# Similes and Superstrings: Writing to Clarify the Cosmos



**Matthew McCool**
Southern Polytechnic SU
E-mail: mmccool@spsu.edu

**Key Words**

Astronomy Communication
Science Writing

## Summary

This paper outlines our strategy for explaining good writing through astronomy. The overarching goal of our paper is to connect the field of astronomy with the process of writing and to demonstrate how writing about astronomy can produce writers who also learn about astronomy.

*Writing is perhaps the greatest of human inventions, binding together people, citizens of distant epochs, who never knew one another.* –Carl Sagan

## Writing about astronomy

In a recent paper, Garland & Ratay (2007) outlined an instructional method for teaching writers the basic principles of astronomy. Their techniques signalled a departure from conventional methods because the strategy was not based on laboratory testing and experiments; their method was literary. Students were given the task of writing about astronomy to *learn* about astronomy, a method that successfully reached a group of beginning writers. Their premise was based on the assumption that language is an ideal platform for shaping the abstract into the concrete.

This is not as counterintuitive as it may appear because writing nudges an author into a sense of understanding and forced concentration. It is not unusual for an author to admit to having a clearer picture of a problem after writing. For reasons not entirely understood, the writing process can draw clarity from confusion. But writing is not always so elegant. In fact, the most common problem with writing of any sort, especially when the topic is astronomy, is lack of clarity. One of the stock concerns for any writing instructor addresses the common problem of verbal confusion. Unclear writing, so the saying goes, is a sure sign of unclear thinking. Even a seasoned veteran of clear and concise prose must acknowledge this issue, since writing is nothing if not the process of communication.

But rather than teaching astronomy through writing, our goal is to teach writing through astronomy. The similarity is actually quite close. As professors who are responsible for teaching effective writing in science and technology, it is our goal to teach the elements of good prose through the equally interesting elements of science. Astronomy, it turns out, is an ideal platform for our cause. It even turns out that many of our astronomy writers learn something about physics.

## Survival of the clearest

Language is a critical dimension of human nature, one that separates us from all other animals (Pinker, 2005). True, other animals are thought to have at least some rudimentary ability to exchange information. Whales can send sonic waves across an entire ocean. Elephants trumpet their tunes across miles of arid plains. Birds chirp in sweet and melodic song. But only humans have the ability to use language to communicate the cosmos, which is why clarity and concision are so important.

Deborah Blum is a Pulitzer Prize-winning science journalist and professor of science writing at the University of Wisconsin at Madison. In her edited collection, *A Field Guide for Science Writers*, Blum outlines a series of key principles for effectively communicating complex topics (2006). Many of the principles outlined in Blum's book concern most forms of applied writing, but three points are particularly useful for writing about astronomy. Consider the following principles, each of which is designed to refine a complex topic into its most essential parts (2006):

- use clear and concrete prose;
- when possible, rely on non-examples;
- use analogies and metaphors.

The first principle, clarity and concreteness, addresses a reader's need to latch onto a

tangible idea. Even theoretical concepts need a conceptual anchor (cf. Greene, 2004; Sagan, 1980). The second example, or non-example, is more exotic, but no less effective. Many people assume, for instance, that antimatter means no matter. A writer can anticipate her reader's assumption and counter it with a non-example. The author may state that antimatter does not mean "no matter", but is actually "invisible" matter. While the non-example does not have to be technically accurate it must be able to explain a concept by what it is not. The third principle of clear writing, analogy and metaphor, is equally useful. Nearly all scientific pursuits rely on simile, analogy and metaphor for effective communication. Consider a case in human genetics.

Recent advances in genetics are now providing an opportunity to determine our ancestral origins. The problem is that most people do not want to have a conversation about genetics, chromosomes and biomarkers. But it is possible to express the same ideas through an analogy. Many soups are based on family recipes passed down through generations. A family may relocate from Ireland to the US, but the soup recipe remains more or less the same. The reason soup recipes are useful is that they contain ingredients that indicate specific geographic regions. For instance, perhaps all Irish soup recipes are known for using celery. By studying all soup recipes in the US, you can deduce from their ingredients whether a recipe is from Ireland or some other region. By reverse engineering a recipe, you can determine where it was originally from and how it changed.

The beauty behind this example is that writing, or specifically, the metaphor of genetic soup, accomplishes two tasks. First, it explains a complex problem in genetics to a reader who lacks the training of geneticists. Second, the process of designing and writing about a genetic soup metaphor also benefits the writer by turning an abstract concept into a concrete, everyday experience. This is the same strategy used in successful astronomy communication.

## The science writing process

Teaching the principles of science writing requires a process for filtering the simple from the complex. In his book, *Being Logical*, philosopher D. Q. McInerny said it best when he described the need to adapt technical topics for a non-technical audience (2005):

*If you are a physicist discussing the principle of indeterminacy with other physicists at a professional conference, you can freely use the technical jargon of your profession. But if you are asked to explain that principle to a group of non-physicists, you should adjust your vocabulary and present your material in ordinary language. Don't use technical or "insider" language merely to impress people. The point is to communicate. The two extremes to be avoided are talking down to people and talking over their heads.*

Notice McInerny's claim that the "point is to communicate", which means the writer is responsible for clear communication (cf. Gater, 2008; Greene, 2004). This assumption is partly based on the idea that language is thought to be a reliable vehicle for exchanging information. In other words, if you do not understand this sentence then it is not your fault, or even the limitation of words. Instead, we are responsible for poor writing and miscommunication.

