to construct a list is to find an appropriate superordinate term that accurately describes the items in the list. Do these items comprise consequences, causes, problems, or some other concept? If you have problems thinking of a superordinate for your list, look up some of the key terms in a good English dictionary; dictionary definitions always describe words in terms of a superordinate concept.

Superordinate terms are underlined in the examples below.

The lab report consists of six <u>sections</u>: introduction, background, engineering theory, experimental setup, procedure, and analysis.

Coral reefs are being destroyed by human activity in many <u>forms</u>:

- cyanide fishing
- coral mining
- deforestation
- coastal development
- and careless divers

4.2.2 Introducing a summary or explanation

Use a colon between *independent clauses* if the second summarizes, explains or amplifies the first.

Use a colon to connect two independent clauses when the first of the pair creates an **expectation** in the reader that is fulfilled by the second. In other words, the second sentence **summarizes, explains, exemplifies** or **amplifies** the first, or provides evidence to prove the preceding statement.

Note that a capital letter is sometimes used after a colon that precedes an independent clause. Although this seems to be a flexible rule, it is best to be consistent in your use.

The local unemployment rate in Savukoski is quite high: in June it stood at 20%, which was an improvement on the average figure for the early part of the year, which was 24.9%. (explains)

The purpose of this paper is twofold: (1) to determine tasks associated with current injury, illness, and fatality trends in the mechanical contracting branches of the construction industry; and (2) to identify current safety practices associated with the reduction of risk of these injuries, illnesses, and fatalities. (explains)

Often the titles of research articles and reports use this function of the colon to give further details explaining the contents of the reports.

Laser Welding Induced Alignment Distortion in Butterfly Laser Module Packages: Effect of Welding Sequence.

4.3 Semicolon [;]

4.3.1 Lists containing internal punctuation

Use a semicolon to separate items in a list in cases where one or more of the items contains commas or other punctuation.

Usually, we use a comma to separate three items or more in a list. However, if one or more of these items contain commas, then you should use a semicolon, instead of a comma, to separate the items and avoid potential confusion.

For example, three items, one of which contains an *internal comma* could be written as a formatted list, as shown below.

Transactions can be scored discriminatingly on three dimensions:

1. asset specificity
2. uncertainty (including complexity, which is similar to uncertainty in its effects)
3. frequency.

However, when presented as an unformatted list, these same items would have to be separated by semicolons:

Transactions can be scored discriminatingly on three dimensions: (1) asset specificity; (2) uncertainty (including complexity, which is similar to uncertainty in its effects); and (3) frequency.

4.3.2   Before connectors in compound sentences

Use a semicolon before introductory words

A semicolon can also be used between two independent clauses, when the second clause begins with a sentence connector as the introductory element. Generally, the semicolon here could be substituted by a period without any change in meaning.

> During the development of the various engineering disciplines, considerable overlap has occured among the different fields**; FOR EXAMPLE,** chemical engineering and mechanical engineering are both concerned with heat transfer and fluid flow.

Why to use semicolons?

To understand why a semicolon is used, you have to understand what kind of problem it solves. Often, novice writers can find themselves in a dilemma when trying to place a sentence connector after a conjunctive like "and" or "but" before introducing a second subject in a compound sentence. This causes the problem that not only the "and" would require a comma to separate the new subject from the previous part of the sentence, but the following sentence connector also requires commas, both before and after. Thus, in theory, you would end up with three consecutive commas. To avoid this problem, simply replace the "and" with a semicolon and then separate the sentence connector from the new subject with a comma.

        PROBLEM (3 consecutive commas):

Similar to Sweden, Finland has an arctic climate, AND, THEREFOR polar bears migrate as far south as Helsinki in search of prey.

    SOLUTION (Replace the "and" with a semicolon):

Similar to Sweden, Finland has an arctic climate; THEREFORE, m bears migrate as far south as Helsinki in search of prey.

however,	moreover,	therefore,	in addition,	nevertheless,

Similarly, a semicolon can be used before introductory words that are followed by a list of three or more items and preceded by a complete sentence.

> First, with few exceptions (Balderjagn, 1988; Schahn and Holzer, 1990; Grunet and Kristensen, 1994), many earlier studies failed to investigate the impact of sociodemographic variables on all components of environmental consciousness**;** namely, knowledge about green issues, attitudes towards environmental quality, and levels of environmentally sensitive behavior.
>
> **Note:** if the introductory words are followed by fewer than three items, then commas are used.

namely	that is (i.e.)	for example (e.g.)	for instance

4.4 Hyphen [-]

The **hyphen** [-] helps avoid confusion by telling readers when combinations of two or more words should be understood as a single concept. These combinations, called **compound words**, have five main uses:

1. **Compound nouns:** Hyphens can join two or more words to form new **'nouns'**. These forms are typical of journalistic and business writing, though less common in academic writing.

2. **Compound adjectives:** Hyphens can indicate that two or more words act as an **'adjective'** before a noun. These forms typically occur in the academic writing of science and technology.

3. **Words formed from affixes:** Hyphens can be used to join an **'affix'** to a word. Americans tend to use this only to avoid misunderstanding, whereas the British use hyphens to separate prefixes clearly from the main part of the word.

4. **Numbers and fractions:** Hyphens are used to form **fractions** (one-third) and **compound numbers** (from twenty-one to ninety-nine).

5. **Avoiding ambiguity:** Hyphens are used to make a clear distinction between words that would otherwise be confused *re-form* (to form again) and *reform* (to improve by change).

4.4.1 Compound nouns

Most compound nouns were initially written as separate words. As these compounds gained popularity, they next appeared joined by a hyphen. Later, as they became firmly established in the language, the hyphen disappeared, resulting in closed-form compound nouns.

Open form	→	Hyphenated form	→	Closed form
fire fighter (1903)		fire-fighter		firefighter
work station (1931)		work-station		workstation
data base (1962)		data-base		database

This process continues today, and has even accelerated, with many words now being formed without an intermediary stage of hyphenation. There are already signs that more recently coined words, such as **cell phone** (1984), **web site** (1995) and **home page** (1992), may ultimately be written as **one-word compound nouns** (**cellphone, website**, and **homepage**). Remember, however, that closed form compounds are much less common in English than in Finnish, Swedish, or German.

Now that we have explored the **evolution** of compound nouns, let's next take a look at two types of **hyphenated compound nouns**: those created from noun-noun combinations and phrasal verbs.

Hyphenated compound nouns

You will often notice compound nouns formed from either **two nouns** or **phrasal verbs** that are hyphenated, especially in newspapers and in the business world. However, these forms are considered **less formal** and therefore should be avoided in more formal academic writing. Consult a good

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dictionary to determine whether particular compound forms should be hyphenated. **Compound nouns formed from two nouns**

Although many new concepts can be created by combining two nouns, this is more typical of the **journalist style** of magazines, such as Time, Newsweek, or The Economist, rather than of academic writing.

Academic style	$\rightarrow$	**Journalistic**
wish list		wish-list
death wish		death-wish
aircraft carrier		aircraft-carrier
asylum seekers		asylum-seekers
drug dealer		drug-dealer
pressure group		pressure-group
rain check		rain-check

Nouns formed from phrasal verbs

Although phrasal verbs (verb + preposition), such as *take off*, *take over* and *set up*, are not hyphenated, the nouns formed from these verbs are hyphenated, or with increasing use become written as one word. Thus, the hyphen helps readers to distinguish between the verb and noun forms.

Phrasal verb	$\rightarrow$	**Compound noun**
to set up		a set-up (setup)
to bail out		a bail-out (bailout)
to pay off		a pay-off (payoff)
to break in		a break-in

Because English lacks clear rules for hyphenating nouns formed from compounds, your best bet is to consult a well-established English dictionary when unsure. In other cases, when dealing with professional terminology, internet search engines, such as Google and www.googlefight.com can be valuable tools.

So far we have examined **compound nouns**. In the next section, we will look at **compound adjectives** that function like adjectives before a noun.

4.4.2 Compound adjectives

For many writers, the most difficult aspect of hyphenation occurs when nouns are premodified by two or more words (**modifiers**) that function as a single **compound adjective** before the noun. An added problem is that most of these compounds are not usually hyphenated when they occur **after a noun**. As a rule of thumb, a hyphen is likely to be needed when a noun compound consists of more than two nouns.

American English tends to apply this rule far less than British English. Americans omit hyphens as much as possible, unless leaving out the hyphen could otherwise lead to possible misunderstanding.

	Premodifies another noun	$\rightarrow$	**Noun compound alone**
🇬🇧	Credit-card debt (Hyphenated)		Avoid overusing your credit card ∅. (No hyphen)
🇺🇸	Credit card debt (Not hyphenated also ok in the USA)		

In general, English hyphenates the **compound modifier** when it appears before a noun in order to prevent any ambiguity. For example, is *a small business loan* a loan which is small (*small business loan*) or a loan meant for small businesses (*small-business loan*)? Only the use of a hyphen can clarify the intended meaning. Further examples are given below.

HYPHENATED	**NOT HYPHENATED**
A **man-eating** shark (a carnivorous fish)	**A man eating shark** (a carnivorous male human)
New **age-discrimination** rules (new rules regarding discrimination according to age)	**New-age** discrimination rules (rules about discriminating against the philosophy of the New Age movement)

Forming compound adjectives

There are seven forms of compound adjectives that require hyphenation. All the combinations of compound modifiers listed below act as **adjectives** before a noun, and it is the hyphen that makes this relationship clear and helps to avoid ambiguity.

1. [NOUN + NOUN] + NOUN   Note how the same compound noun *video games* is not hyphenated when it occurs alone, but requires a hyphen when it functions as an adjective before another noun:

Mobile phones are bringing video games to a broader audience.

[Noun] [Noun] [Head noun]
SEGA is a major player in the video-game industry.

PREMODIFIER

2. [ADJECTIVE + NOUN] + NOUN   In this example, the *communication networks* are not *high*, but rather the *performance* is *high*. In order to show that *high* modifies *performance* and not the head noun, *networks*, a hyphen is necessary.

There is a growing need for **communication networks** that are **reliable** and can achieve **high performance**.

[Adj] [Noun] [NOUN COMPOUND]

There has been rapid growth in the need for **reliable, high–performance communication networks**.

PREMODIFIER

3. [NOUN + PAST PARTICIPLE] + NOUN   This use of the past participle in modifying a noun allows relative clauses to be compressed and placed before the noun. This ordering also places emphasis on the important word *terms*, rather than *computers* which would have resulted if the writer had used the relative clause. However, this strategy cannot be used with all verbs and could, if overused, violate the requirements of light-before-heavy elements.

RELATIVE CLAUSE:
The Webopedia site offers definitions of many **terms that are <u>related</u> to computers**

REDUCED RELATIVE CLAUSE: **terms <u>related</u> to fields.**

NOUN COMPOUND: [Noun] [Past Part] [Noun]
The Webopedia site offers definitions of many **computer–related terms.**

PREMODIFIER

4. [NOUN + PRESENT PARTICIPLE] + NOUN   Similar to modification using a past participle, using the present participle to modify a noun allows relative clauses to be compressed and moved to a position before the noun. By doing this, the writer is able to emphasise *materials* rather than *fields*.

FULL-FORM RELATIVE CLAUSE:
Nanotubes are expected to form outstanding **materials that <u>emit</u> fields.**

REDUCED RELATIVE CLAUSE: **materials <u>emitting</u> fields.**

NOUN COMPOUND: [Noun][Pres Part] [Noun]
Nanotubes are expected to form outstanding **field–emitting materials.**

PREMODIFIER

In the example above, note how the noun *fields*, which is expressed in the plural (*monikko*) form in the relative clauses, becomes singular (*yksikkö*) *field* when it precedes and modifies the noun *materials*.

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5. [ADVERB + PAST PARTICIPLE] + NOUN Once again, a past participle allows the writer to shift elements around in the noun phrase, thus avoiding the use of the more obvious relative clause, which would have meant ending the sentence with a verb.

RELATIVE CLAUSE: transportation systems that have been WELL ESTABLISHED

[Adv] [Past Part] [NOUN COMPOUND]

Europe has a high population density and most EU nations have well–established transportation systems.

PREMODIFIER

The only exception to this rule occurs with **adverb-adjective** compound modifiers. Hyphens are generally not used in adverb-adjective compound modifiers, when the adverb ends in **-ly** because no such confusion is likely to occur.

Premodification → **Postmodification**
A **quickly-moving manager** A vehicle that **moves quickly**

6. [NUMBER + UNIT] + NOUN Use a hyphen when a **number-unit compound** comes before a noun, but not when it follows the noun.

The original image is 30KB in size, while the **version at a width of 200 pixels** requires only 10KB.

[Num][Cnt] [Noun]

The original image is 30KB in size, while the **200 -pixel version** requires only 10KB.

