

Letters

Shakespeare and Statistics

Gina Kolata (Research News, 24 Jan., p. 335) writes of a statistical method devised by Bradley Efron and Ronald Thisted (1) to determine how many new words could be expected to occur in a previously unknown poem by Shakespeare, should one be found. Their work was based on a study by Marvin Spevack, who used a computer to arrive at the total number of words used by Shakespeare. In a poem with 430 words, such as that discovered by Gary Taylor in the Bodleian Library at Oxford University, Efron and Thisted calculated that 6.97 ± 2.64 new words would occur. There are reported to be nine new words in the poem, which falls within their range.

I decided to check the nine words listed as not occurring in Shakespeare's works, with the following result:

admiration—occurs 13 times.
besots—Shakespeare used *besotted*.
exiles—he used *exile* 24 times, *exiled* 6 times.
inflection—did not occur.
joying—joy occurs more than 200 times. Also occurring are *joyfully*, *joyless*, *joyous*, and *joyed*. *Joyed* is a verb form, as is *joying*.
scanty—*scant* occurs 10 times. Also occurring is *scantly*, which is an old adverbial form of *scant*.
speck—did not occur.
tormentor—Shakespeare used *tormentors*.
twined—*twine*, as a verb, occurs once. *Twining* occurs in *Venus and Adonis*, line 256.

All of the words cited as used by Shakespeare, with the exception of *twining*, can be found in a revised edition of *The Complete Concordance to Shakespeare* (the plays only) by Mary Cowden Clarke, published in London in 1879. For over a century it has been a standard reference work.

As for the poem itself, its authorship remains an open question. Obviously, any statistical analysis of the poem will require more computer programming before the question of authorship can be determined. Such programming should take into account all possible inflections of the nouns and verbs used in the body of Shakespearean literature. Only then will we have an accurate count of "new" words used in this recently discovered poem.

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REFERENCES

1. B. Efron and R. Thisted, *Biometrika* 63, 435 (1976).

Response: The statistical analysis of Shakespeare's word usage is quite unlike a literary analysis. What Thisted and Efron are counting is "word types"—strings of letters devoid of context. For that reason, *exiles* is a different word type than *exile*, and *besots* is not the same word type as *besotted*. Driver is correct that *admiration* is used by Shakespeare—there was an error in my article, and the actual word should have been *admira-tions*. In addition, Thisted says that *twined* should be replaced on the list of new words by *explain*.

Although this sort of analysis ignores the fact that words can be linguistically equivalent, it is actually more powerful because of it. As Thisted points out, anyone attempting to write a counterfeit Shakespearean poem might try to imitate Shakespeare's word usage, but not his word types. The word types used by an author seem to reflect an unconscious process in literary composition.—GINA KOLATA

Mexican Seed Bank

In the article by Marjorie Sun (News & Comment, 24 Jan., p. 329), the statement "Pioneer gave USDA [the U.S. Department of Agriculture] a \$1.5 million, 5-year grant to help grow out and evaluate stock from the seed bank known as CIMMYT in Mexico City" appears to be a misquotation. Pioneer does, in fact, have a 5-year agreement with USDA to support USDA research on corn germplasm stored in Latin American seed banks. The collections are stored in government seed banks located in Mexico, Colombia, and Peru (1). This grant does not cover CIMMYT's bank. Pioneer Hi-Bred has been cooperating with CIMMYT in the regeneration of selected bank accessions since 1981.

Second, another statement in the same paragraph—"Brown became worried about the demise of a corn collection at an international seed bank in Mexico"—implies that the CIMMYT maize bank has lost its collection of accessions. This is not correct. The CIMMYT maize bank currently maintains a little over 10,200 accessions of maize germplasm. At CIMMYT, the word "accession" implies that the material has been successfully regenerated and viable seed has been placed in our storage facilities. These accessions are viable and, as such, have not suffered a "demise." Further, CIMMYT has recently remodeled its facilities, and all accessions are now stored under long-term conditions (-15°C) as well as in intermediate conditions (0°C). CIMMYT has also been supplying fresh samples of the acces-

sions (as they are regenerated) to the National Seed Storage Laboratory at Fort Collins, Colorado, for backup long-term storage. Almost half of our accessions are now stored at Fort Collins.

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REFERENCES

1. *Diversity*, No. 7, Fall 1985, p. 9.

Response: Jewell is right about the Pioneer grant to CIMMYT, but he and William Brown, former chairman of Pioneer Hi-Bred International, Inc., do not see eye to eye about the status of the maize bank. According to Brown, the crucial concern is how many seeds from the original collections are still viable now. Seeds have unfortunately been lost in the past, he says.

—MARJORIE SUN

The Dot: Alternative Notation

The new logo makes clear that the AAAS has recognized that science is a dynamic, ever-changing body of knowledge and that the time rate of this change is of the essence. However, it is possible that one or two of your readers might misinterpret the dot over *Science*, and so the alternative standard notation

$$\frac{d \text{ Science}}{dt}$$

might be more appropriate.

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P.S. Also, the dot should be centered roughly over the first *e* in *Science*. Currently it is somewhat off-center.

Black Holes—"Ingestars"?

Is it not high time for astrophysicists to devise a proper name for "black hole"? A superdense star that attracts and permanently ingests all nearby matter and radiation is in no sense a hole, a hole being (by definition) an empty passageway. "Black hole," which is a kind of metaphor, has served the experts well. But the public deserves a less arcane term. "Super ingester" is apt but too long. "Ingestar" is shorter and is consistent with pulsar and quasar.

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