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Facing an Uncertain Past Excuses, excuses, excuses!

Stan Kelly-Bootle, Author

Using my favorite Greek passive-present-neuter participle (I trust you have one, too), I offer a dramatic *prolegomenon* to this overdue column. To wit, an apology and an explanation for its tardiness. (You'll notice the potentially unending recursion,¹ since both column and excuses are late.) The apology is easy: we Brits just say "Jolly sorry, actually,"² and project a pained sincerity, whether we mean it or not.

In the broader political context, though, I have mixed feeling about the epidemic of generic apologies for past sins committed by my distant ancestors. I'm prepared to be jolly sorry, really, that we burnt the White House in 1814, provided that similar regrets are received on behalf of the damned Yankees who torched and looted York (now Toronto) in 1813. No doubt, with more Googling, I can backtrack all past tit-for-tat sequences (using Feynman's sum over histories?), although the cause-effect chain ultimately hits the prime-cause brick wall with a Big Bang. I haven't wikied *Big Bang* lately, but guess it's a stub entry demanding expansions (super-inflationary?) and first-hand, eyewitness citations. Failing these, we are left with an unsatisfactory scapegoat for all our woes: a random quantum fluctuation *in vacuo* that somehow went badly wrong. Who to blame for that?³

Incidentally, in addition to introducing the tag q.g. (*quod googlet*) as a more realistic alternative to q.v. (*quod videt*), I now propose www, meaning *written without Wikipedia*. A moment's thought will convince you that the risk of ambiguity is small. My www can hardly be taken as written with (the help of) Wikipedia, currently the universal default, implied in absentia. Clashes with Berners-Lee's World Wide Web thingy can be left to contextual disambiguation, of course. We've been running out of unique TLAs (three-letter acronyms/abbreviations) for some time, often with accidental delights. Thus, DOS started as a primitive, now-forgotten disk operating system, only to be revived as its malware synonym: denial of service.

A related area of concern in the grovel industry is where we've had no direct involvement in the evil deeds but attract blame for not having done more to discourage or prevent them. The two classes of sin are engraved on many an Anglican soul: "We have done those things we ought not to have done, and left undone those things we ought to have done. And there is no good in us." (Your locale may vary.) In the case of the GOTO disaster, I confess to sins of omission with a large dose of commission. I was there when Dijkstra warned us direly (that daunting Dutch accent), but I more or less sat back leaving Knuth and the experts to sort it out.

My own programs at the time (not by choice) were mainly spaghetti-ridden AlphaBASIC⁴ and WD16 (DEC PDP-11) assembly code, which attracted the slogan, "Branches Everywhere!" In my EDSAC days, we would ponder what, ignoring efficiency, might constitute the minimum set of machine instructions for Turing-type universal computing? The strange answer was SUB(tract) and BNEG (branch on negative). Add could be readily achieved with two Subtracts: $X + Y = X - (0 - Y)$. But, conversely, if you just had Add, it was hard to Subtract. BNEG was essential for generating Multiply and Divide subroutines.

The experts can vilify branching as a high-level programming trick, even when disguised with the use of `case` statements, but deeper down, the poor assembler writers with noses close to the chip's instruction set have little choice! It's a reminder of the ongoing authoritarian debate in the philosophy of science. Mere appeals to authority are shunned by the Popperians, even appeals to the authority of the divine Sir Karl Popper. And what to do when the experts disagree? Cynics say that if all the experts agreed, we would need only one of them. Just one volunteer, please.

The recent BP oil-rig mishap also springs to mind, even more readily than the trivial⁵ flow of Mother Nature's hydrocarbons into her infinitely tolerant gulf. The multinational directors, workers, and shareholders of the so-called *British* Petroleum are promptly contrite in both words and inevitable financial compensation. Narrowing the blame game may possibly pinpoint a failure with individuals for not following procedural rules. This in turn may inculcate the writers of imprecise regulations, who, in their turn, may dodge behind the inherent deficiencies of natural language. The buck stops where? Ask God or Chomsky, if you'll forgive the tautology.

This reminds me that my word of the month is *fungible* (pronounced *funjible*). It has moved from economics to the philosophy of science, taking on much hand-waving baggage. No surprise there. You may know that economic fungibility (not to be confused with its sibling, liquidity) refers to assets, commodities, and currencies that are essentially interchangeable: my legal dollar bill, your legal dollar bill, and anybody's legal four quarters are physically distinct but economically fungible. As far as I understand nonphysicist, nonmathematician, Popperian philosopher Elliot Temple and recent multiverse exponents,⁶ fungible is now applied to sets of parallel universes that are in some way identical—physically indistinguishable but potentially different.

