

Published online 23 February 2011 | Nature | doi:10.1038/news.2011.115

Column: Muse

A metaphor too far



Philip Ball asks whether scientists are addicted to using imagery at the cost of misleading the public and themselves.

Philip Ball

Metaphors influence the way we think. In a paper in *PLoS ONE* published today, Paul Thibodeau and Lera Boroditsky, psychologists at Stanford University in California, show that people approve of differing responses to crime when it is presented as either a 'beast' or a 'virus' ravaging society¹. In the former case they are most likely to call for strong law enforcement, whereas in the latter they are more open to solutions such as rehabilitation and the understanding of root causes.

Perhaps the most striking aspect of this study is that the participants were unaware of the how the metaphorical context affected their reasoning. Instead of acknowledging the image's effect, they found ways to rationalize their decisions on the basis of seemingly objective information such as statistics. "Far from being mere rhetorical flourishes," say Thibodeau and Boroditsky, "metaphors have profound influences on how we conceptualize and act with respect to important societal issues."

To have this demonstrated and quantified is valuable — not least because it underlines something that politicians and their advisers have never doubted. If there is a spin doctor or speechwriter who does not already recognize that metaphors sway opinion, it is a mystery how they ever got the job.

It isn't hard to see why 'crime as wild beast of prey' encourages people to think about how to cage or kill it, whereas 'crime as virus' fosters more eagerness for 'scientific' understanding of causes. But too rarely are such metaphors interrogated at a deeper level.

In both these cases, crime is presented as a (malevolent) force of nature, outside human agency. Whether beast or virus, the criminal is not like us — is not human. By the same token, a 'war on drugs' or a 'war on terror' is not just an emotive image, but deploys a militaristic narrative that bears little relation to reality.

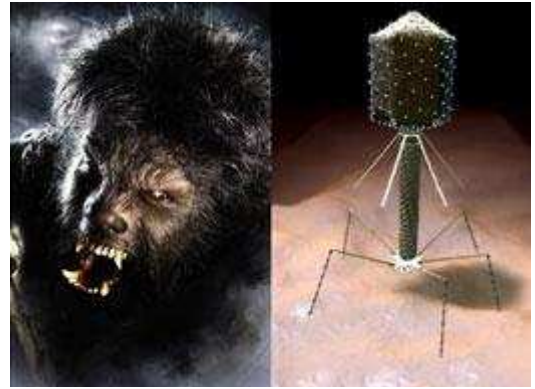
Misleading mentality

In literature, metaphor serves poetic ends; in politics, it is a (subtly manipulative) argument by analogy. But in science, metaphor is widely considered an essential tool for understanding. So where then does this latest work leave us?

Whereas the example of crime used here imputes natural agency to human actions, science generally invokes metaphors the other way around: natural processes are described as if they result from intention. This anthropomorphizing tendency was dubbed the 'pathetic fallacy' by the nineteenth-century critic John Ruskin, although it had also been noted by the scientist and

philosopher Francis Bacon, two centuries earlier.

The pathetic fallacy is an ingrained and profoundly influential habit, especially in biology²⁻⁶, where intimations of intelligent agency seem irresistible even to those who deplore them. Most famous in this respect is the 'selfish gene' proposed by biologist Richard Dawkins in his 1976 book of that title. Dawkins' metaphor is apt and understandable almost to the point of inevitability, given the idea that he strove to convey. But its problems go well beyond the fact that genes are of course not selfish in the way that people are (which is to say, they are not selfish at all).



Which one is more like crime?

*Photos 12 / Alamy, MEDICAL
RF.COM/SPL*

The 'selfish gene' props up the whole notion of a Darwinian world that is uncaring to the point of being positively nasty: an image that has sometimes provoked resistance to the sciences in general and natural selection in particular. And as Denis Noble, a physiologist at the University of Oxford, UK, has compellingly argued, the idea that genes are selfish is totally unnecessary to an understanding of how they work, and is in some ways misleading⁷.

But it is no better to talk instead of the 'cooperative gene', which is equally value-laden and misinformative. Genes are not selfish or cooperative any more than they are happy or short-tempered. It is the concept of scientific metaphor in general that is problematic^{8,9}.

