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This section explores the connections between humor and philosophy as expressed in teaching, in pedagogy, and in philosophy seen more broadly as a life vocation. It includes scholarly articles on pedagogy and humor, the scholarship of teaching and learning as well as examples of humor to use in teaching.

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Metaphor in the Lab: Humor and Teaching Science

Abstract: Using humor, empathy, and improvisation to make science more accessible to the average person, the center has helped many scientists communicate more effectively about what they do. In many cases, this involves taking science down from the metaphorical "ivory tower" and bringing it into the comfort zone of students and people who may not have had a positive experience in science classes. A variety of metaphors are used to make science "come alive." This is an interesting counter example to earlier theories of metaphor and comedy such as the "disparagement theory" (Mio and Graesser 1991) which described jokes as more successful if they relied on disparaging metaphors that build community through shared hostility. The metaphor approach builds community and creates inclusion through "social-facilitative functions of playful language" (Ritchie and Schell 2009). When a scientist helps a layperson or student understand humorous metaphors, it communicates the literal meaning of terms, but also the contextual meaning, research practices, and the laboratory social setting. This is argued through examples of humor, comedy, and metaphor—a timely issue given current political discussions in the United States.

Keywords: pedagogy, science, humor, metaphor, laboratory life

1 Introduction

In 2012, the Alan Alda Center for Communicating Science began a contest that received wide media attention and thousands of entries. The contest challenged anyone to explain what a flame is, in a way that would be understandable and intriguing, even to an 11-year-old student. The winning entry was by Ben Ames, a Ph.D. candidate in quantum optics at the University of Innsbruck in Austria. His entry was a seven-and-a-half-minute video featuring a great mixture of metaphor and humor: a man, chained to a wall in the fires of hell, learns the science behind the chemical bonds, color, and heat of a flame using everyday objects, like Legos, as metaphors for molecules. The video is narrated in such a way that the man can fully understand his human condition, and so that students can enjoy

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both the level of information given in the video, and the comic/tragic circumstance of the man in hell. We can bracket the theological implications about the Legos' presence in hell, although anyone who has accidentally stepped on one in bare feet is welcome to develop their own theories after the session.

What is so interesting about this example, from a philosophy of science and a philosophy of humor perspective, is that it tells us something important about the types of metaphor used in teaching science, and metaphors used by scientists when they discuss their work among themselves. For this presentation I will discuss two prevalent theories on metaphor, and show examples of metaphors used in pedagogical contexts and less formal contexts, so that we can understand the types of metaphors in science discourse and how they relate to humor.

2 Types of Metaphor

There are two major categories or theories of metaphor that can be used to understand metaphor in science. One of them is George Lakoff and Mark Johnson's discussion of metaphor. They acknowledged the metaphors in science that emphasize disagreements and paradigm shifts: winning an argument is winning a war, we attack weak points, we retreat from a debate when it is clear we will lose.

The perception of knowledge as a battlefield, and as a challenge, is reflected in related humorous metaphors like trying to understand science is like trying to drink from a fire hose (no one can successfully do so, and most of the water/information is lost). In a dissertation relying on the Lakoff and Johnson model, Rachel Collier Murdock noted that "While suggestions that the culture of promotion and tenure in science needs to be changed and encouragements to change it are plentiful, actually changing ideas about science communication can be, to borrow a metaphor, like turning around a huge ocean liner in a narrow channel while moving against the current. Changes are slow, and often resisted" (Murdock 2017, 29).

The second categorization of metaphors that is relevant to our discussion is Zoltan Kovecses's discussion of three kinds of metaphors: Structural, Ontological, and Orientational. First, Structural metaphors give a "knowledge structure" for the abstract concept described. For example, we structure how we think of time by making metaphors about time and space, and it gives us "pieces" or "parts" to subdivide time and space. Time slips through our hands like grains of sand, time flies by us like a bird. We often describe space as in outer space as being like a container, because an infinite space is difficult to conceptualize.

In the ancient and medieval periods, scientists who were just beginning to use telescopes would imagine the planets moving in spherical shapes that were all contained within one large heavenly sphere.

