

The following revision is taken from an Survey of the Literature by a Thai-speaking postgraduate student of chemical engineering (c.f. Kibbitzer 32):

Original	Revision
It was shown that JS9 was unable to grow on (<i>p</i> -CT) due to the absence of the enzyme necessary for metabolism of 2-methyl diene lactone (an intermediate of the toluene digestion pathway). On the contrary, mutant strain JS62 is the only strain that can grow on this substance (Haigler and Spain, 1989).	It was shown that that JS6 was unable to grow on (<i>p</i> -CT) due to the absence of the enzyme necessary for metabolism of 2-methyl diene lactone (an intermediate of the toluene digestion pathway). By contrast, mutant strain JS62 is the only strain that can grow on this substance. (Haigler and Spain, 1989).

The following table shows data rounded to the nearest digit for the occurrence per million words of the connectives ***on the contrary***, ***on the other hand*** and ***by contrast*** in a high-prestige science research journal (**Nature**), a popular science journal (**New Scientist**), and a broadsheet newspaper (**The Guardian**).

Connective	Nature	New Scientist	Guardian
<i>on the contrary</i>	5	2	5
<i>on the other hand</i>	55	44	27
<i>by contrast</i>	259	73	18

The following points emerge immediately from the table:

- The comparative rarity of the connective ***on the contrary*** in all three publications.
- The greater use of the 'contrastive' connectives in texts on science when compared with newspaper text. This is not surprising, since much scientific argument has to do with the careful establishing of differences between entities, processes and theories.
- The remarkable weighting in **Nature** towards the connective ***by contrast*** (approximately five times as frequent in that journal as ***on the other hand***, and eight times as frequent as the same connective in **New Scientist**).

The above results should be borne in mind in considering the following discussion of the three connectives:

on the contrary

In modern written English, this connective is typically used to **strengthen** a statement made with a negative. For example: ***It is not bad: on the contrary, it is very good.*** Here are some citations which illustrate the use of ***on the contrary***:

1. Nomadic herdsman do not, by and and large, destroy their pastures. On the contrary, they use it best.
2. The Beveridge settlement ... did not take mass structural unemployment to be a fact of life in Britain. On the contrary, full unemployment was one of the central pillars of the postwar welfare state, ...
3. These reports are not being produced "grudgingly" as suggested by New Scientist. On the contrary, we have provided, as soon as available, the fullest possible information on the nature of the problem found in this area.
4. Andrew Neil, editor of the Sunday Times, lives alone, but not because he disdains the company of women. 'On the contrary, I like women enormously, and see them as great civilisers of men,' he says.
5. Roy Porter does not romanticise London's past. On the contrary, he does full justice to the poverty and roughness of Hogarth's London, and to the appalling sanitary problems and cholera epidemics of the mid-19th century.

Consideration of these examples should show why **on the contrary** is inappropriate in the student's draft: it was clearly intended that the second sentence should not merely **strengthen** the statement in the first sentence, but show a clear **contrast** with it.

on the other hand

This was the student's first suggestion for a revision of her text. Was it possible to distinguish it from **by contrast** (the consultant's preference)? A rapid trawl with [Microconcord](#) produced citations such as the following:

1. Most secondary schools now have at least one CD-ROM drive. Portable computers, on the other hand, remain an impractical option for schools.
2. If our data are expressed in vague terms such as 'x is almost A' or 'y is just a little bit B', then we cannot draw any conclusions using traditional logic. Fuzzy logic, on the other hand, provides us with a method for drawing conclusions from such imprecise data.
3. We don't want to cause undue alarm because the disease is so rare, but on the other hand we need to give people the facts..
4. According to one theory, the outer gases begin to fall inwards, but when they hit the solid surface of the newly-formed neutron star a reverse shock wave rips outward through the star. On the other hand, the outer gases might be flung out by the flood of neutrinos from the star.
5. Close proximity of inserted genes to those of the host concerned with DNA replication or energy production might prove fatal to the host, and thus to the parasite. On the other hand, the parasite may actually benefit from insertions which interfere with the host's "morphogenetic" genes, those involved in development or by insertions near genes that are responsible for making poisons.

Citations 1 & 2 have the basic structure: 'A is x: B is y', where there is a double contrast between the **topics** (A & B) and the **comments** (x and y). For sentences with this structure, the data show large numbers of citations with **on the other hand** and with **by contrast**. Citations 3-5 on the other hand have the structure 'A is both x and y': - i.e. the topic remains the same, and two comments are made about it: for example, two contrasting conclusions from the facts (citations 3 & 4), or two alternative consequences of an action (citation 5). For such contexts it appears from the data (and from native-speaker intuition) that only **on the other hand** is appropriate.

by contrast

We have already seen that the meaning of some contexts appears to allow the connective **on the other hand** but not **by contrast**. Are there contexts in which **by contrast** is possible, but not **on the other hand**? Examination of the data (see, for example, the citations below) suggests that **by contrast** cannot be distinguished on the basis of **meaning**, but that there is a difference in **formality** and **connotation**, **by contrast** emphasising that the contrast is important and worth taking seriously. This difference seems to underlie the heavy weighting towards **by contrast** in the **Nature** data, and was probably what led me to feel that in the student's text it would be more appropriate than the 'casual' **on the other hand**.

1. Control animals, whose tumours had been injected either with saline or with uninfected mouse cells, were unaffected by the drug. By contrast, the tumours of 11 out of 14 animals that had received the retrovirus disappeared.
2. Most previous models of deep earthquakes postulate *a priori* the existence of a planar structure (physical or thermal) that is inclined to the principal axes of stress and which evolves into the fault. By contrast, the microstructures of our specimens suggest a new, self-organizing mechanism that is intimately connected to the transformation process and which exhibits striking analogy to the Griffith theory of brittle fracture.
3. Radioactivity that remained associated with the cells indicated that only a small percentage (1.5- 3.5%) of surface HLA-DR was spontaneously internalized by these cells (fig. 5b). By contrast, a similar experiment with iodinated anti-transferrin-receptor monoclonal antibody30 showed that high levels of transferrin receptor were internalized (peaking at 51%) and that receptors were recycled later on.
4. Addition of purified centrosomes to the interphase extracts resulted in the assembly of very long microtubules as early as 3 min after the beginning of the incubation at room temperature when there was still little spontaneous polymerization. By contrast, addition of purified centrosomes to the metaphase extracts nucleated the assembly of microtubules that remained short over 30 min of incubation at room temperature.
5. Destruction of dopamine-producing neurons causes Parkinson's disease, and it has long been known that many of the symptoms of Alzheimer's disease reflect the gradual loss of a class of neuron that releases a neurotransmitter called acetylcholine. By contrast, there is no common disease process which selectively attacks 5-HT neurons.