

Critical Point Fruitloopery

Telling the difference between an enlightening scientific metaphor and the misuse of technical terms – or what has been billed “fruitloopery” – is harder than it seems. **Robert P Crease** explains

A few years ago *New Scientist* carried a quote in its “Feedback” section, which often reports science-related foibles, from the German politician Wolfgang Böhmer. Talking about his country’s healthcare reforms, Böhmer was reported as saying “I can’t see the quantum leap. But even if we proceed in smaller steps this would be a success.” In commenting, the magazine’s editors quipped “The statement has left us trying to think of a step that is smaller than a quantum leap. So far we haven’t succeeded.”

In response to a couple of readers’ comments, the editors later corrected themselves. In physics, a “quantum leap” is the transition of a system from one state to another without any intervening states, and is not necessarily small. The editors said what they had meant was a “Planck leap” or “length” – the smallest meaningful distance, below which quantum effects dominate and render meaningless the very concept of “distance”. Still, they were correct that Böhmer’s remark was strictly gibberish because a quantum leap cannot be subdivided.

Apart from being mildly amusing, what this story illustrates is that “quantum leap” has taken on very different meanings for scientists and non-scientists alike. In the 1980s the UK computer firm Sinclair launched an overhyped, supposedly game-changing machine called the Sinclair QL (for quantum leap), which it quickly abandoned. *Quantum Leap* was also the name given to a US comedy/science-fiction TV series of the early 1990s with a time-travelling protagonist – a holder of six doctorates, whose “special gift was quantum physics” – who took a different jump through space-time each episode. And in 2000 a camp called Quantum Leap Farm was founded in Florida to help disabled equestrians change their lives through building new relationships with horses.

Leaps and jumps

So how did “quantum leap” leap from scientific terminology applying to subatomic state transitions to an idiom meaning “big jump”? And is such popular use of scientific terms meaningful – or a disturbing mistake that must be corrected?

In the scientific world, the phrase “quantum leap” stems from Niels Bohr’s appli-



Loopy This breakfast cereal has inspired a term that derides sham products and woolly scientific thinking.

cation of the quantum to atomic theory in 1912–1913. Bohr’s work implied that electrons do not have an infinite number of possible orbits about the nucleus, as planets do about the Sun, but a small selection. Electrons must leap or jump instantaneously from one possible orbit to another without tracing a path.

This idea – indeed, most news of quantum theory – did not reach the general public before the 1920s. Until then, in the popular press, the term “quantum” was used in its traditional meaning of “amount”, and applied to all aspects of human life – in expressions such as quantum of trade, quantum of naval strength, quantum of proof or of damages (in discussions of lawsuits), quantum of alms for the poor, quantum of wealth needed for a good life, and so forth.

After the development of quantum mechanics in 1925–1927, however, popularizations such as Arthur Eddington’s *The Nature of the Physical World* spread word of quantum theory among the public. The word “quantum” now became a metaphor for discontinuity, albeit small ones at first. In 1929, for instance, *The Sun*, a US newspaper, noted that modern life had become governed by things that click. “Clocks, obviously,” it wrote. “But also typewriters, adding machines, cash registers, speedometers, tachometers, stock tickers, automatic telephones, telegraph instruments – the whole tribe of appliances that operate by jerks are the masters of men who work. It is the reign of the *quantum* theory in industry [its italics].”

The clicks of such devices were made by small discontinuous transitions. But language has a “moment” (a tendency to twist things) of its own. As modern life encountered ever discontinuous transitions – in the scales of things such as populations, budgets

and military might – and needed a term, “quantum leap” had vitality and glamour. It was soon applied to any large, qualitative increase, especially of effort, money or military strength. The first entry for “quantum leap” in the *Oxford English Dictionary* refers readers to a physics definition; the second, for non-scientists, defines quantum leap as “a sudden, significant, or very evident (usually large) increase or advance”.

Metaphor making

The change in meaning of “quantum leap” is not unique. Other scientific terms and phrases – including complementarity, uncertainty principle and catalyst – now name aspects of ordinary life. Meanwhile, ordinary words – not just quantum but also moment, force and gravity – have gone in the opposite direction and ended up as technical scientific terms. Such transformations generally happen via metaphors.

Metaphors contain two terms, a primary and a secondary. In “love is a rose”, for instance, love is the primary term, the meaning of which is being explored, while rose is the secondary term, used to elucidate the first. This is a “filtrative” metaphor, for it asks us to filter our perceptions of the primary term in the light of certain well-known features of the secondary (love, like roses, is pretty but thorny). The terms are not confused. A rose is not love; it remains in the garden, its identity unaffected. However, a new meaning has appeared – love’s rose-likeness – that allows us to understand our experience better.

Metaphors are particularly valuable when part of our experience is enigmatic – when the “correct” words are insufficient, and we need new ones even if technically incorrect. For example, in *Here Come the Maples* – a 1976 short story by John Updike – the protagonist Richard Maple ruminates about his decaying marriage when his thoughts are momentarily interrupted by a chance reading about subatomic discoveries (the italics are Updike’s).

“He...read, *The theory that the strong force becomes stronger as the quarks are pulled apart is somewhat speculative; but its complement, the idea that the force gets weaker as the quarks are pushed closer to each other, is better established.* Yes, he thought, that had happened. In life there are four forces: love, habit, time and boredom. Love and habit at short range are immensely powerful, but time, lacking a minus charge, accumulates inexorably, and with its brother boredom levels all.”