Second, Ontological metaphors give a kind of existence to something less definite. These often describe abstract concepts such as the mind, and complicated systems like computers. For example, the philosopher René Descartes would describe the human mind as being similar to a theatre: we feel as if we perceive the world from the vantage point of our heads, and we can imagine things within our mind, making us spectators watching a theatre performance taking place in our heads. Imagine the way we describe "clearing our heads" when we need to get something out of our mind; we are describing our understanding as being similar to a clearing in the forest. Ontological metaphors can also describe personification of abstract concepts. When we describe a computer or device "dying" on us, we are using an ontological metaphor that gives the abstract concept of "the computer" or "the iPad" a "life" of its own as if it is a person with a life story.

Third, Orientational metaphors describe abstract concepts in terms of human spatial understanding, using levels, heights, and degrees to measure and describe states of being that are difficult to describe, similar to emotions, strength, and health. For example, the volume of a person's voice can be described in terms of up and down: more is up; less is down. "Speak up, I can't hear you." "Keep your voice down, please." Feeling healthy is feeling up; feeling sick is being down. We say that "Lazarus rose from the dead." Being awake and conscious is being up; but being unconscious is down. We wake up. We sink into a coma. We fall asleep. Similarly, when we feel happy, we are feeling up and things are looking up; when we are sad, we are "feeling low."

Consider how often these metaphors play a role in the teaching of science concepts. Richard Boyd of Cornell University further illustrates how metaphors can be "generative or theory-constructive" used in scientific discourse within the science community and that cannot be paraphrased because there is no other way to talk about a particular phenomenon (such as "the genetic code"). Or, they can be "pedagogical or exegetical metaphors" such as "messenger RNA" used to explain or illustrate a "scientific phenomenon for which a perfectly adequate, alternative original expression exists" (Murdock 2017, 90).

Joking about 'drinking from a fire hose' is a funny metaphor, and scientists enjoy the challenge of absorbing information at a high rate. But that metaphor points to a genuine problem for the teaching of science. "You can't drink from a fire hose—almost all the water escapes you, even if you get some" (Aines 2018; Murdock 2017, 80). While there are noticeable criticisms of using metaphors in teaching science (Cat 2001, 46), they are actually helpful in that they can be used to bring more interest to science, as the entertaining examples from the Alan Alda Center illustrate.

Studies show that the use of deliberate, pedagogical or teaching metaphors is more effective for clarifying complex ideas, and using one consistent metaphor is more effective than the use of multiple metaphors. For example, in a study assessing audience reaction to some of the presentations made by scientists, during one of these presentations, a scientist speaking about polymers called them "chains," "strings of beads," "building blocks," "networks," and "systems"—five different metaphors for the same item in a single presentation—and also personified the polymers by saying the molecules in a polymer "liked" or "didn't like" one another. Audience feedback forms showed that audience members found the speaker who used these varied metaphors to be unclear. Conversely, a speaker who used one metaphor consistently throughout a presentation was given high scores in clarity, and, on feedback forms, audience members mentioned the single metaphor as helping with clarity. Therefore, the rubric instructs assessors to listen for comparisons, and instructs assessors to pay attention to deliberate analogies or metaphors that are clearly meant for teaching" (Murdock 2017, 92).

3 Metaphors Scientists Use in Teaching (and the Incongruity Theory of Comedy)

Specific examples of metaphors used in teaching science are available in published literature on pedagogy and teaching, as well as supplemental materials made available by teachers online. For example, a group of teachers in Utah produced a powerpoint including metaphors for teachers of middle grades science (Metaphors in Science Powerpoint, n.d.). They include an exercise for teacher and students to come up with their own metaphors, and also explain a set of metaphors that they have prepared, including:

> "Oolitic sand is formed like a snowball rolling down a hill," and "Noble gases act "stuck up" as if they don't need anyone."

