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### Computers Track the Elusive Metaphor

By *LISA GUERNSEY*

Aristotle was famous for his love of metaphors and applauded writers who could harness their power. Having command over metaphors could not be taught or "imparted by another," he wrote. "It is the mark of genius."

Some 2,400 years later, computers may not be able to master poetics like Aristotle, but they have become smart enough to know a metaphor when they see one.

An online database called *The Mind Is a Metaphor*, created by Brad Pasanek, an assistant professor of English at the University of Virginia, is a searchable bank of phrases, verses, and lines from literature that encapsulate metaphors of the mind. Mr. Pasanek hopes it will help literary and intellectual historians gain insights into how people's language reflects their understanding of the world around them.

But the database also has another role: to test how much a piece of software can gather about language with a little training from humans. The answer, Mr. Pasanek said, is: much more than he thought.

If Aristotle thought that metaphor could not be learned, "it was nice to find that not only can it be learned, it can be learned by a machine," says D. Sculley, a computer scientist in Pittsburgh who works for Google and who, on his own, has run projects on the database for the past few years.

The database, which can be found at <http://mind.textdriven.com>, has more than 8,700 metaphors found in 18th-century literature. Type in the keyword "rose," for example, and among the results you'll get is a line from Keats: One soul may be snared and labyrinthed in another "like the hid scent in an unbudded rose."

Mr. Pasanek, a scholar of 18th-century literature, started building the database when he was a graduate student at Stanford University. His original goal was to document every moment when a metaphor was used to describe how the mind works, so that he could uncover connections between intellectual movements and the way people used words to describe their thinking.

Today, for example, people often liken brains to computers. We get the download, need rebooting, commit fatal errors. By contrast, Mr. Pasanek says, 300 years ago, as the modern novel was taking shape,

metaphors of the mind commonly evoked paper and books: "It's a very literate moment. People were thinking of themselves as paper or blank paper."

Other scholars are similarly interested in metaphors as signals of thought. George P. Lakoff, a linguist at the University of California at Berkeley and author of *Moral Politics*, has written widely about metaphors and theories of cognitive science.

Another database, with about 1,100 examples from modern-day usage, is run by John Barnden, a professor of artificial intelligence at the University of Birmingham, in England. (It is on the Web at <http://www.cs.bham.ac.uk/~jab/ATT-Meta/Databank/>.)

#### Index Cards and Pencils

Mr. Pasanek started with Shakespeare, Milton, and the King James Version of the Bible, using index cards and colored pencils to note each metaphor he came across. Soon an information-technology adviser at Stanford suggested that he create a database, with retrieval via keyword searching. "I'd start searching for 'mind' and 'blank slate' within a 100 words of each other," the professor says.

Eventually he found he could be even more efficient by training a computer program to recognize patterns in the way words came together. Instead of just plugging in keywords to get word-for-word matches, Mr. Pasanek can train his software to recognize what a particular type of metaphor might look like (using, say, 100 examples) and then ask it to search large text databases for more.

This process, known as machine learning, was brought to his attention by Mr. Sculley, a schoolmate from the sixth grade who happened to catch up with him at a wedding.

"From my perspective," says Mr. Sculley, "the thought of doing this by hand struck me as insane — in the most admirable way."

The two are now collaborators, running machine-learning programs to test software programs and theories about metaphors. They recently wrote two articles about their work, to be published by the online journal *Literary and Linguistic Computing*.

But for Mr. Pasanek, the database is primarily a literary endeavor. He likes to combine close readings of a work of literature with data-mining explorations of bits and pieces of hundreds of texts. "I find myself intensely scrutinizing one metaphor against a background of 400 metaphors," he says.

He is also writing a dictionary of metaphor, using the database to help him store and retrieve examples. In other words, the database is a mind crutch. Metaphorically speaking, that is.

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