Yes, We Have No Standards

Have you ever casually discussed respective vocations with a technologist whose home professional organization is ASTM, SAE, or the like? If you have, as I did just the other day, you must have noticed that their reference frame is a web of "standards." These are criteria that must be satisfied by a product or component and the protocols prescribed for determining if they are met. Remember when "mil-spec" was a world unto itself where great sums of money were spent, on tanks and toilets alike, to meet the exacting specifications of the military defense establishment? Strength, efficacy, safety, consistency, reliability, and compatibility all rely on standards. How did you hold up your end of the conversation when it turned to your profession? Well, all I could muster when faced with questions about the standards in my bailiwick was to explain that out here at the frontier where we are uncovering the secrets of nature, nothing is certain enough to be hemmed in by standards. After all, we need our unfettered creativity. So, I protested to my incredulous friend, "Yes! we have no standards." Sounds more like a confession than an explanation, doesn't it?

It is true that infant innovations just making their way out of the lab don't start with universal specifications. They and their manufacturing processes may eventually adopt some if they are inserted into commerce where failure to perform properly has unacceptable consequences. It's a bit messier though back in the lab. We do, however, have standards of sorts. We call them ethics, or ideals, or principles of the scientific method, and they may apply as much to our behavior as to the products of our work. We have proper ways of verifying and reporting our research results. We have proper ways to acknowledge sources, to reveal assumptions, and to distinguish interpretation from speculation. We use standard, internally consistent systems of units and have naming conventions for everything from organic molecules to planetary bodies. And, we spend more energy ruling out than ruling in potential conclusions. We have, for the most part, learned these more as traditions handed down from professor to student. The creation of offices of scientific integrity in government agencies reflects how serious even perceived breaches can be viewed.

So, I must retract my impulsive, cut-and-dried contention. Not only do we have standards, but they are so intimately entwined with human behavior that perhaps we should envy the simple ones that merely keep our bridges and buildings intact.

Temporal Quanta

It's a wonder that anyone has time to wonder about time. We've chewed at the fringes of the concept before in these pages when we complained that subjective calendars and anniversaries are not as fundamental as their advocates suppose. What is then fundamental about time? I have not, for lack of time, kept up with the current thinking of quantum or relativity theory on the matter of time. For that matter, I'm not sure I'd believe the current thinking anyway because such forefront theories come and go from time to time. I did muse, however, about whether anyone believes time is quantized. They would posit that time is not indefinitely divisible into smaller and smaller amounts of itself. It's a little unnerving to think that there is a minimum unit of time like $h/\Delta E$ where h is Planck's constant and ΔE is, say, the energy of the universe, to pick a big number.

This would mean that the so-called flow of time that poets rely on is actually jerky—a sort of stick-slip progression of events. (It may feel that way after two too many cups of coffee, but we'll defer consideration of that phenomenon to a future article on artificial intelligence.) Just think of the implications. The "decisive moment" in photography could occur incommensurably with the universal ratcheting of time and not be a moment at all. In fact, much of our understanding of the universe is based on the sampling of events at some rate. We could be missing all the really interesting stuff.

Skeptics out there are surely thinking that we live at a macroscopic level compared to this hypothetical phenomenon, that we can't even observe, and we will continue to do just fine experiencing its stochastic average. Perhaps so. But beware of analogies to liquid helium and superconductivity, not to mention relativistic time dilation. Not that far back in time, there were those who thought the quantized angular momentum and energy states in atoms and molecules would stay small—then a fountain of macroscopic quantum states appeared meeting little if any resistance. Dare I suggest that this may have already happened in the case of temporal quanta? From our myopic frame, we may see the temporal quanta as infinitesimal. But, who is to say that, from a cosmological frame, one quantum of time does not separate the last big bang from the next?

Given this degree of ignorance, we are free to define our own quanta. The archaeologists and paleontologists can choose eons. The politicians can choose thirty-second sound bites or legislative sessions, and they should tell us which they prefer to help us vote intelligently. The rest of us can go back to calendaring the hours, days, weeks, months, quarters, years, and generations, but with a new appreciation for the missing moments in between.

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Science is the Answer

(Circle all that apply)

1. What is the real thrill in scaling a mountain?
   a. Getting to the top
   b. The potential drop
   c. Bragging rights
2. After completing therapy, you can be
   a. A good insurance risk
   b. A sound engineer
   c. A lot happier
3. To be more prolific than Einstein, you must be
   a. A genius
   b. A high-energy physicist
   c. Very intimidating
4. It's easier to be the life of the party if you are
   a. Uninhibited
   b. A social scientist
   c. Still standing when it's over
5. The main reason for frequenting a singles bar is
   a. The decibel range
   b. The interaction potential
   c. The coupling constant
6. Virtual laboratories employ
   a. Physical chemists
   b. Synthetic chemists
   c. Organic chemists
7. The best organized researchers are
   a. Also boring
   b. Systematic biologists
   c. Always punctual
8. Least likely to join a movement is
   a. A clockmaker
   b. A stationary engineer
   c. An orchestra

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