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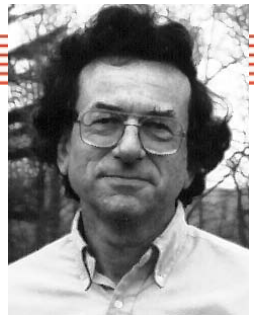

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Fifteen years ago, I mused in a Reference Frame column on how different generations of physicists differed in the degree to which they thought that the interpretation of quantum mechanics remains a serious problem (PHYSICS TODAY, April 1989, page 9). I declared myself to be among those who feel uncomfortable when asked to articulate what we really think about the quantum theory, adding that "If I were forced to sum up in one sentence what the Copenhagen interpretation says to me, it would be "Shut up and calculate!"

In the intervening years, I've come to hold a milder and more nuanced opinion of the Copenhagen view, but that should be the subject of another column. The subject of this one is the habit of misquotation or misattribution that afflicts our profession, a rather different example of which I pointed out a few months ago (February 2004, page 10).

Given my capacity for intellectual development ("inconsistency," in the terminology deployed in the current American political season), it's fortunate that I've now reached an age at which I tend to forget about things I've written more than a few years ago. Indeed, I find it downright irritating when somebody asks me questions about papers I wrote a mere half dozen years ago, naively identifying me with the author of those ancient texts. Until quite recently, I had no memory of ever having written such a childishly brusque dismissal of such an exquisitely subtle point of view, much less of having published it in so widely read a venue.

This amnesia, combined with the evolution in my thinking that had distanced me from my long forgotten words, may explain why I was initially somewhat puzzled by the slight sensation of discomfort that passed over me when, browsing the e-print archive earlier this year, I read a characterization of Max Born's probability rule as "the favorite ingredient of what has been nicknamed, after Feynman's famous dictum, the shut up and calculate interpretation of quantum mechanics."

I yield to nobody in my admiration for Richard Feynman's aphorisms on the nature of quantum mechanics. Indeed, long ago I published a poem (PHYSICS TODAY, April 1985, page 47) consisting of nothing more than a resetting as verse of a paragraph Feynman had written about his own attitude toward the quantum theory, in his now (but not then) famous article that launched the whole field of quantum computation. I like to think I have devoured everything Feynman ever wrote on the character of quantum mechanics.

But while "shut up and calculate" sounded dimly familiar to me as a characterization of a certain interpretive stance, I couldn't recall where Feynman had written it. Mulling this over, a terrible thought began to dawn on me. Could it be that I myself had once used the phrase? If so, then it would appear that I had picked it up from something by Feynman, forgotten the source, and presented it as my own. Devastating!

It was devastating because I have a horror of writing or uttering any witticism that is not original with me, unless I make it absolutely clear where and (if known) from whom I got it. I don't even like to tell jokes unless I've made them up myself.

(I digress to offer you my favorite:

> Question: What is the difference between theoretical physics and mathematical physics?
>
> Answer: Theoretical physics is done by physicists who lack the necessary skills to do real experiments; mathematical physics is done by mathematicians who lack the necessary skills to do real mathematics.

Mathematical physicists tend not to like this joke, but other physicists seem to. Nonphysicists, of course, are entirely immune to its charms.)

So with growing trepidation, I searched through my past writings on quantum mechanics. I was dismayed when I came upon my 1989 column, which confirmed my worst fears. Not only had I appropriated without proper attribution a Feynman quote, but it appeared to be a famous one. How humiliating! I was afflicted with visions of knowledgeable PHYSICS TODAY readers shaking their heads 15 years ago at what must have struck them as my shameless attempt to ride to literary glory on the unacknowledged shoulders of Feynman.

So I went to the Web to find the source, hoping I could then salvage my reputation by persuading PHYSICS TODAY to print an addendum or erratum. Google gives more than 130 hits containing both "shut up and calculate" and "feynman." Most of these do not directly link the two, but about a dozen do. Here are a few:

> "Shut up and calculate" was a motto of Richard Feynman.
>
> For example, there's Feynman's "shut up and calculate."
>
> My personal philosophy is that of the famous physicist Richard Feynman, who said: "Shut up and calculate."
>
> When asked which interpretation of QM he favored, Feynman replied "Shut up and calculate."
>
> Richard Feynman foreslog ligefrem en "shut up and calculate" fortolkning af kvantemekanikken.
>
> Shut up and calculate—Richard Feynman.

Just to make sure, I also searched for "shut up and calculate" and "mermin." I found only 10 hits, all of them mentioning me in ways that had nothing to do with their use, elsewhere, of "shut up and calculate." So it would have been clear to the world that I had

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indeed passed off Feynman's words as my own.