PREMODIFIER

Note that whereas the units in the number-unit expression would normally be plural when standing alone, the units must become **singular** and hyphenated when placed before a noun.

Premodification → **Postmodification**
A **four-day** week A week that lasts only **four days.**
A **three-step** sequence A sequence that consists of **3 steps.**

7. [PHRASE] + NOUN Phrases that premodify the noun are typically hyphenated to clarify their function as adjectives.

[Phrase] [Adj] [noun] [noun]

Customers insist that suppliers operate state-of-the-art green manufacturing plants.

PREMODIFIER

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4.4.3 Affixed words

Hyphens can be used to join an **affix** to a word. In American English, hyphens are used only when their absence could lead to misunderstanding, whereas British English consistently uses hyphens to separate prefixes from the main part of the word. Thus, many more words with affixes appear hyphenated in British English than in American English.

Only American English provides clear guidelines on when to separate an affix from the main word. The following rules are applied by most dictionaries and guides in the United States.

1. Use a hyphen to avoid doubling or tripling consonants and vowels. (**anti-i**mmune, **de-e**nergize)

2. Use a hyphen to separate **self-**, **ex-**, **all-**, **vice-**, **quasi-** and the suffixes **-like**, **-wise** and **-elect** from the main word. (**self-**respect, **ex-**wife, **all-**inclusive)

3. Use a hyphen to when the main word is a number or a proper noun (nouns that are capitalized, such as names and nationalities). (the **post-K**ekkonen era, **non-F**innish)

4.4.4 Numbers and fractions

Now of course you might be wondering when could you ever possibly need to write a out number in full? Use words in the following situations:

1. When spelling out the names of numbers, those numbers less than one hundred are always hyphenated. Note that there is no hyphen between the 'hundreds' and the 'tens'.

   > 25% → **twenty-five** percent
   > 133 €→ **One hundred** and **thirty-three** euros

2. Numbers from *one* to *ten* are usually spelled out as letters (i.e., *ten* not 10). It is common academic practice to use digits for numbers above ten (10), except when they begin a sentence.

   > The beginning of April finds all **five** 'classical' planets, those planets easily visible with the naked eye since ancient times, shining in the evening sky **45 minutes** after sunset.

3. A number beginning a sentence.

   > **Thirty-five** patients with chronic fatigue syndrome were followed for periods of up to eight years.

4. The shorter of two numbers used together.

   > **fifteen** 33-cent stamps. 150 **twenty-cent** coins.

5. Isolated fractions or indefinite numbers in sentence.

   > Nearly **forty** apartment owners, almost **three-fourths** of the residents, took part in the last building society meeting.

4.4.5 Avoiding ambiguity

A further use of the hyphen is to make a clear difference between words or expressions that might otherwise be confused. This use is concerned with **meaning** rather than with mechanics and technical rules. By using the hyphen in this way, writers can preserve distinction in meaning that might otherwise be lost.

Word level

On the level of individual words, hyphens can be used to avoid confusion between words which would otherwise have the same spelling, but completely different meanings. This phenomenon occurs most frequently with words beginning with *re*. Where prefixed words would be identical to words where the *re* is an integral part of the word, the prefixed version is hyphenated in order to avoid confusion.

Hyphenated	**Not hyphenated**
re-form (to form again)	**reform** (to restructure)
re-cover (to cover again)	**recover** (to get better after an illness)
re-sent (sent again)	**resent** (to feel bitter about something)
re-press (to iron again)	**repress** (to hold down)
re-sign (to sign again)	**resign** (to hand in one's notice)

Compound nouns and compound adjectives   Texts which include compound adjectives and compound nouns can sometimes suggest ambiguous meanings. When either a noun or the adjective which modifies it is a compound, it may not always be clear which words belong to the noun and which belong to the adjective. In cases like these, hyphens can be very helpful for maintaining clarity.

foreign-sales secretary (the secretary takes care of sales to foreign countries)	foreign **sales secretary** (*the secretary who takes care of sales is foreign*)
small-business entrepreneurs (*the businesses are small*)	small **business entrepreneurs** (*the entrepreneurs are small*)
extra-curricular activity (*student activities in addition to their actual coursework*)	extra **curricular activity** (*further coursework tasks for students*)

Chapter 5

Connectors

What are connectors?

If you want to write well, you need to pay attention to many things. Grammar is the thing that comes to mind first perhaps, but there several other things just as–or even more–important.

In fact, there are three global considerations–**audience**, **purpose** and **structure**–that you need to consider no matter what you are writing.

You can make your purpose clear to your audience by having a clear structure, and by guiding your readers through it. If you don't do so, you run the risk that readers will either not see what you are getting at, and become frustrated, or will impose their own structure, and misinterpret your message.

You can guide your audience to see the structure and to make your texts more reader friendly in many ways, such as punctuation, topic sentences, and familiar organizational patterns (e.g., problem-solution).

In this unit, we are going to look at another way of guiding your audience: using special words and phrases to help readers understand how ideas and sentences are connected to each other. These words and phrases are often called **logical connectors, linkers, signposts,** or **connectives**, but we'll call them **connectors** here. This unit focuses on signposts that indicate additive, contrastive, and causative the relationships either between elements within a **single sentence** (e.g., conjunctions, subordinators and prepositions) or **across sentences** (e.g., sentence connectors, nouns, adjectives).
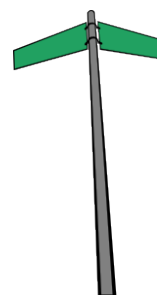
How to guide readers through your texts?

Although the text below contains no grammatical mistakes, it is not a very effective English text because it requires readers to create their own connections between the ideas. Such placing responsibility for understanding on the shoulders of the reader is typical of *reader-responsibl*e cultures, but not very common or even desirable in technical and scientific writing, which demand precision and unambivalent communication. In contrast, Anglo-American culture has been characterised as

writer-responsible in which relationships between ideas are expected to be clearly spelled out, with little interpretation left to the reader. In other words, when writing academic texts in English, you should aim to explicitly guide your reader. Part of this guidance is conveyed through the use of **connectors**.

5.1 Additive connectors

Additive connectors can be grouped into four grammatical classes, as shown in the box below.

- **Sentence connectors** commonly occur at the beginning of a sentence. They are physically separated by a comma to mark their special role, and show the relationship between that sentence and previous sentences.

- **Prepositions** combine only with noun phrases and gerunds (-ing) forms to link the current sentence with earlier ideas.

- **The category** *other linkers* includes adverbs, co-ordinate conjunctions, and non-finite clauses that function to join ideas within a single sentence.

- **Special adjectives** indicate that another example of something mentioned earlier is about to follow.

Table 5.1: Types of additive connectors.

Sentence connectors (Between sentences)	**Prepositions** (Within sentence)	**Other linkers** (Within sentence)	**Adjectives** (Within sentence)
Moreover,...	In addition to ..., ...	and	(an)other
In addition,...	..., as well as...	also	
Furthermore,...	Similar to ..., ...	as well	
Further,...	Like ..., ...	..., with...-ing	
Additionally,...		..., as + [aux verb]	
Likewise,...		not only..., but also	
Similarly,...		both...and	

See http://sana.tkk.fi/awe/ > **Cohesion** > **Signposts** > **Addition**.

5.1.1 Sentence connectors

Moreover,...	In addition,...	Furthermore,...	Further,...
Likewise,...	Additionally,...	Similarly,...	

Both the **additive sentence connectors** and adjectives are unique in their ability to form links across sentences. Sentence connectors always require a comma to separate them from the grammatical subject of the sentence. It should, however, be noted that sentence connectors are an area

of English grammar where little research has been done. We summarize what little research there is, and tentatively offer the following suggestions for using these between-sentence connectors.

You should keep in mind that native speakers themselves may not always follow the guidelines set out here. One thing that is clear, however, is that languages differ in the frequency and range of connectors used in writing. Finnish, for example, tends to rely on a smaller range, and does not seem to use connectors as frequently as English does. This means that Finnish-speaking readers may feel that English texts sound naïve, because they overuse connectors, while Finnish speakers could write texts in English that may seem unconnected or even illogical to English speakers.

5.1.2 Prepositions

In addition to..., ...	..., as well as...	Like..., ...	Similar to..., ...

Unlike sentence connectors which connect 2 separate sentences, **prepositional connectors** are used **within** the sentence to signal the **adding** of extra information. In addition, only prepositions can combine with nouns and noun phrases as well as gerund (*-ing*) forms.

PREPOSITION:

Auroral features come in many shapes and sizes. Tall arcs and rays start brightly 100 km above Earth's surface and extend upward along its magnetic field for hundreds of kilometres. Most of the features in the aurora borealis are greenish-yellow, though sometimes the tall rays will turn red at their tops and along their lower edge. **IN ADDITION TO producing exquisite displays of light**, the energetic auroral particles deposit heat, most of which is dissipated by infrared radiation.

SENTENCE CONNECTOR:

Most of the auroral features are greenish-yellow, but sometimes the tall rays will turn red at their tops and along their lower edge. **IN ADDITION, the energetic auroral particles deposit heat, most of which is dissipated by infrared radiation.**

5.1.3 Other connectors

and	..., with...-ing	..., as well	not only...but also
also	..., as + [auxiliary verb]	both...and	

Although most of these connectors are coordinate conjunctives and thus work to link elements within the sentence, **also** (adverb), ..., with...-**ing** (non-finite structure), and **and** ..., **as** + [auxiliary verb] (structural device) have been added to this group, since they all affect elements at either the clause or verb level.

Positive (+) → Positive (+)

WITH COMMA [subj + verb] + **subj** + verb]

These schemes provide a solution **, AND they** are easy to implement.
These schemes , BOTH provide a solution**, AND they** are easy to implement.

WITHOUT COMMA [SUBJ + VERB] + [VERB]

These schemes **provide** a solution **AND are** easy to implement.
These schemes **BOTH provide** a solution **AND are** easy to implement.
These schemes **NOT ONLY provide** a solution **BUT are ALSO** easy to implement.

Negative (–) → Negative (–)

(For the opposite strategy, see also the contrastive conjunctions but, neither. . . , nor. . . ,
albeit)

5.1.4 Adjectives

(An)other	(A) further	(A) similar

Similar to the sentence connectors, these adjectives together with **synonyms** and superordinate
terms play an important role in linking additional information across sentences. A further advantage of using adjectives for this purpose is that they also help to promote and maintain topical
progression.

5.2 Contrastive sentence connectors

Contrastive connectors can be grouped into four grammatical classes, as shown in the box below.

- **Sentence connectors** (traditionally called sentence adverbs) occur at the beginning of a sentence to link one sentence containing a cause with the effect or result in another one.

- **Conjunctions** (also known as adverbs and co-ordinate conjunctions) are those signposts that function within a single sentence to link causes with effects.

- **Subordinators** (also known as subordinate conjunctions) usually combine with full clauses; however, they can also be used with noun phrases when the main clause has a 'human' subject. Subordinators mainly differ from the other signposts in that they help to move the stress to ideas expressed in the main clause.

- **Prepositions** combine with noun phrases and gerunds (-ing) forms to contrast ideas within the same sentence.

See http://sana.tkk.fi/awe/ > **Cohesion** > **Signposts** > **Contrast**.

Table 5.2: Types of contrastive connectors.

Sentence connectors (Between sentences)	Conjunctions (Within sentence)	Subordinators (Phrase linkers)	Prepositions
However,...	but	Although...,...	In contrast to + noun,...
Nevertheless,...	yet	(even) though...,...	Contrary to...,...
Nonetheless,...	nor	While...,...	Unlike...,...
On the other hand,...	albeit	Whereas...,...	Despite...,...
In contrast,...			In spite of...,...
Conversely,...			Notwithstanding...,...
On the contrary,...			Instead of...,...
Alternatively,...			
Instead,...			

5.2.1 Contrastive sentence connectors

Alternatively,...	However,...	Nonetheless,...	On the contrary,...
By contrast,...	In contrast,...	On the other hand,...	Nevertheless,...
Conversely,...	Instead,...		

These sentence connectors function to introduce information that **contrasts** with or **differs** from information given in previous sentences. Although contrastive sentence connectors can also be placed within the sentences, they mainly occur at the beginning of sentences, especially in the academic writing of biomedical and engineering fields.

Many of these connectors may overlap in meaning, though they have subtle differences in uses and meaning. For example, connectors differ in the things that are contrasted. Some connectors are used to express contrasts between *choices* and others *viewpoints*, while some tend to come only after negative statements. Contrastive connectors can be divided into four groups:

1. **Concessive** connectors introduce something unexpected or surprising in view of what was said earlier.
   (*However,... and Nevertheless / Nonetheless,...*)

2. **Adversative** connectors introduce OR point out differences.
   (*On the other hand,...; In contrast / By contrast,...; Conversely,...*)

3. **Argumentative** connectors challenge or dispute the 'truth' of a widely-held view.
   (*On the contrary,...*)

4. **Replacive** connectors eliminate earlier topics from discussion and replace them with new ones.
   (*Instead,... and Alternatively,...*)

5.2.2 Contrastive conjunctions

. . . , but. . .	. . . , yet. . .	neither/not. . . , nor. . .	. . . , albeit. . .	nor. . .

