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Communication and its Possibilities

Communicating Science: Professional, Popular, Literary. *By Nicholas Russell, Cambridge University Press, Cambridge, UK, 2010, 348 pages, $99.00 (hardcover), $31.99 (paperback).*

BOOK REVIEW

By Philip J. Davis

A writer of whatever sort produces a piece of text. Who are the target readers? The writer may have some group in mind: family members, people madly in love with the sport of curling, dinosaur buffs, or even the entire "literate public." Then again, with no specific target in mind, the writer may simply be responding to an inner itch to write.

How will the text be aired or made public? As a Letter to the Editor, as a reprint in the famous *Everyman's Library*, as an article in the International Journal of Entropographics? The writer may post it on the Internet, a medium considered the modern Forum Romanum by some, the Black Hole of Communication by others.

What can the writer do to ensure that the targeted readers will understand what he/she has written? Oversimplify? Painfully spell out the major lines of the argument? Resort to the coded and specialized vocabulary of the targeted group? Provide a plentiful accompaniment of interactive pictorial possibilities? Include an interview of an entropographical maven by a journalist? While the problems of communication may be multiple, they have been no bar to verbosity. Cisco estimates Internet traffic for 2009 at 14×10^{18} bits/month.

Paralleling the sensible, useful, and famous *Elements of Style* of William Strunk and E.B. White, Nicholas Russell, emeritus reader in science communication at Imperial College London, gives us Seven Commandments, seven "thou shalt nots" to be followed by authors wishing to produce easy scientific reading: Thou shalt not use or create (1) interlocking definitions, (2) technical taxonomies, (3) special expressions, (4) lexical density, (5) syntactic ambiguity, (6) grammatical metaphors, or (7) semantic discontinuity. Because I had only a vague idea of what these expressions mean, I appreciated Russell's singling them out for detailed elaboration accompanied by examples.

Happy to have Russell's Seven Commandments, fashioned for science, I turn now to mathematics, looking for a carryover. I'm sure that with a bit of thought I could give examples of infringement of all seven. Special expressions are easy enough to find. My pet peeve there is when an author fails to remind me in equation (46b) what—in the service of non-redundancy—he explained once and for all time way up in equation (3).

Syntactic (or semantic) ambiguity is a bit harder to spot, but I recall that even native speakers of English sometimes have difficulty when they encounter the words "every," "all," "some," "one," "or," "exist" in mathematics texts. When it comes to published proofs of theorems, I'm sure that seven times seven could not count the ways in which good precepts of exposition have been violated.

There are now in hard print mathematical texts that extend from material for bright three year olds to theories and developments so specialized and so arcane that four copies would suffice: one for the Library of Congress, one for the author, and one each for an aficionado in Budapest and a former co-author in Madison, Wisconsin. Russell discusses three types of science writing: professional, popular, and literary. This taxonomy works well for mathematics, though each of the three can be split into subtypes. Given the hundred or more specialized areas of mathematics, an article may be of only intrafield comprehensibility, with little attempt on the part of the author to accommodate casual acquaintances down the hall who may be curious to know what their colleague has been creating for the past half year. There seems to be no way around this. A mathematical article may be targeted to a wider professional audience, including people outside the field, such as biochemists. The exposition, in the hands of a capable author, would then be paced slower, with jargon eliminated and every effort made to avoid the seven deadly sins listed earlier.

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An article may be intended for the person Lillian Lieber called T.C. Mits—The Celebrated Man In The Street (1942.) In this case, the palette of comprehensible theorems is severely restricted. I think I could undertake to explain Euler's theorem on polyhedra to Mr. Mits, but the extended Euler–Poincaré theorem would give me pause. And I doubt that I would have any success in sitting Mr. Mits down in Hennessey's Bar and explaining to him on a napkin why every symmetric matrix has real eigenvalues, let alone the extension of a symmetric matrix to compact self-adjoint operators in Hilbert space. Yet I am sure there are clever expositors for whom this job would be a piece of cake and who, using every cutting-edge communication device, including YouTube, may well attempt to explain the whole matter. Explanations of elementary calculus via comic strips appeared a number of years ago, and computers and interactive graphics have now enhanced comprehensibility—well, presumably—so that no undergraduate need be left behind when it comes to the laws of derivatives.

Every intellectual area is a country in itself, and on entering it "foreigners" may experience culture shock. I listen on TV to the money mavens talking about various international transformations and operations that involve "serious money," and I am lost. The late Gian-Carlo Rota once sat me down in Hennessey's Bar and tried, with little success, to explain to me what phenomenology means to mathematics. I was lost before the waiter could bring my Tuna Melt. The late great anthropologist Clifford Geertz explained this shock phenomenon in a sentence that could have profited by exposure to Strunk and White and to Russell's book:

"Whatever has been learned about how to get at the curve of someone else's experience and convey at least something of it to those whose own [experience] bends quite differently, has not led to much in the way of bringing into intersubjective connection [these two people]."

Russell devotes four chapters to science in literature and on the stage. He mentions such works as Mary Shelley's *Frankenstein*, H.G. Wells's *The Time Machine*, Aldous Huxley's *Brave New World*, Michael Crichton's *Jurassic Park*, Bertholt Brecht's *The Life of Galileo*, and Michael Frayn's *Copenhagen*. By way of a parallel in our field, novels, plays, and movies with a mathematical basis have appeared thick and fast in recent years. As

examples: *Fermat's Last Tango* (2000), *Uncle Petros and Goldbach's Conjecture* (English translation, 2000), *A Beautiful Mind* (2001). The 2005 movie *Proof* starred Gwyneth Paltrow and Anthony Hopkins. All have been successful: *A Beautiful Mind* won four Academy Awards, and David Auburn's play *Proof* won a Pulitzer Prize (2001).

Yet all of these entertainments, written, I assume, with the advice and consent of professionals, are hardly representative of the rich variety of mathematical concerns, and strike me as confirming the public's well-known opinion that mathematicians are really a bunch of very strange birds. Clifford Geertz confirmed this (in prose easier than that of the previous example) when he wrote that "The rational beauties of mathematical proof are guarantees of no mathematician's sanity."

All of us, asked by Mr. Mits what we have done professionally, have passed over what we are unable to talk about in a Wittgensteinian silence that confirms our sanity.

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