We do have to acknowledge that some of these teaching metaphors are a bit problematic. Can we assume that a middle school science student knows how a camera works, or how a magnet works, to compare these to eyes and chemical bonds? The last metaphor is especially interesting because it seems to mix chemical and physical structures of the "hard sciences" with psychological states discussed in the social sciences. This kind of conflation of scientific ontological categories happens in the opposite direction as well. For example, in the work of sociologist James D. Wright, the metaphor of "society being like an organism" is discussed. Individuals are cells, specialized subgroups of individuals are tissues or organs, and any conflict is a transient aberration—a pathology—the elimination of which restores the social organism to health" (Wright 1991, 82). Kang Shin Ik gives another reading of the relationship between metaphors in the biological and social spheres, noting that conflicts between the sciences may be thought of in terms of "metaphorical incoherence" rather than a right or wrong position (Kang 2016, 187). In this case, metaphors are held to have not only explanatory, but also evaluative power.

Additional advice on how to use metaphors in teaching science comes from very recent research, in the Journal for Medical Education, advocating using "unexpected" objects in metaphors (calling to mind the "incongruity theory of comedy" in which what seems funny is that which is unconnected and incongruous). For example, science teachers in lower level grades will illustrate the inhaling and exhaling of a lung using a bottle and balloons, and medical scholars will illustrate the time necessary to improve a patient's neuroplasticity by discussing learning to eat with chopsticks.

One of the dangers of using humor and metaphor in teaching science is that these metaphors can be criticized as misleading or inaccurate. One of my favorite examples of this comes from a conversation between Alan Alda and Michio Kaku, a theoretical physicist from The City College of New York and The City University of New York. One of Kaku's examples of a scientific concept ripe for metaphor is the unified field theory. Their conversation concluded with the idea that a metaphor for anything could be any metaphor: "I'm still working on that you can probably use any metaphor you that is you know nobody gets what Yeah yeah yeah if this is to the theory of everything then yeah any metaphor will do it" (Mathis 2016, 17: 16).

Perhaps a large unified metaphor can be helpful: In a 2016 article on using performance in undergraduate life sciences, Cindy Duckert and Elizabeth De Stasio argue that there is an important larger goal of the use of humor and metaphor in science teaching. Science, they note, is a process of imperfect model building. Communicating effectively about science and what scientists discover should involve colorful and engaging models that are revisable and falsifiable (a nod to Karl Popper). For example, in explaining DNA, a good explanation can discuss the on-off switches involved in DNA sequences as being like sequences of musical notes and their particular order as musical motifs. It can be explained that in music as in DNA, these switches can vary, much as the opening theme to Beethoven's Ninth Symphony varies throughout the piece. Rather than "dumbing down science," these metaphors make science accessible and understandable by linking scientific concepts to concepts the audience/students already know. Of course, the best metaphors are the ones that consider the specific background knowledge of the audience/students (Duckert and De Stasio 2016, 2, 10).

This brings us back to the Alan Alda "What is a flame?" Challenge and Ames's winning metaphors. In discussing his work with Ira Flatow on NPR, Alan Alda said that "one of the most surprising things was, while they rated entries highly if they were videos, if they had humor in them and if they were easy to understand, they rated them highly on those criteria, but they demoted them, they took points off if there wasn't enough information. They kept talking about how they wanted information and how they needed to learn and remember from these entries what a flame was. That was very heartening to me, and it should be instructive to scientists too" (Flatow 2012).

Perhaps one of the most significant lessons to be learned from the use of humor and metaphor in the teaching of science is that it can help to build not only an accurate understanding, but also to provide good communication in applied science contexts, such as medicine and psychiatry. In a pilot study completed in 2013 by a team led by Amber Jarvie, medical students interacted with individuals who had a diagnosed mental illness, and who were also experienced in stand-up comedy. The comedians worked with the individuals, sharing their knowledge of comedy performance. The comedians used examples from their experience as part of their stand-up performances in front of the medical students, and the medical students gained respect and empathy for the performers. Jarvie and her team observed a significant decline in the degree to which medical students endorsed negative stereotypes about mental illness (Jarvie et al. 2013).

4 Metaphors Scientists Use Between Themselves (and the Superiority Theory of Comedy)

The example of medical school students communicating with persons with mental illness shows that the use of metaphor has to go beyond science teaching and into the communication between scientists themselves. In 2013, Caleb Scharf, an astrophysicist at Columbia, published a piece in *Scientific American* called "In Defense of Metaphors in Science Writing." He described how 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. For example, Scharf once wrote about a dying star as being "bloated and gouty," as its outer atmosphere inflates and blows off to interstellar space.

