*Science is all metaphor”*
*Timothy Leary*

We live in an elegant universe.

The cosmos is like a string symphony.

Genes are selfish.

There is an endless battle between thermodynamics and gravity.

Do you love these statements, or hate them? The reading world gets pretty divided over whether or not it’s okay to apply metaphors and similes to descriptive science writing. It even gets hot and bothered over the use of that most practical parent of metaphors – the analogy. For example, in my 2012 book, *Gravity’s Engines*, I presented a discussion of some of the most extreme and complex astrophysical phenomena in the known universe – black holes – by deploying a whole battleship’s worth of analogy, metaphor, simile, and just about anything else I could lay my hands on (just as I did there). In some quarters this went down a treat, in others not so much.

Of course it’s easy to get carried away, slathering on a few too many layers of metaphorical comparison until the poor reader doesn’t know whether to imagine falling off a cosmological cliff or diving into a collapsing souffle of intergalactic gas (yeah, sorry, that was me). But sometimes you really have no choice.

Subtle writing, writing that leads the reader into a carefully nuanced emotional or intellectual state, is certainly the finer craft. A story evoking a visceral sense of the enormity and alien magnificence of something like a supermassive black hole, and its cosmic context – made with nothing more than finely chosen words and rhythm – would be wonderful. But I think it’s a very significant puzzle as to how to accomplish that without leaving readers confused and adrift.

Subjects like astrophysics, mathematics, microbiology, or quantum mechanics, or for that matter any scientific field, are built upon dryly quantitative facts. They are also, if taken to a sufficiently deep level, beyond our direct physical experience. This does not make for a clearly defined pathway of delicate prose, although I’m sure it’s there if one is lucky enough to find it – and so we’re left making some rather tough language choices.

These are also areas of huge complexity, which is why textbooks are enormous and all too often mind-numbing. However, to capture the practical mechanics of the science poetically, to sneak up quietly on the vital heart of the subject through non-metaphorical innuendo and implication would, to put it bluntly, take a time exceeding most normal human lifespans. Metaphors are the heavy implements that get the job done, albeit with some collateral damage (just like that).

The problem is that while a specific metaphor might work for some people, it won’t for others. This is especially true for scientists themselves, who sometimes lack a sense of humor, or even just common sense. I once wrote about a dying star as being ‘bloated and gouty’, as its outer atmosphere inflates and blows off to interstellar space. I rather liked this. ‘Gouty’ has always made me think of Willam Hogarth, or James Gillray, and their satirical drawings in the 18th century, filled with wonderfully appalling characters. It seemed like a good way to evoke the sense of an aged and, ah-hem, rather flatulent stellar object. But no, for at least one scientist this was all wrong. Stars, they pointed out, can’t possibly be gouty because they don’t produce uric acid…

Oh good grief.

I’ve also had critics say that they wish I’d just ‘stick to the numbers’ in describing things like the mass of black holes or the collections of hundreds of billions of stars that constitute galaxies. No talk of buzzing swarms of bees, or vast dandelion heads, or swirling stellar pizzas. According to these readers there is no need, or desire, to try to bring such cosmic structures ‘down to earth’. It’s a fair point, sometimes you *want* to feel that such things are untouchable, unknowable. But the simple truth is that scientists themselves constantly make use of analogies, metaphorical devices, and similes. Sometimes it’s the only way to build an intuition for a problem, by relating it to something else – Richard Feynman was perhaps one of the greatest players of this game, turning [spinning plates](http://demonstrations.wolfram.com/FeynmansWobblingPlate/) into cutting-edge quantum physics and Nobel prizes.

I’ve also had critical eyes express dislike for anything that smacks of anthropomorphism – the ‘[pathetic fallacy](http://en.wikipedia.org/wiki/Pathetic_fallacy)‘ of John Ruskin. Black holes are not, they complain, allowed to be ‘monsterized’. Galaxies can’t experience painful disruption, planetary systems can’t be spoken of as disheveled entities or family members. Well okay, but since prehistory humans have sought to relate to the world around themselves by finding anthropomorphic connections. Is it scientific? No, not particularly, but what are we to do, just shrug and separate ourselves from the entire natural world – *them* and *us*?

As a working scientist I actually don’t have any problem with the notion of making mental labels for natural phenomena that include some degree of personality. I like my black holes fearsome and my interstellar gas thin and frail. It may well be that in doing so one reinforces a certain blinkering, but we’re not all Mr Spock, we need structures, we need something to hang on to – as long as we remember to let go occasionally.

And here’s the crux. If scientists need something to grasp at, what about the rest of the world? Quantitative reasoning and scientific knowledge is not everyone’s forte, nor is it in everyone’s daily experience (a fact that we might bemoan, but it is the truth). If a metaphor gets it even half right and if it triggers someone’s imagination, that’s not bad in my opinion. Of course it can sometimes backfire, confusing more than elucidating, and even swaying scientific thought in unwanted ways – a point [nicely discussed by Philip Ball back in 2011](http://www.nature.com/news/2011/110223/full/news.2011.115.html).

But so it goes, human language is imperfect, and the human brain is imperfect. We can all see the things we want to, and miss the things we shouldn’t. An erratically driven bus appears as a future danger to one person, merely a erratic bus to another. And an angry, tantrum-ridden, star is a poetic opportunity for a teacher, but simply a pre-main-sequence object to a bored student. Good metaphors are incredibly useful, bad ones a painful detour, but usually the intent is noble – it’s all about trying to communicate our knowledge of a truly vast, complicated, and really very interesting universe.

**About the Author:** Caleb Scharf is the director of Columbia University's multidisciplinary Astrobiology Center. He has worked in the fields of observational cosmology, X-ray astronomy, and more recently exoplanetary science. His latest book is 'Gravity's Engines: How Bubble-Blowing Black Holes Rule Galaxies, Stars, and Life in the Cosmos', and he is working on 'The Copernicus Complex' (both from Scientific American / Farrar, Straus and Giroux.) Follow on Twitter [@caleb\_scharf](http://twitter.com/caleb_scharf).

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