

IN A WORD

The Germans have the art of making science inaccessible.

Johann von Göthe (1833)

‘When I use a word,’ Humpty Dumpty said in rather a scornful tone,
‘it means just what I choose it to mean—neither more nor less.’

‘The question is,’ said Alice, ‘whether you CAN make words mean so
many things.’

‘The question is,’ said Humpty Dumpty, ‘which is to be master—
that’s all.’

Lewis Carroll (1871)

We must be clear that, when it comes to atoms, language can be
used only as in poetry.

Niels Bohr (1922)

Words change an idea by definitions too precise.

Mary Stewart (1973)

The pure mathematical research literature is virtually impenetrable
to outsiders.

John Barrow (2007)

There is no such thing as ambiguity-free language.

Jila Ghomeshi (2010)

It’s not that he’s not here that ticks me; it’s that he gets paid for time he doesn’t do. No questions asked as I co-sign his checks. And so none answered. Does she know? All I know is that he knows I know. To be fair it isn’t all his fault. He’s not my boss. She’s got it so that I control his information. Of course he could find his own. But then, I see he can’t. He finds this situation irksome. The interesting thing is when it comes to Frankly Fiction this is not a problem. It’s clear from the start, whenever that was, that between us he’s the boss.

It’s slowly getting through to Frank (the real Frank I mean) that there’s a language problem. Especially for him. It’s one more thing that has him feeling awkward. I know the feeling when to buy a bus pass takes a guidebook like the tourists use. So I do a kind of guide for him on languages in physics land. Its first rule is: In language all can hinge upon a misperceived inflection.

Yiddish linguist Weinreich is the first to say a language is a dialect that has an army and a navy. Or so it’s said. He says it in Yiddish. He says that another said

it first. Whatever. With no military, physics manages a language of its own. With words like 'canonical'. It's standard English; *Encarta* says it means 'conforming to accepted principles or standard practice'. But in physics it's a word that stakes a claim for the establishment. It's vague but physics flings it into print a hundred times a day. It comes across as meaning: 'If you don't know what I'm saying I am not about to tell you.'

Physics has so many dialects some physicists don't understand what they are saying to themselves. What's canonical to one sub-specialty can be confusing to another. It's like living in the Balkans. Most embrace an old solution to the language problem: Never travel far from home.

Wittgenstein tilts in the opposite direction. Inheriting vast wealth in the early 1900s he survives the First World War as a prisoner. It gives him lots of time to ponder language. He comes up with the notion language is the basis of all thought. At first he says its function is to reflect reality; that words' meanings flow from their associations with real things. Later he abandons this idea. Instead he says words' meanings flow from function. That is, from how they're used. Meaning, in other words, depends on people's choices. Humpty Dumpty could have told him this.

Physicists are noted for loose choice of language. They conceal linguistic sins behind impenetrable jargon. Consider this admission from Rovelli who, for a physicist, is careful with his language:

"The quest for quantum gravity can be separated into three main lines of research. ... They are often denoted 'covariant,' 'canonical,' and 'sum-over-histories,' even if these names can be misleading and are often used interchangeably. They cannot be characterized by a precise definition."

At least Mary Stewart would be pleased.

But physicists are mostly searching for precision. Math is their way of doing it. Humpty would have been at home in mathematics. In math, x means exactly what its master says it means and nothing else. Of course, math is as Poincaré would say another language. He goes so far as to ask, 'Is not our Euclidean geometry in itself only a kind of convention of language?' And, like x , the symbols of math language are defined in—guess what?—ordinary words. Mostly English. *Manchmal Deutsch. Et, after Poincaré, rarement français.*

QM causes Bohr to study scientific language. He's influenced by Wittgenstein. Famously he says we are suspended in our language so we can't say what is up and what is down. He works with ordinary words (in German and a bit of English). But ever he retreats to speak of 'classical' equipment—hokey boxes, shutters, clocks and pointers—that he says must measure the result of an experiment. He *speaks* of this but doesn't actually *use* it. He insists upon tight terminology. He

says that ‘the word reality is also a word, a word which we must use correctly.’ It’s as if to say: When I use a word you must use it my way.

As I read around I find most physicists feel free to go their own way. I like it but it’s not good news for Frank. How to tell him? Smolin lends a hand. A few years back he writes a piece on LQG, in hope, he says, ‘that perhaps some who have avoided thinking about background independent theories might consider doing so now.’ In other words, he’s writing a recruiting poster. Its message: Uncle Smolin Wants *You* for the War for Independence. He uses what for physics passes as beginner’s terms. Here is his pitch for what he calls The Basis of Loop Quantum Gravity:

General relativity and supergravity, in any Spacetime dimension greater than or equal to $2 + 1$, can be written as gauge theories, such that the configuration space is the space of a connection field, A_a , on a spatial manifold Σ . The metric information is contained in the conjugate momenta. The gauge symmetry includes the diffeomorphisms of a Spacetime manifold, usually taken to be $\Sigma \times R$. The dynamics takes a simple form that can be understood as a constrained topological field theory. This means that the action contains one term, which is a certain topological field theory called BF theory, plus another term which generates a quadratic constraint.