Positive (+) → Negative (–)

These schemes provide a solution**, BUT** they are **not** easy. (with comma)
These schemes provide a solution **BUT** are **not** easy. (no comma)
These schemes provide a solution**, ALBEIT a difficult one,** to our current traffic problems.

Negative (–) → Positive (+)

These schemes are **not** easy to implement, **BUT** they are **NEVERTHELESS** technically compatible.

Negative (–) → Negative (–)

These schemes are <u>not</u> technically compatible**, NOR are they** easy to implement.
These schemes are <u>neither</u> technically compatible**, NOR are they** easy to implement.

Positive (+) → Positive (+)

These schemes provide a solution**, AND** they are easy to implement.
These schemes provide a solution **AND** are easy to implement.

(For the opposite strategy, see also *and*, *also*, *both. . . and. . .* , *not only. . . but also. . .*)

5.2.3 Contrastive subordinators

Although. . . ,. . .	(Even)though. . . ,. . .	While. . . ,. . .	Whereas. . . ,. . .

Subordinate connectors function to introduce information that **contrasts** or **differs** from information given in the same sentence. This class of contrastive connectors can be placed either at the beginning, middle or the end of a sentence, separated from the rest of the sentence by a comma.

BEFORE THE MAIN CLAUSE:

ALTHOUGH it is twice as far away from the Sun as Mercury, Venus is the planet with the hottest surface temperature day or night.

AFTER THE MAIN CLAUSE:

Venus is the planet with the hottest surface temperature day or night**, ALTHOUGH it is twice as far away from the Sun as Mercury.**

WITHIN THE MAIN CLAUSE:

Venus**, ALTHOUGH twice as far away from the Sun as Mercury,** is the planet with the hottest surface temperature day or night.

Similar to the contrastive sentence connectors, the subordinators can be divided into two groups.

1. **Concessive subordinators:** signal that something is unexpected or surprising in view of what has been said earlier.
   (*although. . . , ...* and *(even)though. . . ,. . .*)

2. **Adversative subordinators:** introduce or point out differences between two different things.
   (*While. . . ,. . .* and *Whereas. . . ,. . .*)

5.2.4 Contrastive prepositions

In contrast to. . . ,. . .	Despite. . . ,. . .	Unlike. . . ,. . .	Notwithstanding. . . ,. . .
Contrary to. . . ,. . .	In spite of. . . ,. . .	Instead of. . . ,. . .	

Although both subordinators and **prepositional connectors** can be used to signal a **contrast** with other information within the same sentence, only **prepositions** can combine with noun phrases and gerund (-ing) forms.

SUBORDINATOR + **[subject + verb],** [subject + verb]:

ALTHOUGH **the number of 2-income households has doubled since the early 1970s,** average wages have declined by 15% in the United States.

PREPOSITION + **[Noun / -ing form],** [subject + verb]:

DESPITE **doubling the number of 2-income households,** the U.S. economy has been unable to avoid a 15% drop in average wages since the early 1970s.

5.3 Causative connectors

Causative connectors help guide the reader to see logical connections and can be grouped into five grammatical classes, as shown in the box above.

- **Sentence connectors** commonly occur at the beginning of a sentence. They are typically separated from the rest of the sentence by a comma, and introduce a result or effect that logically follows from causes or reasons given in the previous sentence.

- In contrast, **subordinators, prepositions, verbs**, and **special nouns** function within a single sentence and can signal either reason/cause or result/effect relations.

See http://sana.tkk.fi/awe/ > **Cohesion** > **Signposts** > **Cause-effect**.

Table 5.3: Types of causative connectors.

Sentence connectors (Between sentences)	Subordinators (Within sentence)	Prepositions (Within sentence)	Verbs	Nouns
Thus,	since	because of	leads to	The cause of
Therefore,	because	due to	results in	The reason for
Hence	as	as a result of	causes	The effect of
Consequently,	in that	as a consequence of	contributes to	
As a result,		owing to		a result of
As a consequence,		On account of	results from	a consequence of
For this reason,			arises from	the effect of
Accordingly,			stems from	

5.3.1 Causative sentence connectors

Thus,...	Hence,...	As a result,...	For this reason,...
Therefore,...	Consequently,...	As a consequence,...	Accordingly,...

These sentence connectors function to introduce the **result** (because of this) of a **fact**, **action** or **event** given in previous sentences. Although causative sentence connectors can also be placed within the sentences, they mainly occur at the beginning of sentences, especially in the academic writing of biomedical and engineering fields. When occurring within sentences, they follow the normal rules for positioning adverbs in the sentence (preferably around the verb). Different research fields have preferences in their choice and use of these signals. The only way to get a 'feeling' for which connectors and how they are used in your own field is to analyze articles in prominent journals from your own field.

5.3.2 Causative subordinators

Since	Because	As	...in that	Given that

This class of causative connectors can be placed at the beginning of a sentence, separated from the grammatical subject of the sentence by a comma. However, unlike Finnish, when subordinators appear after the verb within the sentence, they do not necessarilly require a comma (See Subordinate clauses p. 69).

5.3.3 Causative prepositions

because of	as a result of	owing to	given
due to	as a consequence	on account of	in (the) light of

Unlike other connector types, this type of connectors can only combine with nouns, noun phrases or gerunds (the *-ing* form of verbs).

PREPOSITION + **noun**

Levels of greenhouse gases have increased dramatically **BECAUSE OF** **human activities**.

BECAUSE OF **human activities**, levels of greenhouse gases have increased dramatically.

PREPOSITION + **noun phrase**

It is estimated that the Earth's average temperature has risen by 0.5 to 0.6°C since 1880 **DUE TO** **emissions of greenhouse gases from human activity**.

DUE TO **emissions of greenhouse gases from human activity,** it is estimated that the Earth's average temperature has risen by 0.5 to 0.6°C since 1880 .

When you use a prepositional connector to introduce a sentence, always *separate this connector* from the subject of the sentence with a comma. However, these prepositions do not require a comma when they occur within the sentence.

OWING TO **their molecular structures,** certain gases like carbon dioxide and water vapor are essentially transparent to visible light but absorb IR radiation very strongly. Such compounds are sometimes termed 'greenhouse' gases because they absorb the scattered IR radiation and tend to raise the temperature of the atmosphere by trapping solar energy.

5.3.4 Causative verbs

	CAUSE → EFFECT		EFFECT → CAUSE	
leads to	accounts for	affects	results from	ascribes to
results in	triggers	influences	arises from	attributes X to
causes	induces	contributes to	stems from	
produces	gives rise to	brings about		

The verbs expressing causative relations can be divided into two groups:

1. **cause-effect verbs** that state the cause before the effect, and

2. **effect-cause verbs** that place the effect before the cause.

Typical verbs that **start with an effect** and then introduce the cause include **lead to, result in, cause, produce, account for, trigger, give rise to, affect, influence**, and **contribute to**.

CAUSE → EFFECT

The major natural greenhouse gases are water vapor, which **causes** about **60% of the greenhouse effect** on Earth, carbon dioxide (about 26%), and ozone.

To move in the opposite direction, **from an effect to the cause**, you can use the verbs **result from**, **arise from**, **stem from**, **ascribe to**, and **attribute to**.

EFFECT → <u>CAUSE</u>

Estimates of the net warming effect of CFCs have recently been reduced. <u>This reduction</u> **stems from the cooling effect** from the CFC destruction of ozone (a greenhouse gas) in the lower stratosphere.

When used in the **passive form** with **by**, several of the verbs (**cause, produce, trigger, induce, bring about, affect, influence**) in the first group can also be used move the effect before the cause.

CAUSE → EFFECT

Greenhouse gases (GHGs)　　　**CAUSE**　　　the greenhouse effect.

EFFECT → CAUSE

The greenhouse effect　　　**IS CAUSED BY**　　　greenhouse gases (GHGs)

5.3.5 Causative nouns

the cause of	the effect of	a result of	the reason for
the influence of	the impact of	a consequence of	

Five nouns can function with the verb *to be* to signal cause/effect relations in English. The main patterns used with these nouns are:

1. The cause of **[RESULT]** is **[CAUSE]**. . .

2. The reason for **[RESULT]** is **[CAUSE]**. . .

3. The effect of **[CAUSE]** is **[RESULT]**. . .

4. **[CAUSE]** had an influence on **[RESULT]**. . .

5. The impact of **[CAUSE]** on **[RESULT]**. . .

6. **[RESULT]** is the result of **[CAUSE]**. . .

7. A consequence of **[CAUSE]** on **[RESULT]** is. . .

However, it should be noted that overuse of the the verb *to be* can lead to texts that sound naïve and child-like. English prefers action verbs.

Chapter 6

GRAMMAR

6.1 Rules for forming the passive

The passive has two main functions in English:

1. Use the passive to **depersonalise** the topic in a sentence. The passive allows you to **omit *I***
   or ***We***. This strategy is especially common when writing up methods sections or describing
   procedures, since the passive places emphasis on the **steps** in the procedure and **how** it was
   carried out, but not on who did it.

2. Use the passive to reverse the sentence word order in order to place *given* information to-
   wards the beginning of the sentence, to move heavy chunks of information so that they occur
   after the verb, and / or to move topical information into subject position.
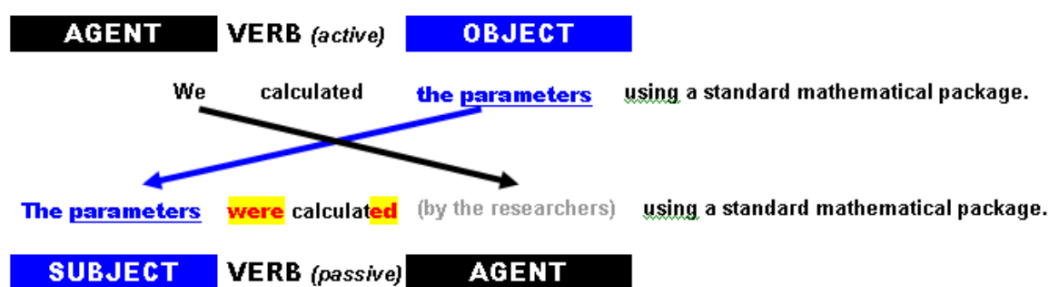
TENSE	ACTIVE VOICE	PASSIVE VOICE
Present	We normally **heat** the water in a kettle. The program **calculates** the parameters.	The water **is** normally heat**ed** in a kettle. The parameters **are** calculat**ed** by/ using the program.
Simple past	We **heated** the water in a kettle. The program **calculated** the parameters.	The water **was** heat**ed** in a kettle. The parameters **were** calculat**ed** by/ using the program.
Present perfect	We **have heated** the water in a kettle. The program **has calculated** the parameters.	The water **has been** heat**ed** in a kettle. The parameters **have been** calculat**ed** by/ using the program.

6.2 Subject-verb agreement

6.3 Relative clauses

A **relative clause** is a group of words that is attached to a noun and serves to narrow the meaning of that noun. Relative clauses typically begin with a **relative pronoun** *which*, *that*, or *who*.

This unit focuses on three areas of relative clause usage that can cause problems for writers:

1. Forming reduced relative clauses.

2. Forming prepositional structures with relative pronouns.

3. Identifying and punctuating defining and non-defining relative clauses. (See Relative clauses p. 65

6.3.1 Reduced relative clauses

Academic English prefers reduced relative clauses. This relative clause should be reduced to either its **past** or **present participle**, or even **deleted** if the main verb is the **verb** *to be*.

PAST PARTICIPLE (-ED)

Full relative clause (passive voice):

Netscape allows administrators to implement programs **which are based** on Java.

Reduced relative clause (better):

Netscape allows administrators to implement **programs based** on Java.

PRESENT PARTICIPLE (-ING)

Full relative clause (active voice):

This study investigates the factors **which influence** the lifetime of telecommunication technology standards.

Reduced relative clause (better):

This study investigates the factors **influencing** the lifetime of telecommunication technology standards.

DELETION OF VERB *to be*

Relative clause (verb *to be*)

The atmospheric aerosols **that are in** heavily polluted areas have the potential to accelerate global warming.

Reduced relative clause (better):

The atmospheric **aerosols** ∅ **in** heavily polluted areas have the potential to accelerate global warming.

STRATEGY FOR AVOIDING ENDING WITH A VERB

End verb (bad):

Java is now the programming language **which developers** in North America **use** most.

Reduced relative clause (better):

Java is now the programming language **used** most **by** developers in North America.

