

# Slippery sentences

Plant science, like all specialist disciplines, has its own particular language. But when this lexicon is used in other contexts, we may find words do not mean what we think they do.

In *Through the Looking Glass*, Lewis Carroll has his young protagonist meet Humpty Dumpty, a creature so skilled with words that he can make one mean “just what I choose it to mean — neither more nor less”, although he pays them extra when he makes them do an awful lot. The potential for misunderstandings, or downright incomprehension, is huge in such a situation. It may be fine to have ‘gimble’ mean to make holes with a gimlet, ‘wabe’ be the grassy area around a sundial, and ‘mome raths’ be green pigs who have lost their way; once such exotic words have been defined, intelligible conversations can proceed. But how was poor Alice supposed to deal with a creature who makes ‘glory’ mean ‘a nice knock-down argument’ and ‘impenetrability’ signify that “we’ve had enough of that subject, and it would be just as well if you’d mention what you mean to do next”?

We all have personal definitions of the terms we use. However, while Humpty Dumpty knew that Alice could not know what he meant by a word before he told her, we assume that whoever we are talking to shares our vocabulary. In scientific research, precision is important and it is vital that language is used carefully and consistently. This is not a problem with specialist or technical terms, which are traditionally defined on first use in a paper or presentation. Where things break down is with more frequently used words, which can acquire a multiplicity of, sometimes, contradictory meanings.

A Comment by Daniel Chamovitz in the September issue of *Nature Plants* (*Nat. Plants* 4, 622–623; 2018) tackled such a slippery term head on: ‘intelligence’. That plants sense their environment and respond to changes in it is not controversial. That they adapt those behaviours over time due to prevailing conditions is also known. And that these can be routes to maximising a plant’s fitness is well established. The mechanisms by which plants control and effect their behaviours is fascinating — using multiple and complex systems of signalling and co-ordination within and between individuals. Whether this is evidence of intelligence or not is dependent on what is meant by ‘intelligence’. Chamovitz’s commentary argued that discussions of ‘plant intelligence’ are not about the

observed behaviours of plants and the mechanisms underlying them, but semantic arguments over the particular meaning of an extremely fluid term. If anything, they are distractions, impeding the study of what is actually going on.

‘Green Revolution’ is another evocative phrase whose precise meaning may be hard to pin down. In a review of Raj Patel and Jason Moore’s book *A History of the World in Seven Cheap Things: A Guide to Capitalism, Nature, and the Future of the Planet* (*Nat. Plants* 4, 316; 2018), we repeated the authors’ assertion that the Green Revolution had “increased hunger and poverty for millions while protecting and increasing crop exports for global markets”. Many people object to that statement, forcefully, and we published one such criticism from Devang Mehta last month (*Nat. Plants* 4, 736; 2018) as well as a reply (*Nat. Plants* 4, 737; 2018). The specific arguments over the claim are well covered in that exchange, but it is worth considering that much of the friction may have arisen from different views on what falls within the umbrella of the Green Revolution. Is it confined to changes made in the 1950s and 1960s, or does its reach extend over a larger part of the twentieth century? Was it concerned only with the breeding of crops for higher yields, or should other changes in food supply also be considered? Was it a global or a local phenomenon?

Such debates, however heated, may seem purely academic. Define your terms clearly and unambiguously and there will be no room for misunderstanding. But words have power, especially when they escape from the specialist language of science into common usage. That something is a ‘revolution’ evokes the image of dramatic and wide-ranging change, rapidly brought about by a small number of triggering events. It becomes all too easy to make calls for a ‘new’ or ‘second’ green revolution to address the problems of food sustainability we currently face. By naming our goal a ‘revolution’, we risk restricting our search to dramatic changes rather than face the reality that the United Nations’ second sustainable development goal — to end hunger and malnutrition by 2030 — will more likely be achieved through small advances on a multitude of fronts, producing slow but continuous improvements.

Another charged term is ‘genetic modification’. As Jonathan Jones points out in a book review in this issue (<https://www.nature.com/articles/s41477-018-0276-9>), genetic modification is a puzzling phrase for scientists, at least as it is commonly employed: “modified from what? — all of our crop plants have been selected over time to be extraordinarily modified from their wild ancestors”. In May, we expressed the hope that “legislatures on both sides of the Atlantic may be edging towards a more consistent and rational approach to modern genomic engineering”, following an opinion by Michel Bobek, Advocate General of the Court of Justice of the European Union. He posited that some forms of genome editing, using technologies such as CRISPR–Cas9, do not result in genetically modified organisms (GMOs) for the purposes of European regulations, as they bring about mutations that could have arisen naturally, a position already adopted by the United States Department of Agriculture (*Nat. Plants* 4, 233; 2018). And yet our springtime hopes were dashed before the end of summer with a ruling from the Court of Justice of the European Union that ignores Bobek’s opinion and classes any new plant variety achieved using genome-editing techniques as a GMO (*Nature* 560, 16; 2018). In this case a difference of opinion over the meaning of two words could have dramatic effects on international trade and global food markets.

There are many more scientific words and phrases whose meanings can be flexible at best and at worst downright slippery. ‘Diversity’, ‘ecosystem services’, ‘novel’, ‘paradigm shift’, ‘sustainability’, all can evoke a sense in readers and listeners that are not what the user intended. As scientists, we should be very careful to avoid using ambiguity to cover holes in our arguments, or launching into heated discussions without checking whether the root of the disagreement is only over the definition of terms.

After all, even Humpty Dumpty knew that while verbs are the proudest words, you can do anything with adjectives. □

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