Scharf liked this vivid description, noting that “Gouty” had always made him think of William 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. Scharf notes that some of his other favorite metaphors for the universe and stars in galaxies include buzzing swarms of bees and swirling stellar pizzas (Scharf 2013).

One other aspect of the academic scientists’ perspective on metaphor may be their sensitivity or awareness of who is being mocked or disparaged in a humorous metaphor. The gender of the scientists may be relevant as well: In research done with a group of scientists reacting to metaphor, with high status persons and positions being disparaged in contrast to low status persons and positions, men judged *disparaging metaphors* to be humorous more often than women (Mio and Graesser 1991, 95). For example,

> “My surgeon is a butcher among doctors” vs. “My butcher is a surgeon among meat cutters.”
> “A general is an ape among military officers” vs. “An ape is a general among jungle animals.”

Mark Twain also participated in the use of humorous metaphors as a disparaging put down to the scientist, in his criticism of medicine in the United States: “Twain told The Society of Medical Jurisprudence in 1902 that a sort of medicine… was in use also in the time of the Pharaohs, and all the knowledge up to fifty years ago you got from five thousand years before that… Medicine was like astronomy, which did not move for centuries” (Ober 1997, 158).

Once one knows what to look for, playful metaphor, humor, and irony are shown to be an important way for scientists to express their frustration and their fears. In a research project involving observing scientists in committee group tasks, a variety of word play, humorous insults, and the elaboration and reconstruction of metaphorical idioms are used for a variety of purposes, including reinforcement of group boundaries, re-constitution of the group’s assigned task, and joint development of a complex set of ideas about group members’ identities as scientists working in a publicly-funded lab (Ritchie and Schell 2009, 90). The scientists’ discussions included jokes about the term “professional” (an orientational metaphor as well as a superiority example, in comparison to “amateur”), calling themselves “geeks and nerds” (a play on superiority), teasing an experienced member of the group as one who has done this before (and therefore knows there are no right or wrong answers, just “productive” answers), and a play on the term "ivory tower" with a structural metaphor riff on the unstable foundation of said tower. The research process involved careful recording and numbering of each comment:

The decision by event organizers to label the scientists' group as the professionals is the occasion for a brief bit of joking at the very outset:

0001 Facilitator: I guess, we're calling ourselves "the *professional* group."
0002 We're all scientists. Ya right.
0003 Participant 1: That's right.
0004 Facilitator: Or "*thereabouts*"
0005 Participant 1: "*Thereabouts*"
0006 Participant 2: "*Pretty much.*"

Professional can be interpreted in contrast to *amateur*, in which case a working scientist, who takes science completely seriously and is totally committed to it would certainly qualify as *professional*. However, neither laboratory scientists nor academic scientists ordinarily consider themselves professionals, since the everyday use of the term to refer collectively to doctors, attorneys, engineers, and other graduates of "professional schools" invokes a second contrast, between *professional* (as practitioner) and *researcher* or *theorist*. The use and echo of the metaphorical idioms, "*thereabouts*" (based on a spatial metaphor) and "*pretty much*" (based on an object/quantification metaphor) activate simulations associated with uncertainty about location and quantity respectively; the echoing of the facilitator's idiomatic expression of ambiguity activates culturally based associations with vaudeville comedy routines and introduces a teasing response to the facilitator that persists throughout the first segment of the discussion.

The negative implications of "*professionals*" are taken up in a playful way by another participant almost immediately.

0007 Participant 3: Can we, can we change our names if we want?
0008 Facilitator: Sure
0009 Participant 3: As first order of business
0010 Participant 3: *Nerds and geeks*
0011 Participant 1: Ya
0012 Facilitator: So. We're changing our names to what?
0013 Participant 3: Geeks and nerds.