6.3.2 Prepositional relative clauses

Of the three main relative pronouns (who, which, that), only *which* and *whom*, the object form of *who*, can be used with prepositions. Knowing how to correctly manipulate prepositonal relatives is important because they allow you to avoid ending sentences with a preposition. There are two special situations when *which* or *whom* should be used with a preposition, and not *that*:

PREPOSITION + WHICH

Always use ***which***, not *that* directly after prepositions. Although which typically introduces *non-defining* information or comments, after a preposition, *which* occurs without a comma and gives *defining* information that defines and restricts the meaning of the word that comes before it.

Each species and genus of plants produces pollen grains that have a distinct shape. These shapes can be used to identify the **type of plant FROM WHICH** they came.

A non-falsifiable theory is a **hypothesis FOR WHICH** no test can be devised.

Global warming theories attempt to account for the documented rise in average global temperatures since the late 19th century and assess **the extent TO WHICH** the effects are due to human causes.

Even without a detectable increase in global temperatures, greenhouse gases could change circulation and **weather patterns ON WHICH** most of the world's population depend for their day to day survival. One potential change is the drying out of the Amazon Basin.

Recently, scientists have documented **trends IN WHICH** the natural timing of animal or insect life cycles changed and the **plants ON WHICH** they depended did not.

NUMERATOR + OF + WHICH

Always use **which** a **quantity expression** with *of*. Note that these expressions require *numerators* and are always divided from the rest of the sentence by a comma before and at the end of the relative clause.

Finland has a diversity of ecosystem types**, each OF WHICH** can be broken down into many finer categories.

The report details projected changes affecting everything from agriculture to breeding grounds for migratory birds**, many OF WHICH** are considered endangered.

In 2002, the global temperature record was broken by a half degree Fahrenheit, which in climatic terms is a huge leap. Previous hot years**, the last two of WHICH were 1996 and 1998,** broke the record by small fractions of a degree.

Each student room is equipped with broadband Internet access available**, the cost OF WHICH** is included within the residence fee.

6.4 Noun compounds

Nouns (*substantiivit*) are the building blocks used to form sentences. However, they do not act alone. Let's take the word *device*. What type of device are we talking about? What is its function? How does it differ from other devices? We seek to answer such questions when we place **modifiers** either before or after nouns.

Nouns combine with their modifiers to form noun phrases. Table 6.1 illustrates a number of noun phrases. Examples would include *portable <u>devices</u>*, *<u>devices</u> that detect bombs*, or a combination of both *portable <u>devices</u> that detect bombs*. In each of the above examples, the modifiers occur either before or after the **main noun** (underlined). We shall refer to this main noun as the **head noun**.

Table 6.1: Different options for modifying a noun to form complex noun phrases

	NOUN PHRASE		
	PREMODIFIERS	**HEAD**	**POSTMODIFICATION**
	Portable (adj.)	**devices**	that detect bombs.
1.	Prototype (noun)	**evaluation**	by end users.
2.	**Testing** (pres. part)	**equipment**	for wireless networks.
	Encryption (noun)	**algorithms**	**providing** (pres. part) higher security.
3.	**Downloaded** (past perf)	**files**	from the Internet.
	Video (noun)	**files**	**downloaded** (past part.) to the hard disk.
4.	Personal (adj.)	**data**	**entered** bythe user.

In spoken English, the most common modifiers of nouns are **adjectives** (*adjektiivit*). Adjectives are a class of words that *describe*, *define*, or *quantify* nouns and are typically placed before, **premodify**, the noun:

Laptop computers and PDAs are examples of   **portable**   **electronic**   **DEVICES**.

           (adj.)   (adj.)   (noun)

As shown in Table 6.1, in addition to *adjectives*, formal academic writing commonly exploits four other grammatical structures to modify nouns. These structures differ in their grammatical **form** and **placement**, either *before* (i.e., premodification) or *after* (i.e., postmodification) the main noun. In this unit, we shall only deal with the first of these four structures: the **noun compound**.

6.4.1 Nouns used as adjectives

One of the most notable stylistic features of writing in science and technology is the increased use of nouns as *premodifiers* before other nouns. This grammatical structure in which two or more nouns function together as a unit to create a new concept is commonly referred to as a **noun compound** (*yhdyssana*).

The Netherlands has greatly reduced the use of **fossil** **FUELS** since the 1970s.
         (noun)   (head noun)

Network **APPLICATIONS** are capable of retrieving data from servers over a network.
(noun)   (head noun)

Typically, noun compounds can be packed and re-written as formal definitions to determine their ultimate meaning:

SPECIES		GROUP / CLASS	DEFINING CHARACTERISTICS	
1	2	2		1
A **fossil**	**FUEL**	is a **FUEL**	that is derived from	**fossils**.
A **network**	**APPLICATION**	is an **APPLICATION**	which operates in	a **network**.

Functional categories of noun compounds

Noun compounds can be divided into seven different categories on the basis of their function.

1. **Material**   **Copper** wire
   What is it composed of?   (A wire composed of copper.)

2. **Mode of Operation**   **Friction** brake
   How does it work?   (A brake that works by means of friction)

3. **Purpose**   **Air** filter
   What does it do?   (A filter for cleaning air)

4. **Location**   **Laptop** computer
   Where is it used/ found?   (A computer that can be used on a person's lap)

5. **Time**   **Summer** cottage (= kesämökki)
   When is it used?   (A cottage that is used in the summer)

6. **Shape** / **form**   **Disc** brakes
   What does it look like?   (Brakes that are shaped like round discs)

7. **Inventor** / **user**   The **Doppler** effect
   Who discovered / uses it?   (An effect that was proposed by Christian Doppler)

                               Passenger car
                               (A car that is used by passengers)

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Finnish vs. English usage

Although Finnish also relies heavily on **noun modifiers** to create new terms, English noun *compounds* differ in *form* and *punctuation* from their Finnish counterparts. The most obvious difference is that the overwhelming majority of English noun compounds are <u>not</u> written together as a single word as shown in Table 6.2:

Table 6.2: Noun compounds: Finnish vs. English usage

	FINNISH	**ENGLISH**
	haku/<u>kone</u>	Search <u>engine</u>
	Kesä/loma/<u>kausi</u>	Summer vacation <u>period</u>
	Liikenne/<u>valot</u>	Traffic <u>lights</u>
	Taide/<u>näyttely</u>	Art <u>exhibition</u>

Moreover, Finnish uses a hyphen (*yhdysviiva*) to separate the name from the superordinate word that classifes the term, whereas English simply writes these as two separate words (see Table 6.3).

Table 6.3: Noun compounds: Finnish vs. English usage

	FINNISH (with hyphen)	**ENGLISH** (without hyphen)
	GPS-<u>laitteet</u>	GPS <u>devices</u>
	ADSL-<u>modeemi</u>	ADSL <u>modem</u>
	Titanic-<u>elokuva</u>	The <u>movie</u> Titanic
	Innoforest-<u>projekti</u>	The Innoforest <u>Project</u>
	Endeavour-<u>sukkula</u>	The <u>space shuttle</u> Endeavour

Instead, English only uses a hyphen to indicate which word groups should be considered a *single modifying unit*, thus avoiding possible misinterpretation as shown in Table 6.4:

Table 6.4: Hyphenation of noun compounds

🙁	**Incorrect: missing hyphen** **Model checking techniques** (= Checking techniques that are ideal for some purpose?)
🙂	**Correct: hyphenated to avoid misunderstanding** **Model-checking** techniques (= Techniques for checking [the validity of] a model)

6.4.2 Introducing the *agent* in a noun phrase

How can we express the *doer* and *receiver* of an action when this action is nominalized as a noun?

English utilizes four different structures to introduce an **agent** into a noun phrase: the genitive-s, genitive-of, *noun compound*, and *agent-by*. Each of these structures has certain limitations.

Engineers	will evaluate	the **prototype**.
(agent)	(ACTIVE verb)	(receiver)
The **prototype**	will **be** evaluate**d**	by engineers
(receiver)	(PASSIVE verb)	(agent)

In the above example, what do we do if we need to identify the *agent* or somebody that performs the *evaluating*? A common mistake is to use a genitive construction, either a **genitive-s** ('s for singular / s' for plural) or the preposition **of**. However, these two constructions have their limitations. Although the **genitive-s** can only be used with agents that are persons and animals, it is typically replaced in formal academic writing by a *noun compound*.

> **Genitive-s:**
>
> This validation is based on **engineers'** <u>evaluation</u> of the prototype.

> **Noun compound:**
>
> This validation is based on **engineer** <u>evaluation</u> of the prototype.

The other option, the ***of*-genitive**, also has the limitation that it cannot be used when the noun phrase already contains the preposition *of*. For stylistic reasons, you should avoid consecutive repetition of the same preposition in a single sentence. Instead, use a **by** phrase to signal the **agent** of the action:

> **Genitive-*of*:**
>
> This validation is based on an <u>evaluation</u> **of** the engineers **of** the prototype.

> **By + agent:**
>
> This validation is based on an <u>evaluation</u> **of** the prototype **by** engineers .

6.4.3 Introducing the *receiver* in a noun phrase

English utilizes three different structures to introduce a **receiver** (*object*) into a noun phrase: *Latin, Anglo-Saxon,* and *noun compound*. If you speak Spanish, french or Italian, you will quickly recognize this structure; it requires both the definite article *the* and the preposition *of*. The Anglo-Saxon noun phrase is characterized by its use of the gerund *-ing* form (without a definite article!).

1. **Latin (*-ion*)**
   Engineers will prepare criteria for <u>**the** evalua<u>tion</u> **of** the prototype</u>.

2. **Anglo-Saxon (*-ing*)**
   Engineers will prepare criteria for **evaluat<u>ing</u> the prototype**.

3. **Noun Compound (*verb + verb*)**
   Engineers will prepare criteria for **prototype evalua<u>tion</u>**.

6.4.4 Finnish vs. English usage

When the head noun expressing action is modified by another previous noun, Finnish tends to put the modifying noun into the genitive form, whereas English prefers to express this as a *noun compound*.

	FINNISH	ENGLISH
⚠	Tiedosto**n** <u>siirto</u>	File <u>transfer</u>
	hankke**en** <u>arviointi</u>	Project <u>evaluation</u>
	Tuottei**den** <u>selailu</u>	Product <u>browsing</u>
	Teksti**n** <u>valinta</u>	Text <u>selection</u>
	paperi**n** <u>tuotanto</u>	Paper <u>production</u>

6.4.5 Head nouns that do not express *action*

Prepositional structures

Noun compounds also consist of *head nouns* that do not express any action. Many of these are derived from **prepositional structures**: most commonly **OF** (quality) or **FOR** (purpose). In such cases, the *prepositional structure* has a more general meaning and the n*oun compound* a more specific meaning. Notice how the order is inversed in these two structures:

NOUN COMPOUND				**PREPOSITIONAL STRUCTURE**		
1	**2**	**3**		**3**	**2**	**1**
A motion	detection	algorithm	=	an algorithm for	the detection of	motion.
1	**2**	**3**		**3**	**2**	**1**
Consumer	product	safety	=	the saftey of	the products for	consumers.
1	**2**	**3**		**3**	**2**	**1**
Graphics	Software	packages	=	Packages of	software for	graphics.

Numbers + noun modifiers

Another unique structural feature of English noun compounds is the dropping of the final **s** in **plural noun modifiers** that represent a *unit of measure*. Such nouns always become singular when they combine with a **number** to function as an *adjective* before another noun. Notice the use of the hyphen in the noun compound form.

NOUN PHRASE (plural)		NOUN COMPOUND (singular)
A work <u>shift</u> that lasts **12 hours**	=	A **12-hour** work <u>shift</u>
A <u>child</u> who is **8 years** old	=	An **8-year-old** <u>child</u>
A <u>bottle</u> containing **1.5 liters** of wine	=	A **1.5-liter** wine <u>bottle</u>
<u>Incubation</u> at 65°C for **10 minutes**	=	A **10-minute** <u>incubation</u> at 65°C

Note that not all plural nouns become singular when modifying another noun. Particularly, the nouns used in the names of certain engineering fields remain in the plural when acting as modifiers. Nevertheless, these are quite rare.

> The telecommunication**s industry**
> Material**s science**
> The Medical Device Manufacturer**s Association**

6.5 Adverbs

Positioning adverbs in the sentence

In academic English, place adverbs **before** active verbs, **after** the verb *to be*, or in **mid-position** between the auxiliary verb and the main verb.

Before an active verb:

The Earth's dry atmosphere mainly contains nitrogen.

After the verb *to be*:

The increase in greenhouse gases **is MAINLY** a result of humans changing the natural patterns of vegetation and polluting the atmosphere.

Mid-position:

The Earth's dry atmosphere **is MAINLY composed** of nitrogen.

Particulary, the adverb *also* seems to give Finnish writers headaches, since Finnish uses the particle -kin, which can be attached almost anywhere in the sentence to show addition. Nevertheless, *also* follows the same rules outlined above. The most notable acception to these rules is when using sentence adverbials and attitudinal adjuncts.

