Technophile Telegraph

We've all heard the expressions "turn a blind eye" or "...a deaf ear," implying being oblivious (intentional or not) to input.[1] A few months ago, while settling into my airline seat and listening to a friendly passenger strike up a conversation with me, I noted he fell silent, mid sentence, for no apparent reason. Responding to my quizzical glance he explained that he was letting me listen to the perfunctory safety briefing the crew had just begun. "Oh," I retorted, "I never hear those things unless someone calls my attention to them." Whereupon he quipped, "I see, you have a notch filter.[2]"

NOTCH FILTER? My background allowed me to immediately typecast this fellow as a double-E,[3] but how would the nontechnical or, worse yet, the technophobic listener react. My goodness, having a notch filter could be terminal, or at least insulting!

Without saying whether it's good or bad, we technical types can certainly telegraph[4] our vocations when we transplant the vernacular of lab chatter to the everyday world. Of course our language boasts plenty of words and phrases to express everyday ideas, but somehow taking a technical phrase out of original context and mapping[5] it onto analogous normal concepts adds a bit of clever charm to the technician's reparté and stilted confusion for the lay listener.

Some phrases have inculcated themselves into the public's imagination. *Quantum leap* leaps to mind.[6] Of course, its small discrete meaning has been corrupted into a large step (usually forward) with some psychological minimum size but no discrete[7] spectrum beyond that. (Clearly a step into the continuum.[8])

As a student at Caltech, I was privileged to hear several lectures by Richard Feynman. Whether on thermodynamic irreversibility, his diagrams, or whatever—I always felt a euphoric sense of clarity and deep understanding...until I left the room. Absent the charismatic presence, I could not reproduce the arguments that led me through the didactic maze to the "obvious" conclusion. I expressed my frustration to a lay neighbor by noting that "my understanding of that stuff just decays[9] exponentially.[10]" Well, the "decays" part gets transliterated to "rots" and that's OK, but "exponentially" generates a unique facial expression that mixes quizzical and intimidated with a strong dose of tolerance for the weird.

Among the many issues to which we scientists and engineers are asked to attend is education of the public about science...take some of the mystery out of it and reveal the practical and aesthetic values. This cause has many exponents and is an admirable goal. Dejargonizing without gross distortion for public consumption is a worthwhile and not easy task. A little nudge toward demystification of scientists and science in the social setting might be achieved if we were to let everyone in on the meaning behind those blurted "foreign" phrases and were to find an easier way to do that than is exemplified by the extended footnotes below. If we do a good job of it, then the next time you ask a friend to tell you all he knows about something by asking him to dump his core,[11] he may not go nonlinear.[12]

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[1]With the advent of computers which receive and send information on input/output devices, the word *input* has crept into everyday use for information receipt by humans as well.

[2]*Notch filter* refers to one of several categories of electronic, selective-pass devices which alter the spectrum of frequencies in a received electrical signal so that some portion(s) of the spectrum is(are) attenuated at the output. The term *notch* is a nice example of how a common word's meaning is borrowed to name a technical device. The device transmits a continuous spectrum except for frequencies within a specified range (or notch as it would appear graphically). Thus notch filter can be used to imply a selective rejection of input.

[3]A *Double-E* or *EE* is an electrical engineer, and today certainly includes electronics engineers and many hardware-oriented computer engineers. The abbreviation grows out of shorthand usage on college campuses where distinctions between individuals according to major technical discipline becomes relevant.

[4]The word *telegraph* naturally derives from the time when instantaneous communication over large distances was made possible by the making and breaking of an electrical circuit in a coded fashion. The colloquial meaning today arises from one consequence of the invention. It provided the ability (wanted or not) to have information one would normally transmit personally arrive at a distant place before one could arrive oneself. Advance (usually unintentional) warning is its meaning now.

[5]The meaning of *mapping* in this context is only a distant cousin of cartography. It more precisely reflects usage in mathematics in describing the relationship between coordinates before and after application of a transformation. An object described in one set of coordinates corresponds, on a point-by-point basis, to its transformed counterpart (or the object's image) in the new set. Thus colloquially, we can interpret mapping to imply any item-by-item correspondence between distinct categories. A discussion of the colloquial analog of transformations with singularities is beyond the scope of this article.

[6]Because the quantum theory permeates most branches of science, the word *quantum* might have crept into common usage in many ways. In fact, it is used in a way rather faithful to its origins. A minimum finite, rather than infinitesimal, amount of something (radiant energy in the first instance to avoid the ultraviolet catastrophe) is implied. Somehow it picked up the implication of a transition between states at not inconsiderable separation (see text).

[7]*Discrete* does not have a particularly different meaning in technical and nontechnical contexts but in conversation can be misunderstood as the more common and always nontechnical homophone *discreet*. Insofar as discrete quanta tend to go unnoticed, however, they are apparently also discreet.

[8]A region where elements occur continuously so that between any two there is a third is a *continuum*. The set of real numbers is one from mathematics and the allowed energy levels of an unbound particle is one from physics. It is the epitome of nondiscreteness.

[9]*Decay*, in scientific terms, is a transition of a system from its current state to one of lower energy and usually occurs naturally (i.e., without stimulation) with some probability. The probability determines the average time it's liable to take before one system does it or, alternatively, the average rate at which it occurs in an ensemble of identical systems. Assuming that not understanding is a lower energy state than understanding, *decay* is an appropriate term.

[10]A purely mathematical concept, *exponential* means a functional dependence which arises from raising a quantity to a power which incorporates the independent variable of the function. This implies that the dependence is very strong because a change in the variable causes a multiplicative rather than additive response. If the variable is time, this implies something happening very fast. There is a relationship to decay in that if the probability of decay is a constant per unit time (as in radioactive decay), then the likelihood of the decay not already having happened by a certain time is an exponentially decaying function of that time.

[11]A *core dump* is sometimes the only way to locate a bug in a computer program. It refers to reading out the entire contents (thus a dump rather than a controlled pour) of the computer's memory (the core) for examination. Contrary to its other usage, the word *core* here does not imply that the memory is at the physical center of the computer (it can be quite distant), nor does it mean that it is at the logical center, although that is true in some sense (no disparagement of CPUs intended). The word actually derives in this context from the many little magnetic cores used in the first magnetic memories to store zeroes and ones.

[12]*Nonlinear* is a more general description of mathematical behavior than is exponential. Whereas the latter specifies a certain functional form, the former simply rules out one functional form, i.e., the simplest or linear behavior. A linear function is a straight line and given a minimum of information (two points), it is entirely predictable. Systems which control processes or amplify or record signals usually operate in a linear range. Going nonlinear in an unspecified way not only means deviating from predictable behavior, but deviating along an unknown (often input dependent) functional path. In such situations, the best thing to do is to crank back on the input until a return to linearity is achieved.