



**Physics by analogy**

Poets and novelists are renowned for their use of analogy, metaphor and simile, which allow them to identify parallels and transfer features between differing domains. Indeed, we all use these kinds of descriptions on a daily basis. As Forrest Gump famously remarked in the movie of the same name, "life is like a box of chocolates: you never know what you're going to get". In physics, analogy is used to help visualize and communicate concepts that are beyond sensory perception, from colliding atoms to colliding galaxies. It is commonly employed when communicating with non-scientists, to make physics accessible and memorable. But analogy can also be used to explore new research areas and to explain novel ideas to colleagues. Examples of analogies range from simple examples with superficial relations, often used to make a topic engaging and accessible to novices, to complex analogies with deep structural relations that are used to compare physical systems. The precise form that an analogy takes depends heavily on its function and the context of use,

but in general analogies fall into three broad and overlapping categories.

The first type tend to break down if they are taken beyond superficial similarity and are commonly found in popularizations of science, such as comparing a vibrating cosmic string to a guitar string.

Analogies in the second category do not break down when taken beyond the superficial, and usually have a combination of pictorial, physical and/or mathematical features.

Finally, physicists sometimes use abstract mathematical analogies in their private conceptualisations, journal articles and conference talks that are too sophisticated for non-experts to understand. Such formal, mathematical analogies are often taken for granted. Like the foundations of a building, these analogies often become invisible as the associated theory becomes established.

(Taken from [http://people.bath.ac.uk/pspcam/publications/pw\\_feb2007\\_p16.pdf](http://people.bath.ac.uk/pspcam/publications/pw_feb2007_p16.pdf))

**EXERCISES**

**1 True or false?**

- a. Analogy is commonly used to explain concepts in physics. T F
- b. Usually physicists use only very simple analogies. T F
- c. A vibrating cosmic string can be compared with a guitar string. T F
- d. Physicists never use abstract mathematical analogies in their private conceptualisations. T F

**2 Complete.**

Physicists use many analogies to ..... physics. In general we can ..... these analogies in three broad categories. .... belonging to the first ..... can be considered only in a ..... way, otherwise they tend to ..... down. Those belonging to the second category are more ..... and usually have a ..... of pictorial, physical and mathematical ..... The analogies of the third ..... are too sophisticated for non-experts to ....., and are commonly used by ..... in their private conceptualisations.

*robust • superficial • combination • type • understand • explain • organise • analogies • break • group • physicists • features*

**3 Match questions and answers.**

QUESTIONS		ANSWERS	
<b>A</b>	How do physicists use analogies?	<b>1</b>	The analogy between the gravitational mass quadrupole moment of a body and its tensor of inertia, is an example of an analogy of the third group.
<b>B</b>	Can you make an example of an analogy belonging to the third group?	<b>2</b>	Analogies allow poets to transfer features between differing domains.
<b>C</b>	How do poets commonly use analogies?	<b>3</b>	In physics analogy is used to visualise concepts, it is commonly employed to explain physics concepts to non-scientists.