You may guess that I subscribe to Nobel physicist Steven Weinberg's suspicion of excessive metaphysical speculation when it interferes with doing science. Weinberg⁷ jokingly twists Eugene Wigner's famous observation on *The Unreasonable Effectiveness of Mathematics in the Natural Science*. Out came *The Reasonable Ineffectiveness of Philosophy in the Natural Science*. Mathematician Israel Gelfand, who applied mathematics to cell structures and functions, also played with this template when he wrote *The Unreasonable Ineffectiveness of Mathematics in Biology*. Yet, according to Avner Friedman, former director of the MBI (Mathematical Biosciences Institute, Ohio State University), the gulf between biology and mathematics is narrowing as each domain tackles the language, concepts, and methods of the other.⁸ Friedman compares the complexities of physics, where the unit is the atom, with those of biology, where the unit of life is the cell, typically containing many millions of interacting molecules. There are strange echoes of that apocryphal paper on milk production that started: "Consider a perfectly spherical cow, C!" To simplify the hideous equations for the healing of real wounds subject to size, shape, and different levels of blood supply, Xue, Friedman, and Sen start with models of perfectly circular open wounds with annular regions of partial healing.⁹

No doubt, *ACM Queue* readers will share these doubts, especially about the effectiveness, or lack of, of CS (computer science), which uneasily straddles all other branches of science without knowing quite where to perch. I remind readers of the percipient and quotable views of Richard W. Hamming (1915-1998), co-founder/president of ACM, CS pioneer, and recipient of the 1968 Turing Award.¹⁰ He famously said, "The purpose of computing is insight, not numbers."¹¹ The same theme runs through Hamming's works on numerical analysis and statistics: avoid the mindless, mechanical application of standard numerical tests that can lead you away from understanding the underlying physical realities.

Hamming's own earliest exposure to computing was at Los Alamos during the development of the A-bomb. Before the first test explosion (Trinity, 1945), Hamming was presented with the equations that modeled the expected global effects of the test on the earth's atmosphere. There were real fears of Armageddon and the phrase *risk analysis* assumed a new apocalyptic urgency. Hamming led the programming effort that declared the earth would not be destroyed, and the test went ahead. It's hard to verify the details, and no doubt some urban-mythic embellishments have accrued. The only sizable computer available in 1945, as far as I know, was the relay-based Harvard Mk1. I invite reader feedback/correction. Nevertheless, the computing challenge, given the relatively primitive hardware and software, must have been Herculean (appropriately named after the demigod Etruscan bastard quite capable of global control). We may never know at which point in Hamming's calculations insight preempted the numbers! We've all stumbled over the simple IF $X = 0$ GOTO GO-TRINITY ELSE STOP-TEST, for real X . Mathematicians and computer accumulators can differ on the meaning of zero. If $X = \text{Probability \{End-of-World\}}$, some caution is advised. Hamming seems to have computed X as *effectively* zero, in that it was deemed safe to proceed with Trinity (and eventually win WWII).

Risk analysis involves the calculation $E(X)$, the expectation, $= \text{Prob } \{X\} \times B(X)$ (the estimated Benefit if X happens). For very, very,... very large negative values of $B(X)$, such as total global destruction, we can't relax unless $\text{Prob } \{X\}$ is zero or very, very,... very small. After millennia of both sloppy hand-waving and precise axiomatics, problems still bedevil our everyday, commonsense views of the infinitesimal (fleeting ghosts of zero) and the infinite (fleeting horrors of beyond the huge).

The mysterious leap from the very, very,... very large-but-finite to the actually infinite remains a singular thorn in the physicist's physical flesh. Pure, unsullied-by-philosophy mathematicians, with few exceptions, get used to the formal tricks of *Limits*, to which variables are allowed to get as close as you dare without *actually* arriving. That $1/n$, with real $n > 0$, can exceed any given finite number N by setting n small enough (viz., smaller than $1/N$) can be expressed symbolically as $\text{Limit } n \rightarrow 0, 1/n = \infty$. It's naughty, at this level, to write $1/0 = \infty$, since the usual real-number division operator X/Y is *undefined* for $Y = 0$. The beauty, and agony to many, is that mathematicians can define number systems, operators, and symbols in any damned way they like, subject only to internal, axiomatic consistency.

Truth, as Bertrand Russell said with Pythonic irony, don't enter into it! Infinite hierarchies of ever "larger" Cantorian infinities don't bother mathematicians as they juggle their symbols, whereas physics struggles with the smallest enumerable infinity, aleph-0. But that puny cardinal is big enough to make a singularity, leading cynics to say that black holes occur whenever God rashly breaks the rules and divides by zero. Do we need an infinite, or just a very large finite number, of parallel universes in the Deutsch MWI (multi-world interpretation)?

Stay tuned, and, if possible, remain in my fungible neck of the multiverse.

Meanwhile, back in the Gulf, as with all complex accidents, we face both *acts of God* (surely intended acts of commission!) and *acts of persons* (the Anglican mix). There's been talk of specific safety-valve design flaws. If so, these may still be free of human error. There are inherent limits in modeling and predicting chaotic events. Paradoxes lurk at the borders of chaos and quantum theory. That chaotic susceptibility to tiny input uncertainties can apply in some equations even when a real variable is altered by less than the usual Planck limits. Spookier and spookier, as a modern Alice might say.

Insatiable consumers of BP's products, and hydrocarbons in particular, must also confess their contributory guilt. I can't hear you. Speak louder.

Finally, I move on from apologies and excuses to offer a plausible range of reasons for the Curmudgeon's tardiness.