On guard

Books of life, junk DNA, DNA barcodes: all these images can and have distorted the picture, not least because scientists themselves sometimes forget that they are metaphors. And when the science moves on — when we discover that the genome is nothing like a book or blueprint — the metaphors tend, nonetheless, to stick. The more vivid the image, the more dangerously seductive and resistant to change it is.

Thibodeau and Boroditsky give us new cause to be wary, for they show how unconsciously metaphors colour our reasoning. This seems likely to be as true in science — especially a science as emotive as genetics — as it is in social and political discourse.

Most scientists would probably agree with Robert Root-Bernstein, a physiologist at ADVERTISEMENT Michigan State University in East Lansing, that "metaphors are essential to doing and teaching science"¹⁰. They might also sympathize with Paul Hebert, a biologist at the University of Guelph in Canada, who responded to criticisms of his 'DNA barcoding' metaphor¹¹ by asking, "Why would we want to be so scientifically proper as to make our science tedious?"³

But the need for metaphor in science stands at risk of becoming dogma. Maybe we are too eager to find a neat metaphor rather than just explain what is going on as clearly and honestly as we can. We might want to recognize that some scientific concepts are "a reality beyond metaphor", as Nobel laureate David Baltimore, a biologist at the California Institute of Technology in Pasadena, has said of DNA³. At the very least, metaphor should be admitted into science only after strict examination. We ought to heed the warning of pioneering cyberneticists Arturo Rosenblueth and Norbert Wiener

that "the price of metaphor is eternal vigilance"¹².

References

1. Thibodeau, P. H. & Boroditsky, L. *PLoS ONE* **6**, e16782 (2011). | [Article](#) |
2. Nelkin, D. *Nature Rev. Genet.* **2**, 555-559 (2001).
3. Nerlich, B. Elliott, R. & Larson, B. *Communicating Biological Sciences* (Ashgate, 2009).
4. Nerlich, B. & Dingwall, R. in *Cognitive Models in Language and Thought: Ideology, Metaphors and Meanings* (eds Dirven, R., Frank, R. & Pütz, M.) 395-428 (Mouton de Gruyter, 2003).
5. Kay, L. E. *Who Wrote the Book of Life?* (Stanford University Press, 2000).
6. Keller, E. F. *Refiguring Life* (Columbia University Press, 1996).
7. Noble, D. *The Music of Life* (Oxford University Press, 2006).
8. Lakoff, G. & Johnson, M. *Metaphors We Live By* (University of Chicago Press, 1981).
9. Brown, T. L. *Making Truth: Metaphor in Science* (University of Illinois Press, 2003).
10. Root-Bernstein, R. *Am. Sci.* **91**, (2003).
11. Hebert, P. D. N., Cywinska, A., Ball, S. L. & deWaard, J. R. *Proc. R. Soc. B* **270**, 313-321 (2003). | [Article](#) | [ISI](#) | [ChemPort](#) |
12. Lewontin, R. C. *Science* **291**, 1263-1264 (2001). | [Article](#) | [ISI](#) |

Comments

If you find something abusive or inappropriate or which does not otherwise comply with our [Terms](#) or [Community Guidelines](#), please select the relevant 'Report this comment' link.

Comments on this thread are vetted after posting.

To Paul Dirac's comment on quantum physics that nature's laws "do not govern the world as it appears in our mental picture in any very direct way, but instead they control a substratum of which we cannot form a mental picture without introducing irrelevancies," I am fond of appending "but some irrelevancies are more relevant than others." The metaphors we use to help us investigate the natural world must be as relevant as possible, and the metaphors we use to explain our understanding to others require no less careful circumspection. When writing about science and when teaching our students to write we must neither give in to the temptation to make catchy headlines, nor allow the headlines to steer our thinking about the science. #18285

[Report this comment](#)

Posted by: **B Metscher** | 2011-02-24 05:16:23 AM

This is especially important in explaining the undirected nature of evolution. We often say "evolution did this" (suggesting evolution as an agency) when we really mean "this happened through the process of evolution." Many people are under the misconception that evolution is an intelligent agency which recognizes a problem and devises a solution, when evolution is a simply an unthinking process which operates exclusively in the present (the anthropomorphic fallacy). #18302

[Report this comment](#)

Posted by: **Matthew Gilbert** | 2011-02-24 12:17:21 PM

Complete avoidance of metaphors is probably impossible for human beings. The way we think is #18338 intimately coupled to evaluating and categorizing the things we experience. But in using categories (even when assigning a term / an expression), we already apply a generalization to a specific event or object that is limited to some extent and may simultaneously be fraught with implications/ connotations.