Chapter 7

Use of articles

Although the articles **a**, **an**, and **the** are very small words, they can cause considerable problems for students of English—even advanced students. These three words are the most common words in the English language and always occur before a noun to indicate a particular viewpoint of that noun. Thus, the same noun (e.g., *student*) can refer to different viewpoints depending on which article precedes the noun. These viewpoints can best be understood in terms of the following three scenes.

Table 7.1: Scene 1, indefinite view

Scene 1 **INDEFINITE VIEW**	**Scene 1** shows an engineering student from such a distant viewpoint that it makes it impossible to identify the person. Consequently, the student seems **unfamiliar** or **vague**. From this vantage point, we could <u>not</u> say anything very definite about the identity of the person, except that he is most likely a student. English typically expresses this 'vague' view of a noun using the **indefinite article** with countable nouns. Thus, scene 1 can be expressed as:
	<u>A</u> **student** is walking along the path at Otaniemi. (indefinite viewpoint)

Many foreign writers may not realize that their choice of an article (or the lack of one) communicates a particular viewpoint of the noun referred to. To use the articles correctly, you need to be able to distinguish between **countable** and **uncountable nouns** (Section 7.1); to determine whether a noun refers to a **general** (Sections 2 and 4) or **specific** (Section 3) instance of the concept; and to understand how your perspective can become **definite** (Section 3) due to either the unique nature of noun the itself, or the *adjectives* and *modifiers* that accompany the noun.

7.1 Countability [a(n) / ∅]

The largest group of nouns refers to things that can be counted. We call these **count nouns**. These nouns have both singular and plural forms (*computer—computers*). In English, you cannot say *an equipment* or *equipments*, since this word is considered to be uncountable, or a **uncount noun**,

Table 7.2: Scene 2, definite view

Scene 2

DEFINITE VIEW

Scene 2 provides us with a close-up view of the same picture in scene 1. We can now see enough details to allow us to realize that the the student is familiar. In such cases, when the noun is **familiar**, **known** or **identified** to the viewer, English expresses this definite viewpoint with the **definite article**:

<u>**The**</u> **student** is Tommi and he is wearing blue coveralls. (definite viewpoint)

As well as indicating to the reader whether you are referring to a *general* or *specific* instance of the noun, these two viewpoints are important in marking information as either **new** (scene 1) or **given** (scene 2).

Table 7.3: Scene 3, symbolic view

Scene 3

DEFINITE SYMBOLIC VIEW

Whereas the first two views refer to actual examples of a student, **scene 3** presents a **symbolic** view of an engineering student that represents a **whole class** of the noun student. This view is typically called **generic reference** and is expressed using the following forms:

Engineering student<u>s</u> are known as 'teekkarit' in Finland.

<u>**The**</u> **Finnish engineering student** is famous for consuming large quantities of alcohol.

<u>**A**</u> **'teekkari'** is <u>**a**</u> **student** studying engineering at a Finnish university.

while some nouns can function as both countable or noncountable nouns, which are commonly known as **two-way** nouns.

7.1.1 Count nouns

Plural nouns

Some **count nouns** in English can occur only in their plural forms:

contents	facilities	instructions
data	funds	premises
earnings	goods	wages

The **contents** of the letter <u>**were**</u> very surprising.

*The word *data* (singular: *datum*) is unusual, since it can be used both as a **count** noun (only in the *plural* form!) and as an **uncount** noun:

> The **data** from the Mars orbiter **were** published in the journal Science late last year. (**count** form)
>
> Our **data was** backed up off site, so we knew the data was safe. (**uncount** form)

Irregular plural forms

Some count nouns, especially those derived from Greek, have irregular plural forms:

SINGULAR	PLURAL	SINGULAR	PLURAL
med**ium**	medi**a**	radi**us**	radi**i**
dat**um** (rare!)	*dat**a**	stimul**us**	stimul**i**
symposi**um**	symposi**a**/ symposium**s**		
analys**is**	analys**es**	criter**ion**	criteri**a**
ax**is**	ax**es**	phenomen**on**	phenomen**a**
bas**is**	bas**es**	antenn**a**	antenn**ae** / antenna**s**
cris**is**	cris**es**	formul**a**	formul**ae** / formula**s**
emphas**is**	emphas**es**	append**ix**	appendices /appendix**es**
hypothes**is**	hypothes**es**	ind**ex**	ind**ices** /index**es**
parenthes**is**	parenthes**es**	matr**ix**	matr**ices** /matrix**es**
thes**is** (diplomityö)	thes**es**		

Plural-looking

Some count nouns that appear to be plural in form can actually be used in both a singular and plural meaning:

> **Singular meaning:**
>
> **A means** ~~were~~ **was** found to move the bookcase without having to take it apart.
>
> **A** new **species** of mosquito ~~have~~ **has** recently been found in Southern Finland
>
> **A series** of experiments **was** / **were** used to prove Einstein's theory of relativity.
>
> **Plural meaning:**
>
> In 1900, the main **means** of transportation **were** the horse, train, ship, or your own feet.
>
> There **are** over 150 **species** of mosquitoes in Finland.
>
> Several good British **series are** on television at the moment. (plural)

7.1.2 Uncount nouns

Uncount nouns cannot be directly modified by a number or combine with an indefinite article (*a* or *an*). These nouns refer to **qualities, substances**, and **actions** rather than specific objects or events. Uncount nouns can be divided into the following five classes.

Mass nouns

Mass nouns typically refer to **liquids** (water, juice), **powders** (sugar, sand), or **substances** (metal, wood) that lack clear boundaries or form.

water	radiation	current	cement	pulp
oil	mass	voltage	cotton	paper
air	light	friction	wood	cloth
hydrogen	energy	amplitude	glass	ink
fuel	heat	power	metal	rubber
	cold	velocity	plastic	

Abstract nouns

Abstract nouns are those that you cannot physically *see, hear, smell, taste,* or *touch.* Nouns in this class refer to a *quality, process* or to an *instance* of a quality or process:

expertise	planning	innovation
safety	funding	experience
enthusiasm	design	help
intelligence	transport	interest
beauty	computerization	access
creativity	acceleration	storage
efficiency	distribution	consumption

Aggregate nouns

Aggregate nouns refer to a group of similar people or objects. Although these nouns appear to be singular, they are not. Aggregate nouns have no plural forms, even though they are normally used with **plural verb forms**. Note that the nouns marked with an asterisk (∗) cannot be used with *a* or *an*

∗staff	spacecraft	government
∗personnel	aircraft	parliament
∗management	audience	committee
∗police		board

Some aggregate nouns, especially if they refer to groups of people, can be used with both singular and plural verb forms:

> The **staff** is very polite and helpful. (the staff seen as a group) The Helsinki **police is** investigating another murder. (the whole department)

> The **staff are** very polite and helpful. (the staff seen as individuals) Helsinki **police are** dissatisfied with their salaries. (individuals within the department)

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Collective nouns

Like aggregate nouns, collective **nouns** refer to a collection of similar objects and have no plural forms. However, they differ from aggregate nouns in that they require a **singular verb**:

software	machinery	landscape	plumbing
hardware	equipment	scenery	wiring
code	circuitry	information	∗data

> The **software is** currently under development. The **equipment is** working exactly as promised.

*Beware! The noun **data** is actually plural but is increasingly being used by scientists as a collective uncount noun (See also 7.1.1 plural nouns p. 106):

> The **data was** / **were** analysed using SPSS statistical analysis software.

Plural uncount nouns

Many nouns describing fields of **science** or other human **activities** are written in the *plural form* but are used with a singular verb:

mathematics	economics	thermodynamics	politics
physics	acoustics	genetics	athletics
electronics	statistics	news	sports

7.1.3   Strategies for making *uncount* nouns countable

There are basically two strategies you can use to convert an uncount concept into a countable one. You can either use a **counter** (i.e., a unit of measurement) or you can simply use it in the countable sense to indicate a particular type of the noun.

Counters

Although you cannot convert an uncount noun into a countable one, it is possible to add certain phrases to the noun that are countable. We call these phrases *counters*. Counters are used in phrases with the preposition **of** to make an uncount noun countable.

cup	piece	unit	type	form
litre	kilogram	item	amount	body

> Generally, a tyre will lose up to **one or two kilopascals of** air pressure per month in cool weather.

> Some **forms of** energy are more convenient than others in certain situations.

Often in English, many counters can only be used with a particular object or concept. To find a suitable, it might be best to google the word. For example, searching in Google using *of glass*, or *of paper* could reveal the following:

> He broke **three panes of** glass.
>
> He asked for **two sheets of** paper.

However, not all counters come before the noun. In science, counters more often come after the noun as the *head noun* in a **noun compound** (See p. 98):

Many software **packages** are available for creating your own graphics.

Two-way **nouns**

Certain nouns (sometimes called **binary**, or **two-way** nouns) can be both countable or uncountable, though sometimes with distinct differences in meaning:

> Tyres consist mainly of **rubber**, steel, and textiles. (kumi)
>
> Using a **rubber** can help prevent the spread of HIV. (kondomi)
>
> Work is usually expressed in newton-metres. (työ)
>
> Kaurismäki's latest film has been praised as an impressive work of art. (taideteos)

In science and technology, many nouns can be **uncount** when they refer to a **general concept**, but **countable** when they refer to **a type of**, **one instance of**, or **an amount of** the same concept:

analysis	difficulty	change	work
investment	failure	light	technology
construction	success	fuel	industry

The most common meaning given to an uncount noun is a *a type of*:

∅ **Technology** is the process by which humans modify nature to meet their needs and wants. (uncount)

Several **technologies** [types of technology] have been developed to solve this problem. (countable)

Especially, uncount nouns expressing **actions** or **process**, usually formed from a verb, can become countable when they refer to **one instance** or an **embodiment** of that action:

> ∅ **Analysis** of the data shows that most Finns are satisfied with their lives. (abstract uncount)
>
> Section 3 presents **an analysis** [instance of analysis] of the data. (countable)
>
> Can you give me some **light**; I can't see anything in this darkness. (mass uncount)
>
> The **lights** [embodiments of light] in the kitchen are not working. (countable embodiment)

Other uncount nouns (e.g., *velocity, pressure, force,* and *energy*) can become countable when they refer to **an amount of** of that concept:

> The instrument used for measuring **resistance** is the ohmmeter. (mass uncount)

> A 60-watt bulb has <u>**a**</u> higher **resistance** [amount of resistance] than a 120-watt bulb. (countable)

7.2   Specific uses of the indefinite article *a* or *an*

Scene 1

INDEFINITE VIEW

The best way to think of the indefinite articles **a** and **an** is as the **default setting** for all **singular**, **count nouns**. Similarly, uncount nouns also have their own default setting and that is the **zero article** ∅. Then, you only need to remember what are the special situations that require using the definite article **the** (See section **??**). Below, we outline some of the other situations requiring indefiniteness.

7.2.1   Introducing something 'new'

The indefinite article signals to your reader that the concept expressed by a singular, count noun is **new** and has not been mentioned earlier. As we saw in Section 1.1 (given and new information), the correct position for new information is after the verb. However, when you are unable to follow this rule, then at least make sure that you signal this with **a** or **an**.

> This study **PROPOSES**   <u>a</u> novel control <u>algorithm</u>   to reduce the interactions described above.
> **NEW INFO**

> <u>**A** novel control **algorithm**</u>   **IS PROPOSED** to reduce the interactions described above.
> **NEW TOPIC**

A number of **verbs** commonly introduce **new information** and therefore normally take an indefinite article:

be	need	find	show (osoittaa)
have	require	determine	indicate (osoittaa)
there is	lack	create	describe
consist of	obtain	form	present
comprise	give	develop	introduce
represent	provide	design	propose
produce	offer	plan	use

> The EU **IS** <u>**a** world **leader**</u> in the area of life cycle assessment (LCA).

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Finland **LACKS** <u>a</u> **clear energy policy** for decreasing our dependence on fossil fuels.

A computer <u>simulation</u> **WAS USED** to visualize the effects of the interactions.

The project **DESIGNED** <u>a</u> **new user** <u>interface</u> for the web application.

7.2.2 Generic *a* and *an*

Use the indefinite article when you don't want to refer to a specific person or thing, but instead to <u>any</u> person or thing of that particular type.

I want to buy b for use at the university. (He hasn't decided yet which one)

Anna cannot afford **a car** at the moment. (She knows that they're all too expensive)

Jukka is searching for **a job** in civil engineering. (Any job will be ok!)

Teemu met **an interesting Russian girl** in the lift. (He forgot to ask her name. . .)

In science and technology, the generic indefinite article is most commonly used for creating definitions (See Patterns: 2.1.1 definitions p. 29), in which both the term and the class are expressed in a generic form:

TERM	=	CLASS	+	DEFINING CHARACTERISTICS
An MP3 player	is	**a** device	**that**	uses the MP3 compression algorithm to store music on a hard drive or flash memory chip for later playback.
A solenoid	is	**a** coil	**which**	converts electrical energy into magnetic energy capable of performing mechanical functions.