On the other hand, poetic language can greatly improve the delivery of complex ideas. Aristotle believed that the use of metaphor exemplified the higher signs of intellect: "*The greatest thing by far is to be a master of metaphor. It is the one thing that cannot be learnt from others; and it is also a sign of genius, since a good metaphor implies an intuitive perception of the similarity in dissimilar.*" (Aristotle/McKeon, 2001) Calling users of metaphors geniuses may be a bit excessive, but metaphors have a clear role in expressing a range of tough topics. Science writers readily grasp this literary device and are eager to incorporate its use within their own work.

## From similes to superstrings

Simile and metaphor are two types of literary techniques known as *tropes*, distinguished only by a minor difference (Kövesces, 2002; Lakoff & Johnson, 2001). Metaphor is when one thing can be substituted for another. Item *A* can replace item *B* because both have identical properties. A simile is when one thing is likened to another. Item *A* is said to be *like B* because they have similar, but different properties. Many people use the word metaphor when they really mean simile, but this is an unimportant technical distinction. The point here is to remember that both simile and metaphor have long been used (at least since Aristotle) to explain one thing in terms of something else.

Our strategy for teaching effective astronomy writing is based on using simile and metaphor as part of a three-stage process. The first stage begins with a simple idea. The second stage builds on the original idea. The third and final stage combines elements from the first two stages to create a clear and accessible image for the reader. Although the exercise is based on developing good writing skills, most writers walk away from the project with a deeper understanding of the cosmos (or in this instance, superstrings). Consider the following three-part example, which is taken from an exercise whereby writers assemble a method for explaining string theory to a general reader.

***Step 1 (build the foundation):*** The first stage entails splitting a complex problem into two parts (we aim to do this with most scientific topics). Although some problems require a third perspective, the issue of string theory fits neatly within a dual framework. Thus, writers are then asked to outline the two sets of seemingly incompatible laws defining the Universe — the smoothness of Einstein's theory of gravity and the jitteriness of quantum mechanics. Students are then asked to briefly define these two theories, gravity and quantum mechanics, in terms of everyday experience.

***Step 2 (layer detail):*** The second stage entails overlaying some complexity onto the first stage. In this instance, writers are asked to add detail to their original example by equating each kind of physics as a distinct kind of "musical language". Novice writers accomplished this task by explaining that each theory speaks a different language, but they lack a common protolanguage. Because both "languages" are correct, a third "musical language" must connect the two theories.

***Step 3 (connect through the concrete):*** The third stage entails connecting the simple first stage and the slightly more detailed second stage, thereby creating a concrete third stage. Thus, writers are asked to hone in on the idea of music as a simile for bridging both theories. This is based on the idea that language and music share similar tonal qualities. The "strings" connecting the two laws of nature are equated with a "harmonic bridge", a kind of musical apparatus connecting both languages. Thus, the simile is that a harmonic bridge is like a string.

Writers are then asked to rationalise their simile. In the example given above of a harmonic or musical bridge, the simile is rooted (according to most writers) in the universal nature of sound and music. Everyone has an intuitive sense of harmonics, even if they lack a technical command of the subject. Further, music crosses every culture without the aid of a natural language. While a harmonic bridge hints at a similarly abstract idea it actually taps into a deep and primal impulse for rhythm and sound. Although imperfect, many writers argue that music's universal nature can link the abstraction of both theories for most readers.

## Discussion

A nice side effect of teaching science writing through astronomy is that novice writers — namely, undergraduates in applied fields of science — learn quite a bit about astronomy. Even astronomy majors are surprised by their increased level of understanding. Although astronomy students bring greater depth to the workshops, our approach brings greater breadth. But writing about astronomy has other selling points.

As with using writing to learn about astronomy, our process of using astronomy to learn about writing can be easily ported to similar environments. While travelling, for instance, we regularly visit science museums and planetariums that feature outreach programmes and in-house activities for all ages. A brief writing exercise would be ideal for at least some of these venues because it burns a deep imprint of the subject in the participant's mind. That in itself is reason enough to rethink astronomy in respect to writing, since few topics are more interesting or enjoyable than contemplating our little corner of the cosmos.

## References


- Aristotle 2001, *Poetics, The Basic Works of Aristotle*, (New York: Modern Library), 1455-1487
- Blum, D., Knudson, M. & Henig, R.M. 2006, *A Field Guide for Science Writers*, 2nd Editon, (New York: Oxford University Press)
- Garland, C.A. & Ratay, D.L. 2007, *Using Literacy Techniques to Teach Astronomy to Non-science Majors*, Astronomy Education Review, 6, 1
- Gater, W. 2008, *Why Should we Bother to Communicate Astronomy?*, Communicating Astronomy with the Public Journal, 2, 30
- Greene, B. 2004, *The fabric of the cosmos: space, time, and the texture of reality*, (New York: Alfred A Knopf)
- Kövesces, Z. 2002, *Metaphor: A Practical Introduction*, (New York: Oxford University Press)
- McInerny, D.Q. 2005, *Being Logical: A Guide to Good Thinking,* (New York: Random House)
- Montgomery, S.L. 2003. *The Chicago Guide to Communicating Science*, (Chicago: University of Chicago Press)
- Pinker, S. 2005, *So How Does the Mind Work?*, Mind & Language, 20, 1
- Sagan, C. 1980, *Cosmos*, (New York: Ballantine Books)


### Biography

**Matthew McCool** studied intercultural communication at New Mexico SU (USA), literature and philosophy at the University of Illinois at Springfield (USA), and neuroscience at the SIU School of Medicine. He has just released a book about intercultural writing called *Writing around the World* (Continuum).