Our grasp of reality and our thinking will always be limited; the only thing we can do is try to stay aware of this fact ("eternal vigilance", see above).

[Report this comment](#)

Posted by: **Ralph Feltens** | 2011-02-25 09:38:23 AM

I suppose a reminder never hurts, but I doubt the esteemed Dr. Baltimore is the only person #18344 mindful that reality exists beyond language. Is there potential harm in metaphor? Sure. But a worse fate would be to restrict scientific discourse to hyper-technical, omniprecise jargon accessible only to the few specialists who have the time to learn it.

[Report this comment](#)

Posted by: **Dave Perlins** | 2011-02-25 12:52:10 PM

There are more dangerous — because more precise — metaphors used daily in science. I am #18360 thinking particularly of the fact that the huge majority of beginners in physics believe the atom to resemble a tiny solar system, with electrons "orbiting" a nucleus. This a powerfully understandable picture but, of course, wholly false; and damagingly so when those students reach the kingdom of quantum physics. Nothing in the atom is orbiting anything; energy is not released or absorbed when "an electron 'jumps' from one 'orbit' to another"; so this metaphor, or perhaps simile, or perhaps even an intended actual picture, is wholly misleading (as, to declare an interest of my own here, see www.realnewphysics.com) is much of physics . . .

[Report this comment](#)

Posted by: **Martin Woodhouse** | 2011-02-26 03:52:21 AM

This article was a real eye opener for me, I will be much more careful when I use or repeat other #18386 people's metaphors while teaching from now on.

[Report this comment](#)

Posted by: **Mohammad Shahbazi** | 2011-02-27 03:52:50 AM

Iain McGilchrist's wonderful book "The Master and his Emissary" points out the fundamental role #18394 of metaphors in understanding – esp to the Right Brain.

[Report this comment](#)

Posted by: **Nicholas Beale** | 2011-02-27 05:01:52 PM

I think metaphors can be useful to help explain a concept. For example the term 'The selfish gene' #18408 does encapsulate the idea that genetically similar organisms group together. The problem is with lazy metaphors when they are used without thought and without an assessment of the full implications of the metaphor. As you say Phil the idea that this metaphor humanises genes is opposite to the truth.

[Report this comment](#)

Posted by: **Roseann Campbell** | 2011-02-28 09:30:06 AM

I think in education it's important to explain that a metaphor used to promote understanding of a #18410 particular matter serve as a 'lie to children'; that is that the metaphor is not 'true' but is there to provide a basis from which deeper understanding can and should be attained. This is important not only for students but also for the public in general who rely on newspapers for their 'understanding' of the latest novelty in science to be reported. If we all had a more critical eye when presented with such metaphors it would allow

us to ask more searching questions and gain a more accurate picture of what it is we are trying to understand.

[Report this comment](#)

Posted by: **Richard Gidwaney** | 2011-02-28 11:11:44 AM

Science have own "dialects" in every specific fields of the knowledge. The language has function of communication that include the possibility of "translation" from special scientific dialect to "the natural" language. #18435

[Report this comment](#)

Posted by: **Boris Shmagin** | 2011-03-01 10:42:48 AM

Translation is an art, the art of translation as any art has communicative function and bases on cultural experience of the translator. #18437

[Report this comment](#)

Posted by: **Boris Shmagin** | 2011-03-01 10:51:06 AM

We said it before (Chew & Laubichler, 2003, *Natural Enemies* "Metaphor or Misconception? *Science* 301:52-53) and it had certainly been said before that. Metaphorical insight begins the process of understanding, but does not complete it. We could argue over whether the process is ever complete, or whether human conceptions consist [metaphor] of a web [metaphor] of metaphors. Consider the case of "alien" species; the metaphor was drawn from English common law concerning citizen status sometime between 1835 and 1847. The species "invasion" metaphor was coined just prior (perhaps by Darwin in Argentina). Now human aliens (local non-citizens), and particularly undocumented immigrants are metaphorically labeled "invasive species" with some regularity. Which is the metaphor? #18441