7.2.3 Partitive *of* (*a/an*)

Use the indefinite articles in **partitive *of*-genitive phrases**. Partitive phrases are similar to counters (see 7.1.3 *Counters* p. 109) in that they introduce a *unit* of measure before plural count nouns and uncount nouns. Below are listed some of the most common **partitive *of*-genitives** found in technical writing. Note that many of these could replace the informal *a lot of* or *plenty of*:

a number of	a multitude of	a series of	a portion of	an approach to
a host of	a range of	a class of	a total of	a solution to
a plethora of	an large amount of	an array of	a way of /to	a function of
a variety of	a set of	a period of	a method of /to	a summary of

A <u>number</u> **of techniques** can be used for creating artificial visual scenes in computer graphics. It is not unusual for heavy smokers to smoke **a pack** <u>of</u> **cigarettes** per day.

With uncount nouns, **partitive *of*-phrases** can act like **counters** (see p. 7.1.3 *Counters* p. 109) to make an uncountable noun countable:

> We discovered an important piece of information. The mechanical engineering student got sick after drinking over two litres of beer. (uncount)

For the use of *the* with the preposition *of*, see 3.4.17.3.4 *Descriptive of-genitives (the)* p. 117.

7.2.4   Presenting amounts and values (*a/an*)

In science and engineering, the indefinite article and **of** are also combined to specify an amount or value:

Pattern 1: A(n) [`VARIABLE`] of [`amount`]

🙁 The **`DENSITY`** of water **is** `1 gram per cubic centimeter`. (text is about 'density')

🙂 Water has **a `DENSITY` of** `1 gram per cubic centimeter`. (text is about 'water')

Pattern 2: A(n) [object] of [`VARIABLE`] + [`amount`]

🙂 In the men's Olympic hammer throw, **a steel ball of `RADIUS`** `6.1 cm` is swung on the end of **a wire of `LENGTH`** `1.22 m`.

7.3   Specific uses of the definite article *the*

Scene 1

INDEFINITE VIEW

The **definite article *the*** is used to indicate two different perspectives. If you are referring to a whole class of something, we call this **generic reference** (Section 7.4). However, if you a referring to a specific person or thing, then you are giving the concept a **specific reference**. Unlike, the indefinite articles **a** and **an**, the definite article can be used with any type of noun: *count, uncount, singular* or *plural*.

Generic reference:

The Finn is an honest, diligent and reliable worker	(singular count noun)
The Fin<u>ns</u> enjoy a high standard of livings but pay high taxes for it	(plural count noun)
The cost of producing ∅ **electricity** has risen dramatically in recent years	(uncount noun)

Specific reference:

The Finn from TKK gave an excellent conference presentation   (singular count noun)
The Finns carrying 4 cases of Estonian Saku beer   (plural coun noun)
Biomass accounts for about 1% of **the electricity** generated in the USA   (uncount noun)

Of these two forms of reference, specific reference is by far the most common, since most texts only discuss general features of the topic at the beginning before moving on to focus on specific instances of the topic.

Many students make the mistake of over-estimating their reader's knowledge. As a general rule of thumb, use **the** when you think your listener will be able to identify the thing that you are referring to, regardless of whether or not you have explicitly referred to it earlier. Thus, by using *the*, you imply to your readers that they should already be aware that such a thing exists. If you doubt that they have this knowledge, use **a** or **an** when referring to one thing that is countable.

Seven situations give specific reference to a noun and thus require the definite article *the*.

7.3.1 Special adjectives (the)

Superlative adjectives

Superlative adjectives make the noun that they modify unique, since there can only be one *tallest building*, one *most expensive car*, or one best of anything:

The **largest** values	The **least effective** method
The **highest** bandwidth	The **most important** solution
The **weakest** signal	The **simplest** formula

Ordinal numbers

The numbers that you use to rank something—ordinal numbers—also make the following noun unique, since there can be only one unique *first* place position, one *second* place, and one *last* place:

The first stage	The former example	The final step	The previous example
The second option	The latter reason	The following section	The last ten years

Restrictive adjectives (*the*)

In addition to superlatives and ordinal numbers, there are also many adjectives that because of their nature can restrict or limit the thing to one of a kind, thus making the noun unique.

exact	actual	sole	current	above
main	same	only	present	below

All of **the above reasoning** about scaling only applies to objects that are of the same shape.

7.3.2   Special nouns (*the*)

Some nouns refer to unique aspects of our existence. Use *the* with nouns that refer to periods of time or unique physical features of our world:

Time periods (*the*)

Use the definite article *the* when the noun refers to a specific period in time. Such nouns include time **orientation** *the past, the present, the future*, as well as those representing specific time periods, e.g., **decades** (*the 1990s*), **centuries** (*the 21st century*), **seasons** (*the autumn/ winter/ spring/ summer*), and **time of day** (*the morning/ afternoon/ evening*).

>   In **the 1920s**, Edwin Hubble began studying Doppler shifts in the light emitted by galaxies.

Physical features of the world (*the*)

Certain features that are common to everyone are always considered unique and therefore require the definite article *the*.

>   If **the sun** were to increase its light output even slightly, it could melt enough the ice in **the Antarctic** to flood all **the world's** coastal cities.

Institutions and titles (*the*)

Common institutions usually require a definite article to signal their uniqueness.

>   **The E.U.** has passed numerous directives this year.
>   Recently, China opened direct talks with **the Dalai Lama**.
>   **The Rector** will resign when Aalto University is launched in 2009.

Proper names derived from a common noun (*the*)

Named products, processes, models, institutions and places are often unique, especially if the second part of the name is something common to our existence, such as *river, ocean, forest*, and *mountains*. Common nouns describe the CLASS of things that the concept refers to (See also 8.6 *Superordinates* p. 129). Notice how in the examples below, the last word in each expression is a common noun (in bold):

The Pacific **Ocean**	**The** European **Union**
The Vantaanjoki **River**	**The** Java collections **framework**
The Baltic **Sea**	**The** Document Object **Model**
The Sahara **Desert**	**The** Sony **Corporation**
The automotive **industry**	**The** European Space **Agency**
The Physics **Department**	**The** North Karelia **Project**

Appositive use of *the*

Use the definite article *the* when the first of two nouns **classifies** or **defines** the second noun
(**CLASS** + **TERM**), and the second noun provides a **name** for the concept. Notice how reversing
the order of the two words changes the form of these phrases into a definition, shown below in
parentheses. (See also 8.6 *Superordinates* p. 129)

The [Class] + [Name]

> Marijuana is considered to be a major drug of abuse. The drug can be smoked or eaten,
> leading to psychoactive effects from the compound **tetrahydrocannabinol** (THC).
>
> (Definition: **tetrahydrocannabinol** is a compound that...)

> By **the** year **2007**, the sun will be shining directly over Uranus' equator, thus producing
> more evenly distributed sunlight and the ability to see features at all latitudes on Uranus.
>
> (Definition: **2007** is a year)

> Although the cell phone manufacturer **Nokia** is rooted in Finland, it sells cellular phone
> products virtually everywhere on the globe.
>
> (Definition: **Nokia** is a manufacturer **of cell phones**)

> The human eye consists of rods containing the photopigment **rhodopsin**.
>
> (Definition: **Rhodopsin** ia a photopigment)

7.3.3   Previous mention

It is important to remind your reader that a noun is **given** (familiar) information and not a new or
different instance of the same kind of thing. If you are mentioning a thing or concept for the second
time, signal this by using the **definite article the**.

> If you have **a cell phone** which does not have a built-in modem, you will need to purchase
> a PC card modem for your laptop. **The cell phone** will also need to have a data port.

When you are referring back to something, you do not have to repeat the same noun or use a
pronoun (e.g., *it, this, they, them*). Instead, you can use either **the** or **this** and a **superordinate**
of that noun. In fact, *this* is more commonly used than *the* for referring back in academic and
technical texts.

> A hydrogen fuel cell is a device that generates electricity as a byproduct of **a chemical**
> **reaction** between Hydrogen and Oxygen. The only other byproducts of **this process** are
> water and heat, thus producing very environmentally friendly energy without the need for
> combustion.

7.3.4 Modifiers following the noun

Another way to make a noun unique is to provide extra description that further identifies and narrows down the meaning of the noun to only one *type*. Such identifying text that comes after the noun is often referred to as **identifying postmodification**. The most common types of postmodification in technical writing are the **of-genitive** and **defining relative clauses** (clauses that begin with *that*, *who*, or *which*).

3.4.1

Descriptive of-genitives (*the*)

Use **the** before nouns that are followed by the preposition **of**, especially when the following *of* prepositional phrase describes the main noun. Such phrases are called descriptive of-genitives.

> The Space Shuttle orbiters are **the orbital <u>spacecraft</u> of** the **<u>Space Shuttle</u>** program operated by **<u>NASA</u>**, **the space agency of** the **<u>United States</u>**. Fuel cells produce electricity from fuel and an oxidant, which react in **<u>the presence of</u>** an electrolyte.

However, if the noun that comes before the preposition *of* is either a **plural count noun** or an **uncount noun** expressing an **action** or **process**, there is a strong tendency in formal writing to omit the definite article.

Plural count nouns:

Precise ∅ **measurements <u>of</u>** the energy released in the radioactive decay of a given type of atom showed inconsistent results.

∅ **Generation<u>s</u> of** inventors have tried to create a machine, called a perpetual motion machine, that would run forever without fuel.

Uncount noun:

The same temperature must be maintained throughout the fuel cell in order to prevent ∅ **destruction <u>of</u>** the cell through thermal loading. (to destroy → destruction)

∅ **Loss <u>of</u>** helium pressure in this cavity results in an automatic engine shutdown. (to lose → loss)

There are two important exceptions to this rule:

> **7.2.3 *Partitive of (a/an)***
> Unlike **descriptive** *of*-genitives, **partitive *of*-phrases** take an indefinite article (*a/an*) and express quantity in **uncount** and **plural countable** nouns:
>
> **A number <u>of</u> techniques** can be used for creating artificial scenes in computer graphics.
> It is not unusual for heavy smokers to smoke **<u>a</u> pack <u>of</u> cigarettes** per day.

7.2.4 *Presenting amounts and values (a/an)*
In science and engineering, two very important patterns use the indefinite article
a/**an** and **of** to specify an amount or value:

🙁 The **depth** of the lake **is** 12 metres. (text is about 'depth')

🙂 The lake has **a depth of** 12 metres. (text is about the 'lake')

Postmodification by relative clause *that*

A second way to make a noun unique is to modify the noun with a relative clause. This provides
extra description to narrow down the meaning of the noun to only one *type*.

> THE GENERATORS THAT **the electric company uses to produce energy** are much more
> efficient than those in a car engine.

> Although the fuel cell itself only emits heat and water as waste, pollution is often caused
> when generating THE ELECTRICITY THAT was required to produce the hydrogen.

However similar to postmodification by the descriptive *of* (7.3.4), the definite article *the* can be
omitted when the noun is either a **plural count noun** or an **uncount noun** expressing an **action** or
process:

> ∅ **Solar light<u>s</u> that** charge during the day and light up at dusk are a common sight along
> walkways.

> In the 1920s, there were ∅ **experiment<u>s</u> that** suggested energy was not conserved in
> radioactive processes.

Definitions (*a/an*)
Use *a(n)* when the noun is postmodified by *that/which* in a **definition**.

TERM	=	CLASS	+	DEFINING CHARACTERISTICS
A Trojan horse	is	**a** malicious program	**that**	pretends to be a benign application.

See 7.2.2 *Generic a and an* for more information on this topic.

7.3.5   Shared knowledge

Use the definite article to refer to nouns when you are sure that your readers can uniquely identify
the concept from their knowledge of the field, subject matter, or expected content of the document
that they are reading. In such cases, we say that the noun is definite because of **shared knowledge**.
For example, in the two versions of the same text below, the writer could use the **indefinite form** *a*

joint mission for a **lay audience (non-experts)**, whereas the same text would require the **definite form** *the joint mission* when the writer assumes that the reader will know that the reference here is to a particular mission (e.g., *The LISA Project*).

Reader lacks prior knowledge:	**For experts in the field:**
<u>A</u> **joint mission of** NASA and ESA will launch three spaceships into orbit around the sun during the next decade.	**The joint mission** of NASA and ESA will launch three spaceships into orbit around the sun during the next decade.