So when he walks in late this clip is waiting on his desk. He turns to me a look that says: You’ve lost your mind! I say: Physics is freemasonry, all symbols and strange words. My next task is to show how physics is in love with math. It isn’t easy to convey to him how mathematical the physics landscape is. I’m hoping Smolin’s wordy paragraph will do the job. The italics are all mine—more than twenty special terms. Each means something more or less precise that’s based on underlying math. If I hooked them up as hypertext, Frank could click each special term and see its definition. Thing is, each click would lead to more such terms, each with more clicks.

Ultimately physics like philosophy’s about ideas. One difference is that physics dresses its ideas in math. The math of each sub-specialty excludes all those who do not know it. Smolin’s poster piece is an exception. Mostly it’s *not* dressed in math. He wants to interest more physicists in its ideas. In other words, I say to Frank, this is physics that’s dumbed down.

It’s odd: Most physics papers that I read are mostly words; yet everywhere I read that math is physics’ natural language. Humpty says why physics needs math language in just fifteen words. He uses them to mean what readers think they mean. But, like he says, he could have used them to mean something else—anything he feels like using them to mean. This loose way with words is not confined to math and physics. Check any Tax Act. That a meaning can’t be found in

any dictionary on the planet doesn't bother lawyers. They use Humpty's method. Thus they can manufacture meanings more precise than any word already in existence. This makes work for lawyers but it also narrows the potential for misunderstanding. Of course, even with the benefit of Humpty, lawyers argue over words. In this law or that contract clients pay them well to argue if they think it may make money sense. Large sums can hinge upon the placement of a comma or the meaning of a word. So, what's in a word?—maybe megabucks.

What does this have to do with him and how the universe began? Well, physicists build physics slowly, brick by ideaistic brick. If a brick is later found to be defective, chunks of physics structure may fall down. So though physics by its nature may be avant-garde, physicists by circumstance tilt to conservative. Unlike lawyers, they aren't paid to argue about words. Pondering some physics proposition, even more than lawyers they must know exactly what it means.

Mathematics is a language that's adapted to this need. It's designed to narrow down to zero any leeway for misunderstanding. Physicists view reasoning in math as more reliable than the same reasoning in words. Some even say that words are so embedded in experience they can't be used for physics. Only with math language can they, in von Neumann's words, satisfy 'the requirements of mathematical rigour. And only a math language can show up exactly where these requirements are not satisfied.'

The 20th century sees physics take on math as its intrinsic language. Today a dwindling coterie of physicists engage with their roots in philosophy. They see that, just as the strict symbologies of math serve vital needs in physics, so does the languid language of ideas.

Frank has no math. And if he did, it wouldn't suss out the Beginning. But words can do what math cannot. Words can roam across a landscape of ideas. Words can explore with marvelous facility concepts that, exposed to view, take math years to figure out with rigor. Even physics' Standard Model doesn't meet *this* standard yet.

One last word for him on words: The language of the scientific revolution isn't English. Poincaré kicks off relativity in French but Einstein gets it up to speed in German. By 1900 *Hochdeutsch* is the standard dialect for physics. *Quantenmechanik's* brought to life by German speakers. It's not only publications, it's formative discussions between colleagues too. They express Germanic modes of thought. The word quantum's origin is German; it's like quantity but bears an extra sense that it's precise. Frank Herbert says, 'Ideas imbedded in a language require that particular language for expression.' Glenn Gould gives an extreme example. He says of silences in music: 'German silence is organic as opposed to French silence which is ornamental.'

Language structures like verb moods or tenses show how the shared history of a people shapes its shared perceptions. The Pirahã in Brazil have no word for 'one'. So no arithmetic. They cannot think—they cannot do—one plus one equals two. Think on this, I say: If you have no word for something you can't *think* about it. In his business it's a hidden handicap.

By the latter 1900s English is the language of the sciences. It brings with it English-think. But it brings no standard dialect to physics. By then physics is itself fragmented.

What seems obvious to me—but not to him—is the language that he needs. It's not the English of philosophers; it doesn't get them to the crux. It's not the trying-to-be-rigid words and formulas of physics. It's not math. What he needs is fervid fictional-detective language. That's the glot we want.