[Report this comment](#)

Posted by: **Matt Chew** | 2011-03-01 12:28:37 PM

Metaphor is the horse of the mental landscape. #18443

[Report this comment](#)

Posted by: **Mikels Skele** | 2011-03-01 01:06:23 PM

RE: A "metaphor-industry" too frivolously created — and wasted — in the Dawkinsian style of "pseudoscience-rhetoric" pursuit & scientism since 1976!? #18450

I thought Ball's excellent analysis of "A metaphor too far" is still much too mild — or self-restrained (in my opinion) -- on the criticism of the world-renowned Oxford armchair ethologist and neo-atheist Richard Dawkins' prolific and pernicious use of metaphors, semantics, and rhetoric, in his lifetime neo-Darwinist pseudoscience writings and lectures worldwide, since the publication of his first fundamentalist, neo-Darwinist, reductionist, pseudo-genetic metaphor and rhetoric book (of all books) *The Selfish Gene* (1976) in our modern biology and Western philosophy literature — as one that has had even surpassed those thoughtful naturalisms of the great British naturalist (not neurologist) Charles Darwin (1809-82) in the pursuit of science and philosophy issues, in our common and universal human history on Earth!

Such Dawkinsism of pseudoscientific reductionism and rhetorical treatment in biology and humanity issues, has had been widely criticized and refuted by several contemporary but more competent scientists and philosophers alike ever since — among whom, the earliest critics being the British moral philosopher [Mary Midgley](#), and the late *Nature* editor and physicist [Sir John Maddox](#), et al — but to no avail!

This is because Dawkins has had just (historically and arbitrarily) ignored such a sound criticisms of his armchair theories; and he even censored and ridiculed *ad hominem* (with his likeminded readers and fans and followers alike) of all of his more insightful critics and detractors alike (religious or not); as indeed, he has had just simply continued and been going on to labor and generate more of his evermore faithful

neo-Darwinist, reductionist, and sophist business as usual — in spite of those valuable and sharp criticisms of his early writings, since the late 1970s through the 1980s!

Even today, after publishing over 10 books of his similar reductionism and sophistry on neo-Darwinism and "evolutionary biology" -- or turning the 19th-century Darwinism into his "scientism" of the 21st century, or his "neo-atheism" as manifested in his 2006 folly book *The God Delusion* -- there has had not been any Dawkinsism in self-correction or rescindment at all: either in sight or in further debating our current practical science and philosophy issues; or in whatever reasons (or seemingly having been conditioned in and by his own extremely metaphorical "super-egotism") that Dawkins might have had not been able to self-reflect in humility or realize the fact that he has had indeed painted himself to a practical "science-philosophy" corner — after having been engulfed himself in his own pseudoscience reductionist mentality and sophistry — in and for as long as he shall be so willingly to continue and imbue (and anoint and bemuse) himself (and his followers alike) with evermore of his creative but self-limited conceits; self-deceitful pseudoscientific metaphors; and rhetorical semantics in all of his neo-Darwinism and scientism pursuits — especially in defiant of those that have had been well surveyed, outlined, established, rooted, and defined in and by our commonly and universally practiced science-philosophy observations and literature; standards; and all humanistic issues, in continuity, ever since antiquities, worldwide!

Ergo, Dawkinsism — not a metaphor or rhetoric; but based on an analysis of his literary works since 1976 — has had failed Darwinism (since 1859) -- in its global perspective of an "evolutionary" theory of "naturalism" by "natural selection" etc; as one that is unrelated to the "developmental" theory of "genetics" or Mendelism (since 1865) -- let alone our current theory of "humanism" in our "inner" or both our "intellectual and spiritual" perspectives of our common and universal humanities on Earth -- *including naturalism (or science) and supernaturalism (or religion), etc, since antiquities* -- are to be culminated, fully informed, comprehended, and appreciated into the 21st century and beyond!