7.3.6   Implied uniqueness (*the*)

Use **the** to indicate that something is unique because it forms a typical part or component of another entity. For example, using **the** in the example below implies that these are typical parts of an engine.
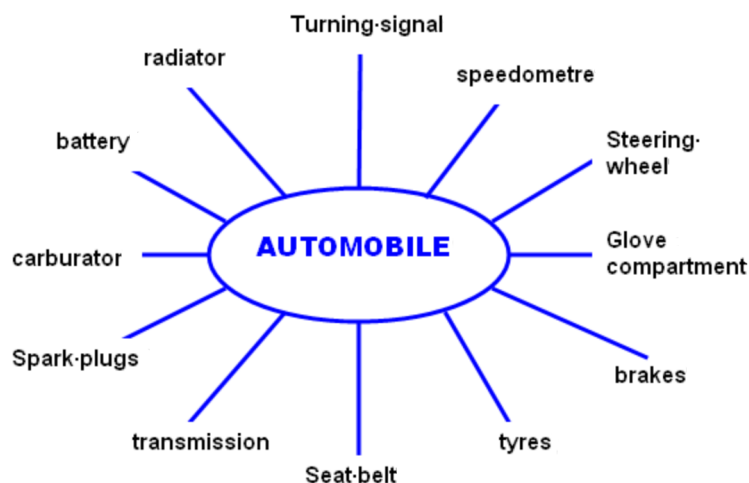
View: Not usual components	**View: normal components**
The area between <u>a</u> **piston** and <u>a</u> **cylinder liner** and between ∅ piston rings and <u>a</u> **cylinder liner** is <u>a</u> large source of friction in internal combustion engines	The area between <u>the</u> **piston** and <u>the</u> **cylinder liner** and between <u>the</u> **piston rings** and <u>the</u> **cylinder liner** is a large source of friction in internal combustion engines.

7.4 Generics

Scene 3

GENERIC (SYMBOLIC VIEW)

Technical writing involves a great deal of generic description, since much of engineers' time is spent in describing and evaluating the properties, operating principles, performance, and problems of technical solutions. When doing these tasks, you will not be describing one single physical application, but rather generalizing to all members of the group of applications that apply the same principles. English has five different ways to refer to a whole **group** or **class** of something. Of these five, however, you will most likely only need the first three for most of your writing in science and technology.

7.4.1 ∅ + plural noun

This generic form refers to **representatives** of a class, and not to the class itself. In science and technology, using the **plural form** with **no article** is the most common strategy for talking in a general way about a concept.

> **Many computer applications** show percent-done progress indicators for operations taking more than about 10 seconds.

> **Computer users** are often too easily tricked into giving away personal information in emails or fake web sites.

7.4.2 ∅ + uncount noun

When talking in a general way about an **abstract uncount** concept, use the **zero article** ∅.

> **Electricity** can be generated from heat through the use of thermoelectric generators.

> **Failure** refers to the state or condition of not meeting a desirable or intended objective.

> **Genetic engineering** refers to an experimental technique through which genes can be isolated in a laboratory, manipulated, and then inserted stably into another organism.

Note that *the* can only occur with an uncount noun to signal second mention (Section 7.3.3) generic form or identifying modification (Section 7.3.4).

> Biomass accounts for about 1% of **the electricity that** is generated in the USA. The emergency propulsion system must function despite **the failure of** any one critical component.

> Continued progress in **the genetic engineering of** crops is critical to feeding future world populations.

7.4.3   *a(n)* + singular count noun

Although this generic form is the default form, it is clearly less common than the use of plural nouns (section 7.4.1) when writing in science. Note that both examples below could easily be changed to the plural generic (i.e., *mobile phones, users*) without any change in meaning:

> Most of the respondents said that carrying **a mobile phone** makes them feel more secure.
>
> For a trojan horse to become active, **a user** must either download the file from a web site or receive it as an e-mail attachment.

However, the definite article is more commonly used for creating definitions:

> **A spacecraft** is **a vehicle** or machine designed for flight in space.

See also 7.2.2 *Generic a and an*.

7.4.4   *the* + singular count noun

Use *the* when referring to an **entire class** of people or **type of inanimate object**, most commonly **devices** and **machinery**. Note how in the examples below, the writer is not referring to any specific instance of the user or the mobile phone, but rather to **a single** *type* of *person* or *phone*.

> When **the user** moves the mouse over an image/text or button, it either fades in or out.
> **The mobile phone** is an indispensable part of the everyday life of Finns.

7.4.5   *the* + plural nationality /religious or political affiliation

This last generic form is rare in English and is only used to refer to groups of people that have some special membership based either on **nationality**, or **religious / political** beliefs:

> **The ancient Greeks, Arabs and Chinese** had theories of light and vision, all of which were mostly wrong, and all of which were accepted for thousands of years.
>
> All Finnish church records prior to 1860 were microfilmed on roll film by **the Mormons** in the 1950s.
>
> In Finland, **the communists** fought against **the whites** in 1918.

Chapter 8

GRAMMATICAL TERMINOLOGY

8.1   Nouns and noun phrases

Nouns (*substantiivit*) and **noun phrases** (*substantiivilausekkeet*) are the primary units or 'building blocks' of the sentence. As you'll note in the example below, not only do noun phrases comprise the majority of the elements in the sentence but they also fulfill many of the most important fuctions, including the **subject**, **complement**, and **object** of the sentence.

	The greenhouse effect	is	**the rise in temperature that the Earth experiences**
	subject	verb	complement
because	**certain gases in the atmosphere**	trap	**energy from the sun.**
	subject	verb	object

If we think of **noun phrases (NPs)** as the main building material for the sentence, then **verbs**, **prepositions** and **subordinators** act as the 'glue' that holds our sentence together.

What is a noun?

A **noun** is a word that can be used to refer to a **person**, **place** or **thing**. As we have already seen, nouns are important because they can serve as the **subject** or **object** of a verb. The subject is the 'doer' of the sentence, while the object is the '**receiver**' of the action:

Subject:
Global warming is threatening polar bears with starvation by shortening their hunting season.

Object:
Climate change is threatening **polar bears** with starvation by shortening their hunting season.

Nouns (substantiivit)

In its simplest and lightest form, a noun can be

- a **simple pronoun** (*it, they, we*)

- a **noun** (*processes*)

- an **article** or **other determiner + noun** (*a process, the process, this process*)

Nouns come in three forms **uncountable**, **countable** (can have a *singular* and *plural forms*) and **proper** (names of people and places) nouns. Nouns are also special in that they can occur with definite (*the*) and indefinite (*a, an*) articles.

Uncountable noun	→	**Heat** is the transfer of internal energy from one region to another.
Singular countable noun	→	The Earth acts like **a greenhouse.**
Plural countable noun	→	**Greenhouses** work by trapping heat from the sun.
Proper noun	→	**The Earth** acts like a greenhouse.

Noun + modifiers (substantiivilausekkeet)

As you have probably already noticed, nouns rarely occur by themselves, but instead come in groups which we call **Noun phrases (NPs)**. In academic writing, many NPs can be very **complex** and **long**, as the writer attempts to define and narrow the meaning of the **head noun**. NPs are typically modified by **adjectives**, **genitive forms** (*-'s or of*), **relative clauses** (clauses introduced by *that*, *which* or *who*), **prepositional phrases** (clauses introduced by prepositions like *to*, *from*, *on*, *at* or *in*), other nouns (*noun compounds*, e.g. *school parking area*) or NPs can be created from **gerunds** (*-ing forms*).

Adjective + noun	→	**Global** *warming* results primarily from the release of heat-trapping gases.
of-genitive	→	*The temperature* **of the earth** has increased by about 0.6C.
Prepositional phrase	→	Global warming will bring about *a rise* **in temperature** and other major changes.
-ing Gerund	→	**Selecting** *the right data storage system* is no easy task.
Relative clause	→	CO2 is *a greenhouse gas* **that traps the Sun's radiation in the troposphere**.
Noun compound	→	**Automobile exhaust fumes** lead to ozone generation.

8.2 Head nouns

A **head noun** is the main noun that is modified by other elements in a noun phrase. It is important that you can find head nouns, because this allows you to determine whether the phrase can take

an indefinite article (if the head noun is a **uncountable** noun, then it cannot occur with *a* or *an*). Similarly, knowing the location of the head noun also allows you to ensure that the noun properly agrees in number with the verb.

A readers ability to process the message is affected by the length of the noun phrases and their order in a sentence.

8.3 Pronouns

Pronouns are words that can replace a noun. You use pronouns like *it, which, this, that,* and *we* to make your sentences less top-heavy and less repetitive.

Personal pronouns (I, we, you, he, she, they)

In general, academic writing tends to avoid **personal pronouns** and, instead, prefers repeating nouns. The pronouns **I** and **you** are especially avoided, though **we** can be used in some fields when offering explanations or justifications for particular methodological choices, for instance, in report writing.

Referring to your own work/ideas:

To shed further light on connector performance, **I** have conducted numerous tests aimed at addressing the problem of fretting corrosion under field conditions.

To shed further light on connector performance, **the present author** has conducted numerous tests aimed at addressing the problem of fretting corrosion under field conditions.

In this paper, **we** present a detailed description of the measurement campaign performed in order to obtain sufficient path variation data for acceptable characterization of the UWB on-body channels.

This paper presents a detailed description of the measurement campaign performed in order to obtain sufficient path variation data for acceptable characterization of the UWB on-body channels.

Referring to other authors work:

Richards and coworkers (1999) found high levels of dissatisfaction among users of instruction manuals, though **they** were unable to identify the exact linguistic reasons for this finding.

Williams (2005) suggested that coyotes may have reduced the carrying capacity of bobcats in eastern Maine by diminishing the availability of prey. However, **she** neglected to take into account the affects of humans living in the area.

Coyotes may affect the carrying capacity of bobcats by diminishing the availability of prey **(Williams, 2005)**. However, this view has been questioned, since **Williams** neglected to take into account the effects of humans living in the area.

Third-person pronouns (*it, they*)

Use **it** and **they** to refer to only to those nouns which have been in topical or subject position in the previous sentence.

EXAMPLE 1:

This section of the review describes current limits on the biological aspects of nanotechnology. **It** outlines selected broad areas of research opportunity, and **it** sets forth challenges for the intermediate and long-term future.

This section of the review	**describes** current limits on the biological aspects of nanotechnology.
↓	
It	**outlines** selected broad areas of research opportunity, and
↓	
It	**presents** challenges for the intermediate and long-term future.
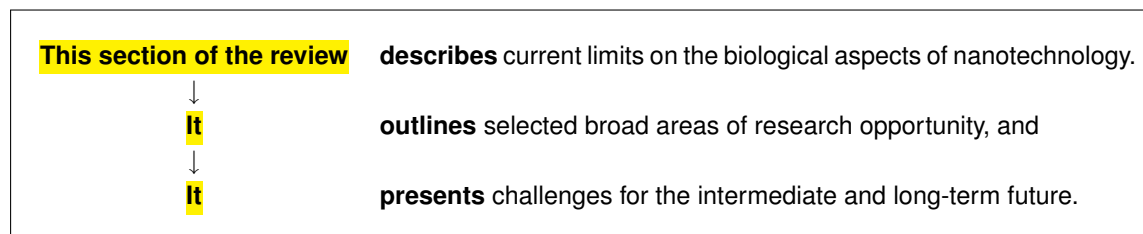
EXAMPLE 2:

The benefits of process control are many. **They** include achieving reduced variability and higher quality, safety enhancement, reduction of process upsets, and in many cases, environmental improvements due to achieving mass balance in processes with material in/product out

.

Demonstrative Pronouns (*this, these and that, those*)

The demonstrative pronouns are **this, that, these** and **those**. **This** and **that** are used to refer to **singular** and **these** and **those** to **plural nouns and noun phrases**. Demonstrative pronouns differ in two ways from the third-person pronouns **it** and **they**:

1. Demonstrative pronouns can refer to and summarize the whole of a preceding sentence (e.g., *this* in the example below).

2. Demonstrative pronouns can also refer to information which is not yet topical, or has been mentioned many sentences earlier, so that it has 'fallen' out of focus. Note how in the example below, **these** refers to information that has just been introduced (after the verb) as new information in the previous sentence.

EXAMPLE 1:

In the 19th century, Poul la Cour discovered that **fast rotating wind turbines with fewer rotor blades generate electricity more efficiently than slow moving wind turbines with many rotor blades.** **This** led to **a number of wind turbine advances** during the 20th century. **These** included the introduction of AC generators, electromechanical yawing to ensure that the rotor always faces directly into the wind, and stall controls to keep the rotor from turning too fast in very strong winds.