Here, Participant 3 replaces the indisputably general term professional with one more warmly self-deprecating, "nerds and geeks," which a scientist might apply to others in that guild as a way of establishing common ground playfully (as being extended to anyone who is obsessed with either technology or science to the exclusion of ordinary social activities). (Ritchie and Schell 2009, 93)

A second bit of playful joking involves the meta-communicative task of setting ground rules for the discussion. The following segment comes immediately after a bit of playful banter over who has the worst handwriting (and who is thus ineligible to be appointed to take notes).

0038 Participant 1: I *hasten* to *point out* that
0039 *Larry's done this before*
0040 and he knows all the right answers.

At first this sounds like mere teasing banter, directed both at Larry ("teacher's pet") and at the process. But it is turned into a meta-communicative discussion about the nature of the focus group process itself when the facilitator protests.

0043 Facilitator: There are no right answers.
0044 Participant 1: There are always right answers.
0045 Participant 3: Or they're all right answers, one or the other.
0046 Participant 4: Well
0047 Participant 3: There're either none,
0048 Participant 4: put it this way
0049 Participant 3: or they're *all* right
0050 Participant 4: they seem *productive* answers
0051 Participant 5: Oh h h h h (laughter) (Ritchie and Schell 2009, 94)

The facilitator attempts to get the group to focus on the "*stewardship*" metaphor, but instead another participant returns to the "*ivory tower*" metaphor.

0195 Participant 4: Jack said something,
0196 one way of
0196 of *capturing* part of that,
0197 ah, change of role is
0198 ah, no more *ivory tower.*
0199 It's probably, we're,
0200 we're *not there* now
0201 it's probably not too *far in* the future.
0202 Participant 2: I've never really *seen the ivory towe*r. (Laughter) (Ritchie and Schell 2009, 97)
And the speaker concludes the irony with a second play on the word, "*foundation.*"
0214 Participant 4: Ya, instead of the *ivory tower*,
0215 we're in an *unstable foundation.* (Ritchie and Schell 2009, 98)

5 Conclusion

In conclusion, what these metaphors attempt to do is not only to help students understand science, but also help scientists express themselves in more understandable and entertaining ways. Alan Alda gives us one overarching metaphor about the metaphors of science, a meta-metaphor if you will. The average person today, he says, is on a blind date with science. To get them to fall in love with science, there has to be a thought process happening that the average person can understand and connect with—then the three stages of love, can be achieved: attraction, then infatuation, then finally commitment. "Real people try to make a connection not only to one another, but to what their inspiration is for their next sentence. And if you see that going on, if there's real contact with the people you're talking to, they're going to pay more attention" (Vertsberger 2015).

References

Aines, Roger. 2018. "Why Can't Scientists Communicate Outside our Field? Because We Aren't Trained That Way." Posted May 7, 2018. https://championingscience.com/2018/05/07/cant-scientists-communicate-outside-field-trained-way/.

"Alan Alda on Teaching Science." 2017. Posted May 8, 2017. http://higheredprofessor.com/2017/05/08/alan-alda-teaching-science/.

Ames, Ben. 2012. "What Is A Flame." YouTube video, 7:30. April 26, 2012. https://www.youtube.com/watch?v=5ymAXKXhvHI.

Boyd, Richard. 1993. "Metaphor and Theory Change: What is 'Metaphor' a Metaphor For?" In *Metaphor and Thought,* 2nd edition, edited by Andrew Ortony, 52. Cambridge: Cambridge University Press.

Cat, Jordi. 2001. "On Understanding: Maxwell on the Methods of Illustration and Scientific Metaphor." Studies in History and Philosophy of Science Part B: *Studies in History and Philosophy of Modern Physics 32(3).* doi:doi.org/10.1016/s1355 – 2198(01)00018 – 1.

Duckert, Cindy L., and Elizabeth A. De Stasio. 2016. "Setting the Stage for Science Communication: Improvisation in an Undergraduate Life Science Curriculum." *The Journal of American Drama and Theatre* 28(2): 1 – 18. https://jadtjournal.org/2016/05/27/setting-the-stage-for-science-communication-improvisation-in-an-undergraduate-life-science-curriculum/.