Whereas to the chagrin and amazement of most of Dawkinsian readers and critics: In the last 3 decades or so, Dawkins and his followers -- *or by his own metaphor: his pseudo-genetic and likeminded "replicators"* -- have had managed to galvanize, stir, influence, spawn, and spin a new (but wasted) industry of "transgressionary" neo-Darwinist and neo-atheist pseudoscience literary works — and purveyors of nihilism as their science and philosophy arguments *ad hominem* in both Darwinism and Creationism issues — that have had since modeled on Dawkinsism of his most irrationally-aggressive but frivolous pseudo-genetic, pseudoscientific but transgressive, and reductionist-sophist advocacy (of "science vs. religion" fallacies) of literary style (over substance) in metaphors, rhetorical semantics, and scientism: One that has had indeed permeated and been attempted increasingly by neo-Darwinists and sophists, so as to transgress and corrupt all fields of pop-science pursuit, inquiry, and culture, including psychiatry and the education in high schools, etc; all attempted in the name of "evolutionary science or evolution" or neo-Darwinism or "evolutionism" to be exact scientifically and philosophically speaking — as One that I have had just analyzed and refuted passionately in the recent *Psychiatric Times* online, whose specific topics are linked [here](#): in the SearchMedicaUSA; and topics regarding the high school biology education issues [here](#): "RE: It's not their fault!? -- Or, Attempting to treat Malignancy (neo-Darwinism or Darwinism as atheism fallacy) by its symptoms!?" (GodsGenesConscience:GlobalDialoguesNowUSA; February 4, 2011); and more issues are raised therein: in "More on The folly of neo-Darwinism & Dawkinsism (or Darwinism as atheism fallacy)!" (GodsGenesConscience:GlobalDialoguesNowUSA; December 5, 2010); etc.

Best wishes, Mong 3/1/11usct3:16p; practical science-philosophy critic; author "Decoding Scientism" and "Consciousness & the Subconscious" (works in progress since July 2007), [Gods, Genes, Conscience](#) (iUniverse; 2006) and [Gods, Genes, Conscience: Global Dialogues Now](#) (blogging avidly since 2006).

[Report this comment](#)

Posted by: **Mong H Tan, PhD** | 2011-03-01 04:17:06 PM

Jonathan Haidt has written on decision making and the moral sense for a while (see

http://www.believmag.com/issues/200508/?read=interview_haidt). His point is that people's **#19430** moral decisions are more or less based on gut feelings, and that the rational justifications come afterward. This sounds a lot like what was described in these experiments, with the added twist that the gut feelings were manipulated by the choice of metaphor. Interesting.

I don't see any way to get rid of metaphor in our thinking, and I suspect that any attempt to do so would impoverish our thought. We should probably also keep in mind that a "clear and honest" explanation of anything probably has a lot of implicit metaphor and analogy built in. Ultimately, no substitute for hard critical thought all the time.

[Report this comment](#)

Posted by: **Mark Fulton** | 2011-03-30 11:45:13 AM

Interesting reading, I never though about it ever before. Find [Park Vista Hotel Gatlinburg](#) **#45811**

[Report this comment](#)

Posted by: **Lola pop** | 2012-07-04 12:12:35 PM

Add your own comment

This is a public forum. Please keep to our [Community Guidelines](#). You can be controversial, but please don't get personal or offensive and do keep it brief. Remember our threads are for feedback and discussion - not for publishing papers, press releases or advertisements.

You need to be registered with Nature to leave a comment. Please log in or register as a new user. You will be re-directed back to this page.

[Log in / register](#)

Nature ISSN 0028-0836 EISSN 1476-4687

[About NPG](#)
[Contact NPG](#)
[Accessibility statement](#)
[Help](#)

[Privacy policy](#)
[Use of cookies](#)
[Legal notice](#)
[Terms](#)

[Naturejobs](#)
[Nature Asia](#)
[Nature Education](#)
[RSS web feeds](#)

[About Nature News](#)
[Nature News Sitemap](#)

Search:

© 2013 Nature Publishing Group, a division of Macmillan Publishers Limited. All Rights Reserved.

partner of AGORA, HINARI, OARE, INASP, ORCID, CrossRef and COUNTER