Poul la Cour discovered that   **fast rotating wind turbines. . . generate electricity. . .**
↓
This   led to **a number of wind turbine advances. . .**
↓
These included **the introduction of AC generators. . .**
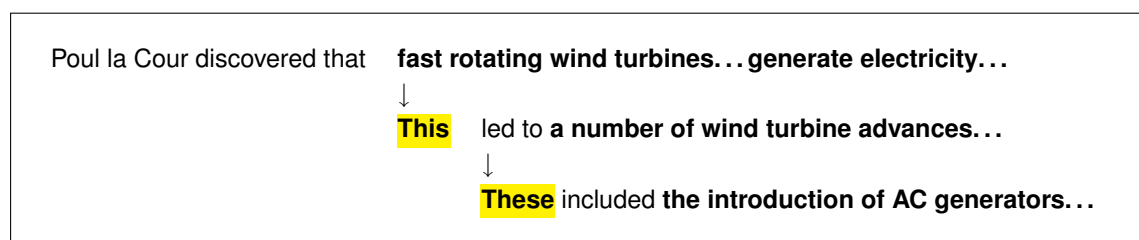
See also section 1.4 *Repairing problems* p. 22 and 1.4.2 *Strategy 2: use pronouns* (*it, they / this these* p. 24).

8.4 Gerunds (-ing)

Although all **gerunds** end in **-ing**, they are not necessarily very easy to recognize, since they can be easily confused with present participles, which also end in **-ing**. Gerunds are derived from verbs and serve as nouns, whereas **present participles** serve as the continuous form of verbs and as shortened forms for relative clauses (See also section 6.3.1 *Reduced relative clauses* p. 96).

VERB:
John **is selectING** a book.

REDUCED RELATIVE CLAUSE:
The panel who are selectING the new secretary have been told to hire someone who speaks Spanish.(full form)

The panel selectING the new secretary have been told to hire someone who speaks Spanish.(reduced form)

GERUND NOUN:
SelectING the correct data storage system is no easy task.

8.4.1 Paraphrases for Gerunds

A gerund phrase, one that starts with a gerund, can often be paraphrased with either a **noun compound** or a **French-based noun phrase** consisting of the form **the ...tion of**, which contains a *definite article*, the latinate *verbal noun*, and *of*. The table below shows examples of the three types of noun phrases, increasing in formality as one progresses to the bottom.

> **GERUND:**
> **SelectING the correct data storage system** is no easy task.

> **FRENCH (FORMAL):**
> **The selectION of the correct data storage system** is no easy task.

> **NOUN COMPOUND (TECHNICAL):**
> **Correct data-storage system selectION** is no easy task.

8.5 Subject

The **subject** is a grammatical term used to describe the nouns, pronouns, and noun phrases that occur before the verb in a sentence. Thus, the subject describes a **position** in the sentence. When the verb is in the **active** form, the subject of the sentence is the **doer** or **agent** (*who* or *what*) that causes the action.

	Subject	Verb (ACTIVE)	Object
Noun	**The dog**	was chasing	a cat.
Pronoun	**We**	found	a badly scratched dog.
Noun Phrase	**Chasing cats**	can increase	a cat's blood pressure.

However, when the verb is in the **passive** form, the *subject* of the sentence is the **target** or **result** of the action.

	Subject	Verb (PASSIVE)	Object
Noun	**A cat**	was being chased	a **by** the dog.
	A badly scratched dog	was found	(by our family).
Noun Phrase	**the blood pressure of a cat**	can be increased	**by** chasing cats.

Not all verbs express an action. Some verbs simply serve a **linking** function. Such verbs include **be** (*is, are, was, were*), **seem**, and **become**. Linking verbs connect the subject to something that is said about the subject by either defining or adding extra information.

	Subject	Linking verb	Complement
Noun	**The cat**	is	afraid.
Pronoun	**It**(=the cat)	is	tired of being chased.
Noun Phrase	**Chasing cats**	is	a favourite pasttime of dogs.

In English, all sentences <u>must</u> always have a subject, either a noun or noun phrase, or a pronoun, even if there is no natural agent. This is why verbs like rain must carry a subject such as **it**, even if nothing is actually 'doing' the raining. *It* is in this case a **dummy pronoun**. Another common *dummy subject* is **there**.

DUMMY SUBJECT IT

Dummy	verb	
It	is raining	cats and dogs.
It	is important	to keep cat away from dogs.
It	is likely	that the dog will get badly scratched.
It	is known	that dogs can live in peace with cats.
It	appears	that cats may dislike dogs.

DUMMY SUBJECT THERE

Dummy	verb	
There	remain	a number of critical issues.
There	is	a very wide range of disciplines contributing to developments in nanostructure science.
There	has been	considerable research activity in molecular electronics and bioelectronics.

Can you find the grammatical subjects for each sentence in this text? Underline the word(s) in the text below that you feel would make a better topic and unify these three sentences.

---

[1]A high potassium / manganese ratio is generally responsible for a rise in total cholesterol levels following the switch to a vegetarian lifestyle. [2]Similarly, a rise in zinc and a decrease in iron are common when switching to vegetarianism, which can also result in raised total triglyceride levels. [3]At the same time, lower protein and/or phosphates are known to cause higher levels of VLDL triglycerides, as can occur in a vegetarian diet due to increased intake of calcium and simple carbohydrates (sugar, honey, sweet fruits).

8.6   Superordinates

Superordinate terms (often also called *hypernyms*, *anaphoric nouns*, or *discourse-organizing words*) are nouns that can be used to stand for an entire **class** or **category** of things. Thus, a superordinate term acts as an umbrella term that includes within it the meaning of other words. For example, *vehicle* is the **superordinate** concept for **subordinates** *lorry, automobile, bicycle*, and *tram*.

VEHICLES

bicycles   cars   lorries   ships   trams
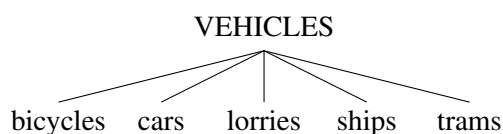
Superordinate terms play an important role in promoting *cohesion* by providing writers with a more explicit means than would be possible using only pronouns (*it, they, this, these, those*) for linking their ideas either back to earlier pieces of text, or forward to upcoming information.

Superordinate terms tell the reader what to expect when they occur before an idea. In this function, superordinate terms serve as the class in definitions, and describe the items and examples presented in lists.

8.6.1 Referring to categories: Definitions

Formal definitions consist of three parts: the term to be defined, the class/category of concepts or objects to which the term belongs, and the characteristics that distiguish it from others in that same class. Here, the **class** corresponds to the superordinate term.

Term		Class	Characteristics
A lorry	is a large	**vehicle**	that is used to transport good by road.

8.6.2 Referring forwards in the text

Introducing items in a list

Similar to definitions, lists require a *superordinate term* that **links forward** in the text to the items in the list and describes the 'class of things' to which they belong.

NUMBER + [SUPERORDINATE] + LIST OF ITEMS
In front of the house were parked three **VEHICLES: a lorry, a car and a large, red bicycle.**

[SUPERORDINATE] + SUCH AS + [EXAMPLES]
Most engineering The mobile lifestyle we know today would not be possible without **VEHICLES such as** automobiles, buses, trams, and aircraft.

[SUPERORDINATE] + INCLUDING + [EXAMPLES]
A new energy tax will be levied on most motorised **VEHICLES**, **including** automobiles, lorries, and motorcycles.

[EXAMPLES] + AND OTHER [SUPERORDINATE]
A new energy tax will be levied on all automobiles, motorcycles **and other** motorised **VEHICLES**.

Enumerated paragraphs

Enumeration is a paragraph pattern that highlights the connection between ideas by using ordinal numbers. To use this pattern correctly, writers need to inform the reader in advance about **how many** and **what 'class'** of ideas will be listed.

ENUMERATION (PARAGRAPH PATTERN)

Today's computer-display manufacturers are limited by **two FACTORS. First,** manufacturing the high-grade 'single crystal' silicon used to make fast chips and processors is expensive and requires high temperatures, and the end product is too brittle to be layered onto large surfaces. **Second**, while so—called amorphous silicon-typically used in transistors that control whether display pixels are on or off—is easily and cheaply fashioned into thin-film electronics, it has slow electron flow and chews up a lot of power. Nanosys believes it can use nanotech to give the display industry the best of both worlds.

Many defining relative clauses require a superordinate term as the head word that introduces and refers forward in the text to the relative clause.

[SUPERORDINATE] + WHICH

A research team from the Georgia Institute of Technology and Drexel University has discovered a surprising new **MECHANISM by which** polymer materials used in nanocomposites control the growth of

8.6.3 Referring backwards in the text

Superordinate terms also classify or summarize what has been said when they occur after a thought. When representing an entire category of actions, concepts or objects, superordinates are typically modified by **demonstrative pronouns** (*'this/these', 'that/those', such*), **numbers**, and **adjectives** (*'similar', 'another,' 'same'*).

SUCH (A) + [SUPERORDINATE]

If the companies involved in generic engineering were really concerned with protecting the environment and reducing the amount of chemicals used, they would fund research into organic farming, encourage farmers to move away from chemical dependency towards organic and less intensive systems. **Such a POLICY** would of course not advance corporate profits.

THIS + [SUPERORDINATE]

An often repeated lie by the genetic industry is that what we are doing is no different to what has been practised by selective breeding ever since man became a domesticated animal. **This CLAIM** is demonstrably not true and shows either an appalling level of ignorance or an act of deliberate deception.

SIMILAR + [SUPERORDINATE]

It might be argued that complex protein or nonprotein machines are impossible or useless, on the grounds that, if they were possible and useful, organisms would be using them.**A similar CARGUMENT** would, however, conclude that bone is a better structural material than graphite composite, that neurons can transmit signals faster than wires, and that technology based on the wheel is impossible or useless. Nature has been constrained less by what is physically possible than by what could be evolved in small steps. Thus, the absence of a proposed kind of molecular machinery in organisms in no way suggests its infeasibility.

OTHER + [SUPERORDINATE]

The Queen owns eight State limousines, consisting of two Bentleys, three Rolls-Royces and three Daimlers, all of which are painted in Royal claret livery. **Other VEHICLES** include a number of Volkswagen 'people carriers'

ANOTHER/ A FURTHER + [SUPERORDINATE]

Social engineering attacks take place on two levels: the physical and the psychological. First, we focus on the physical setting for these attacks: the workplace, the phone, your trash, and even on-line. In the workplace, the hacker can simply walk in the door, like in the movies, and pretend to be a maintenance worker or consultant who has access to the organization. Then the intruder searches through the office until he can find a few passwords lying around and emerges from the building with ample information to exploit the network from home later that night. **Another TECHNIQUE** to gain authentication information is to just stand there and watch an oblivious employee type in his password.

8.7   Transitive and intransitive verbs

A simple English clause (*lause*) or sentence (*virke*) consists of at least two elements: a **subject (S)** and a **verb (V)**. The subject is typically the first participant or doer in a sentence, and the verb indicates what the subject is doing (an action or process). If the action is not directed at another participant, as in the examples below, the sentences and verbs are classified as **intransitive**.

Subject	**verb**
(Participant)	(action)
The dog	sleeps.
The mobile phone	beeps.
The sun	shines.

If the sentence includes an object, another participant–at which the action is directed–the sentence and the verb are **transitive**. In the examples below, the nouns *water*, *a text message* and *photons* are **direct objects**.

Subject	**verb**	**object**
(Participant)	(action)	(participant)
The dog	drinks	water.
The mobile phone	transmits	a text message.
The sun	emits	photons.

In some cases, a sentence may contain two objects: **direct** and **indirect object**. Such a sentence is **ditransitive**. The direct object usually benefits from the action or receives something.

Subject	**verb**	**direct object**	**indirect object**
The mobile phone	has transmitted	a text message	to you.
The sun	emits	ultraviolet light	to earth.

Many English verbs can function both as transitive and intransitive verbs. One such a verb is *to increase*.

	Subject	verb	object	
intransitive	The number of 3G phones	increases	∅	rapidly.
intransitive	The temperatures	increase	∅	in late summer.
intransitive	Marketing expenditures	increased	∅	nearly 10% this year.
transitive	Marketing	may increase	expenses	by 10%.

8.8 Auxiliary verbs

What is an **Auxiliary Verb**? **Auxiliary verbs**, or sometimes informally referred to as *helping verbs*, are those verbs that can be used for two main purposes. Examples of auxiliary verbs include *be, have do, will, can, could, should, would*.

The most common use of an auxiliary verb is together with a main verb to show tense or person in questions, negative and passive forms.

NEGATIVE:

Environmentally benign manufacturing (EBM) **DOES NOT compromise** the environment.

QUESTIONS:

What **DOES** EBM **mean** and how **DO** EBM practices **differ** in various regions of the world?

PASSIVE:

Most of the research in nanostructured magnetostrictive materials **IS carried out** in Japan and Europe.

Second, auxiliary verbs can act as **pro-forms** that appear alone to mark the place where a main verb has been omitted, but is still understood:

COMPARISONS USING *than*:

Nanostructures **offer** higher surface areas **than DO** conventional materials.

(See Comparing results)

AS + [AUXILIARY VERB]:

In Finland, strong emphasis has been placed on the development of 'design for environment' (DFE) tools. Nokia **HAS demonstrated** several examples, **as HAS** VTT, the Technical Research Centre of Finland.

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