Maple does not think his marriage is subatomic physics. Still, he finds its terms useful in understanding its dynamics. Maple is trying to fill in what he intuits but cannot say. He is confused, wants to understand, and

Left: Bureau LA Collection/CORBIS



Middle: Sinclair; right: Quantum Leap Farm

What's in common? (From left to right): the TV show *Quantum Leap*; the Sinclair QL (for quantum leap) computer; and Quantum Leap Farm, a camp for disabled equestrians.

uses the best tools he has at the moment – the words of an article he happened to have stuffed in his pocket. The article could have been about almost anything – economics, sports, theatre – and he would have seized on those rather than physics. What matters is the phenomenon to which the metaphor is pointing – here, Maple’s marriage – not what is being used to point.

Expressions, however, can stop being metaphors when we forget about their origins, and cease to connect the expressions with the world from which they came. Think of the “bonnet” of a car – or what Americans call a “hood” – which no longer prompts us to think about head garments. Pointers can turn into names. But only certain laboratory terms make this discontinuous jump – this quantum leap – to becoming pointers and names. It generally occurs for scientific ideas that, as Eddington wickedly put it, are “simple enough to be misunderstood” or, rephrased more charitably, “simple enough to be suggestive”.

But scientific words can make this transition in other ways besides filtrative metaphors. In “creative” metaphors, the priority of the terms is swapped. In an extraordinary linguistic reversal, the secondary term deepens in meaning through the metaphor to subsume its previous meaning as well as that of the primary term. The pointer becomes the pointed at.

In physics, for instance, a “wave” originally meant something that took place in a medium. However, its metaphorical extension to light (which does not require a medium in which to move) and thence to quantum phenomena (where what moves are probabilities) changed its meaning. A “wave” is now not just a metaphor but the correct term for light itself, and other things such as probability variations that it did not originally name.

A more troubling example is “complementarity”, Bohr’s term for the fact that particle and wave behaviour are simultaneously necessary yet mutually incompatible in the quantum world. This puzzling feature, Bohr

thought, sprang from the fact that human beings have to be both actors and spectators when observing the microworld. Noting that this dual role of both acting and watching is also a feature of anthropology, biology and psychology, Bohr tried to extend complementarity to those domains. Had he been successful, it would have been a dramatic instance where concepts developed in subatomic physics could be applied non-metaphorically in the human sphere.

Yet his efforts met with mixed results, and are regarded today with embarrassment by many physicists. Indeed, in 1998, after the physicist Alan Sokal mocked humanists for delving into physics to support their ideas in a way that seemed ignorant at best and zany at worst – in what has come to be known as “Sokal’s hoax” – historian Mara Beller published an article in *Physics Today* entitled “The Sokal hoax: at whom are we laughing?”. She cited remarks by Bohr – but also by Heisenberg and Pauli – to make the point that in this respect physicists could sometimes be as zany as humanists, and there is no neat way to distinguish between the two.

Falling for fruitloopery

New Scientist refers to pretentious and erroneous use of scientific words as “fruitloopery” – a term that itself originated in an especially weird filtrative metaphor. Froot Loops are a popular US breakfast cereal – it comes in small, garishly coloured ring-shaped pieces with fruit-like flavours – introduced by the Kellogg Company in 1966. For a time, “fruit loop” was US slang for a gay man, or a gay-friendly neighbourhood, but soon all but lost this connotation and began to mean something lightweight, wacky and a bit pretentious.

In 2005 Mike Holderness, a freelance contributor to *New Scientist*, mentioned in an article “professional dissidents” who are given the oxygen of publicity by those science journalists who, he wrote, “divide all stories into precisely two sides that get equal space: too often the reality-based community versus fruitloops and/or special interests”. The

word fruitloopery quickly grew into the in-house *New Scientist* term for the use of scientific words, such as quanta or tachyons, either wildly out of context or in a completely unverifiable way.

However, I think the term should be extended to any pretentious and erroneous use of scientific terms. Much self-help literature and amateur philosophy is studded with such execrations; one of my personal favourite examples being by the actress Shirley MacLaine, who remarked that today’s physicists are suggesting “that the universe and God itself might just be one giant, collective ‘thought’”.

Physics seems to inspire more fruitloopery indicators than other fields because, I think, of its cultural prestige. Those who link a sham product or woolly thought with physics principles are being deliberate, meaning to imply that it has an especially deep and secure grounding. Advertisers and actresses do not make mistakes, only fruit loops.

The critical point

Why are we troubled by Wolfgang Böhmer’s words but not those of Richard Maple? Why do we find the invocation of physics principles dangerous in self-help literature but not in the names of farms and films? The answer, I think, has to do with the intentions of the metaphor-makers; that is, not with the fact that a meaning is being transformed but why. No fruitloopery is involved if the metaphor-makers are aware of the genesis of the scientific term, assume the audience is also aware, and are genuinely trying to increase understanding. It is fruitloopery when the metaphor-makers are being deceptive or self-deceptive – when terms are used not as tools of knowledge or expression, but to peddle wares, impress the gullible or cloak one’s ignorance. The distinction, unfortunately, is harder to spot than it seems.

Robert P Crease is chairman of the Department of Philosophy, Stony Brook University, and historian at the Brookhaven National Laboratory, US, e-mail rcrease@notes.cc.sunysb.edu