No, I will not play the deceased-parent-grandparent card, since attentive readers will have noticed that I have already, over many deafaids of delayed columny [sic], dealt up the six allocated excuses offered by that unconvincing ploy, stretchable, in emergencies, with dearly and timely departed steppies, siblings, wives, close neighbors, and pets. Nor, these days, can I recycle the dog-ate-my-floppy tale, made more poignant by the subsequent, painful death of my dog. Current technology, however, does offer a fresh array of excuses including crashed disks, sick servers, misrouted e-mail, malware attacks, bankrupt ISPs, burst clouds, and the undeniable clincher, conflicting versions of Microsoft Word. But, respecting ACM and its readers, I shun all such dissemblance. To borrow a non-Schiller gem from Beethoven's Ninth: *O Freunde, nicht diese Töne!* Which, in French, reads *Amis, rien de mes blagues!*; in Esperanto, *Morto al Vuvuzeloj!*; in English, *Friends, no more noisy prevarications!*; and in my native Liverpool Scouse dialect: *Gerron witchyer!* [Get on with you!].

The anticlimactic truth, hard to admit as you may have noticed, is that old devil entropy, increasing inexorably for 80-plus years with occasional nondecreasing episodes due to medical interventions. Proper poorly at times, with ischemic, noncircular, cutaneous wounds,⁹ but refusing to go gently. Elective surgery has not removed my electives.

Next month (DV): my over-overdue review of *Programming: Principles and Practice Using C++* (Bjarne Stroustrup, Addison-Wesley, 2009). ♠

REFERENCES

1. See entries at *recursion*, *endless loop*, and *loop, endless* (Kelly-Bootle, S. 1995. *The Computer Contradictionary*, MIT Press). Steve Bourne was quick to remind me that, strictly speaking, *endless recursion* was a confusing oxymoron. But when did language ever coexist with strict speaking?
2. With a grateful nod to Tony Thorne. His *Jolly Wicked, Actually* (Little Brown, 2009; Audible Books, 2010) is a playful, alphabetized glossary of the 100 English words that best characterize what we vaguely call Englishness. His title, of course, offers three familiar emblems upfront. Presumably, *bloody*, the favorite among American impersonators of English (also known as *social climbers*), was considered a tad offensive for the title in some parts of the U.S. Or, possibly, *bloody* has long been replaced throughout Anglophonia by terms of greater industrial strength. How to imprecate convincingly in non-native registers remains a socio-linguistic mystery. So far, I've reached Thorne's depressing entry at *binge* (see also *ale*, *beer*, *alcopop*, *Babycham*). I'll know more when I reach Thorne's entries at *bleeding* and *teenage mums*.
3. I'm delighted to report that the pretentious *whom* is on the way out, even among the top *London Times* editors. It's one of the few survivors of a complex Old English case-system with its Nom/Acc/Gen/Dative, Masc/Fem/Neuter noun and pronominal endings, as fussy, useless, and unmemorable as the Latin and Russian. Nobody missed the dative *whaem*, apart from a few 12th-century pop-grammarians pedants, and the disappearance of *whom* will bother only a few nitpickers, those to *who* such fossils distinguish the clever from the dumb.
4. AlphaBASIC was (is?) one of the better BASICS, boasting the predicate *Extended*. The late, greatly

missed Peter B. Fellgett joked about extended manure served with a layer of ice cream, but denied having originated the insult.

5. One early BP top-brass statement unfortunately described the leak as tiny. Semi-numerate readers have understandable trouble distinguishing large absolute numbers (millions of barrels per day) with small percentages. We don't normally think of oceanic volumes (estimated global total, 1.37 billion cubic km) in terms of standard U.S. oil barrels (approximately 159 liters). Actual percentages and their significance are left as an exercise for whomever. Hint: 1 billion cubic km is 10^{21} liters. Given the uneven distribution of effluent, fish, birds, anglers, and beachcombers are likely to view the calculations differently. I'm loath to mention one widely circulated picture of an apparently oil-stained, Floridian bird. Ornithologists rushed to explain that this was a healthy fledgling Ibis in its natural light-brown plumage. It was equally unscientific, of course, for the deniers to deduce that no birds were injured.
6. I'm still awaiting preordered delivery of a coherent, horse's-mouth account from David Deutsch's *The Beginning of Infinity*, the sequel to his *Fabric of Reality* [this column, *passim*].
7. Weinberg, S. 1993. *Dreams of a Final Theory: The Scientist's Search for the Ultimate Laws of Nature*. Pantheon. To be fair to Weinberg, he does value the philosophical speculations of Russell, Wittgenstein, Polkinghorne, and others with a mathematician's or physicist's grounding.
8. Friedman, A. 2010. What is mathematical biology and how useful is it? *Notices of the American Mathematical Society* 57 (7).
9. Xue, C., Friedman, A., Sen, C. K. 2009. A mathematical model of ischemic cutaneous wounds. *PNAS* 106: 16782–16787.
10. Hamming, R. W. 1980. The unreasonable effectiveness of mathematics. *The American Mathematical Monthly* 87(2): 81-90.
11. Hamming, R. W. 1971. *Introduction to Applied Numerical Analysis*. McGraw Hill.

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