Flatow, Ira. 2012. "The Winning Answer to A Burning Question." *Science Friday Talk of the Nation,* June 8, 2012. https://www.npr.org/2012/06/08/154587992/the-winning-answer-to-a-burning-question.

Foran, Chris. 2017. "Alan Alda makes the case that improv and empathy can help us hear each other." *Journal Sentinel Online,* June 9, 2017. https://www.jsonline.com/story/entertainment/books/2017/06/09/alan-alda-makes-case-improv-and-empathy-can-help-us-hear-each-other/369438001/.

Jarvie, Amber L., Jane A. Buxton, Andrew C. H Szeto, and Jehannine C. Austin. 2013. "A Pilot Study of the Effect of Exposure to Stand-Up Comedy Performed by Individuals with Mental Illness on Medical Students' Stigmatization of Those Affected." *UBC Medical Journal* (5)1: 15–18. EBSCOhost, search.ebscohost.com/login.aspx?direct=true&db=a9 h&AN=93609831&site=ehost-live.

Kang, Shin Ik. 2016. "Jumping Together: A Way from Sociobiology to Bio-Socio-Humanities." *Zygon: Journal of Religion & Science* (51)1: 176–90. EBSCOhost, doi:10.1111/zygo.12235.

Kovecses, Zoltan. 2010. *Metaphor: A Practical Introduction.* 2nd edition. Oxford: Oxford University Press.

Lakoff, Geoge, and Mark Johnson. 1980. *Metaphors We Live By.* Chicago: University of Chicago Press.

Mathis, Ben. 2016. "Alan Alda on Making Scientists & Doctors Better Communicators." https://bullhorn.fm/kickassnews/posts/2NFgnvs-alan-alda-on-making-scientists-doctors-better-communicators.

Metaphors in Science Powerpoint. n.d. "Lesson Plan." Utah Education Network. Accessed January 30, 2019. https://www.uen.org/lessonplan/download/16901?lessonId=4694&segmentTypeId=2.

Mio, Jeffery Scott, and Arthur C. Graesser. 1991. "Humor, Language, and Metaphor." *Metaphor & Symbolic Activity* 6(2). EBSCOhost, doi:10.1207/s15327868ms0602pass:[_]2.

Murdock, Rachel Collier. 2017 "An Instrument for Assessing the Public Communication of Scientists," Doctoral Dissertation, University of Iowa, PhD Rhetoric and Professional Communication. https://lib.dr.iastate.edu/cgi/viewcontent.cgi?article=6593&context=etd.

Ober, Karl Patrick. 1997. "The Pre-Flexnerian Reports: Mark Twain's Criticism of Medicine in the United States." *Annals of Internal Medicine* 126(2). EBSCOhost, doi:10.7326/0003–4819–126–2–199701150–00012.

Ritchie, David L., and Char Schell. 2009. "'The Ivory Tower' on an 'Unstable Foundation': Playful Language, Humor, and Metaphor in the Negotiation of Scientists' Identities." *Metaphor & Symbol* 24(2): 90–104. EBSCOhost, doi:10.1080/10926480902830847.

Scharf, Caleb A. 2013. "In Defense of Metaphors in Science Writing." *Scientific American*, July 9, 2013. https://blogs.scientificamerican.com/life-unbounded/in-defense-of-metaphors-in-science-writing/.

Starkey, Jennifer S. 2018. "Sophoclean Moments in Greek Comedy." *Classical Philology* 113(2): 134–61. EBSCOhost, doi:10.1086/697114.

Unteregger, Fabian, and Philipp Mayer. 2019. "Medical Lectures Upgraded: 11 Hacks from Comedy." *GMS Journal for Medical Education* 36(3):1–4. EBSCOhost, doi:10.3205/zma001231.

Vertsberger, David. 2015. "Alan Alda lectures on scientists connecting with their audience." *The Stony Brook Statesman,* February 24, 2015. https://www.sbstatesman.com/2015/02/24/alan-alda-lectures-on-scientists-connecting-with-their-audience/.

Wright, James D. 1991. "Popular Science, Social Science, Metaphor and Deception." *Society* 28 (5): 81–84. EBSCOhost, doi:10.1007/BF02695693.