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Physics words with surprising origins

Many everyday English words have a double meaning, being used as physics jargon. This month, we share some of our favourite stories of how physics terms came to be.

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As the old joke goes, "Gravity. It isn't just a good idea. It's the law." To state the obvious, the punchline works because 'law' in everyday English and 'law' in physics jargon are two words that are spelt the same and pronounced the same, but their meanings are distinct. This month, we ponder some of the more amusing physics usage of standard English words, and the stories behind how those words came to have two meanings.

Often, physics terminology is based in whimsy. When physicists talk about charm, they are usually referring to a type of quark. The name, according to Sheldon Glashow, refers to the pleasing symmetry that charm quarks bring to the subnuclear world; Glashow, John Iliopoulos and Luciano Maiani also pointed out that a charm is "a magical device to avert evil", which is fitting for charm quarks that prevent quark theory from predicting decays that aren't backed up by experiments[1].

Other times, the choice of an everyday word is something of an in-joke. For example, in particle physics, a barn is 10^{-28} m^2 and is a unit for the cross-sectional area of a reaction, approximately equal to the cross-section of a uranium nucleus. The term originated in the Manhattan Project, where it was natural to want to work in units where a uranium nucleus has a cross-section close to unity. A Los Alamos National Laboratory report from 1944 (ref. 2) claims that scientists considered naming the unit after a person but the obvious choices weren't suitable – 'Bethe' would be confused with the Greek letter beta, and 'Oppenheimer' was too long. In the end, they arrived on 'barn' because, in the context of nuclear cross-sections, 10^{-28} m^2 may as well have been as big as a barn (pictured).

Another physics term that started as a joke is the penguin diagram, a class of Feynman diagram. The diagrams themselves were initially studied by Mikhail Shifman, Arkady Vainshtein, and Valentin Zakharov, but as Shifman recounts, "they did not look like penguins at all. Later on they were made to look like penguins and called penguins by John Ellis" (ref. 3). Ellis had been playing darts against Melissa Franklin, and had been bet that if he lost (which he did), he had to include the word penguin in his next paper. He managed to fulfil his side of the bet after realizing that some of the diagrams looked a bit like penguins[3].

There are also physics terms that have a different meaning to the same word in other sciences. Sometimes, the overlap is simply a matter of two words coming from the same origin, such as the nucleus of an atom and the nucleus of a biological cell both being named after the Latin for 'nut'. Other times, the overlap is deliberate. Plasma is a state of matter, as well as a component of blood. In fact, medical scientists were already using the word plasma, derived from the Greek verb 'plassein' meaning 'to mould', when Irving Langmuir started experimenting with electrical discharges in the 1920s. Langmuir chose the name in a deliberate reference to blood plasma: blood plasma carries around blood cells, and the plasma Langmuir was studying carries around particles[4].

As editors, part of our job is to help our authors choose language that will be as clear as possible for as many readers as possible. Sometimes we ask authors to add an explanation of a term they consider standard, to avoid confusing readers who come from other areas of physics. Other times, we let context do the work of making the meaning clear – editing is as much an art as a science. But we always enjoy seeing the ways that language is used.

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