Or had I . . . ?

I noticed that not a single one of the Web sites attributing the phrase to Feynman cited a source or hinted at the circumstances under which he had said it. A ray of hope flickered on: Could I once again have become a victim of the Matthew effect?

The Matthew effect was enunciated by the great sociologist of science, Robert Merton.[1] Merton worked in those innocent days when sociologists were interested only in the behavior of scientists and not in the content of their science. (To be fair to contemporary sociologists of science, I should modify that last phrase to "and not in the manifestations of that behavior in the content of their science.") I first learned of the Matthew effect more than 20 years ago, on the occasion of my first and, perhaps until now, only, victimization at the hands of the *New York Times*.

I learned the name for what the *Times* had done to me when I received a very nice note from P. W. Anderson in which he expressed his regret that the newspaper had given him exclusive credit for a nomenclatural advance that was entirely due to me. "A depressingly typical example of the Matthew effect" was how he characterized the misattribution. (I reported the entire history of this contretemps in these pages back in those dark ages [April 1981, page 46] before there were Reference Frame columns.) When I wrote back asking him what the Matthew effect was, he referred me to Merton.

It was Merton who identified and named the tendency always to assign exclusive scientific credit to the most eminent among all the plausible candidates. At least I hope it was he, though I'm sure Merton, who invented many wonderful jokes himself, would have been delighted if the credit for it turned out to be misattributed to him. Merton named the effect after the Gospel According to Matthew, because there it is written,

> For unto every one that hath shall be given, and he shall have abundance: but from him that hath not shall be taken away even that which he hath.
>
> —Matthew 25:29.

Could the widespread attribution of my wretched witticism to Feynman be another instance of this same deplorable practice? Had I once again been matthewed?

Although I didn't say so in my old Reference-Frame article, what inspired this not so terribly bon mot were vivid memories of the responses my conceptual inquiries elicited from my professors—whom I viewed as agents of Copenhagen—when I was first learning quantum mechanics as a graduate student at Harvard, a mere 30 years after the birth of the subject. "You'll never get a PhD if you allow yourself to be distracted by such frivolities," they kept advising me, "so get back to serious business and produce some results." "Shut up," in other words, "and calculate." And so I did, and probably turned out much the better for it. At Harvard, they knew how to administer tough love in those olden days.

This bit of history is relevant to the question of whether Feynman's abundance might have been augmented by a portion of the little that I had. Can you imagine the young Feynman ever having had a similar experience that seared "shut up and calculate" into his tender consciousness? No, of course you can't! Nobody could ever have had the slightest reason to direct the best human calculator that ever was to shut up and calculate.

But perhaps Feynman was offering such advice to others who were searching for a better understanding of the quantum mechanical formalism. I can't believe that. He said that he "always had a great deal of difficulty understanding the world view that quantum mechanics represents," and added, "I still get nervous with it."[2] Nobody who felt that way would ever respond with "shut up and calculate" to conceptual inquiries from the perplexed.

Well maybe Feynman, like me, was merely dismissing an interpretive position of others by lampooning it as a "shut up and calculate interpretation." I find this unlikely. For one thing, his strong preference for working things out for himself and, of course, his well-known disdain for philosophy make me doubt that he ever paid much attention to the interpretive positions of others. For another, would one for whom calculation was so effortless and understanding so important be likely to translate anybody's admonition against fruitless speculation into such terms?

In short, I suspect that it is only Feynman's habitual irreverence that has linked him in the minds of many to the phrase "shut up and calculate." Who else among the high and mighty—and Merton has taught us that it is only among the high and mighty that people tend to look—could have said it? Albert Einstein? Don't be silly. Erwin Schrödinger? Of course not. Niels Bohr? Don't make me laugh. None of them besides Feynman could have said it. Does that mean that Feynman said it? No!

Broaden the search to embrace the low and powerless. Among them am I, who hereby put forth the hypothesis that I was the first to use "shut up and calculate" in the context of quantum foundations. I'm not proud of having said it. It's not a beautiful phrase. It's not very clever. It's snide and mindlessly dismissive. But, damn it, if I'm the one who said it first, then that means I did not, even unconsciously, appropriate the words of Richard Feynman and pass them off as my own. So I have nothing to be ashamed of other than having characterized the Copenhagen interpretation in such foolish terms—a lesser offense than unconscious plagiarism, in my moral bookkeeping.

So, dear reader, if you have evidence that Feynman really did say "shut up and calculate," please send it to me. I will not be happy to receive it. I'd rather be a Matthew victim than a plagiarist. But I'd like to know the truth.

## References


1. R. K. Merton, *Science* **159**, 56 (1968).
2. R. P. Feynman, *Int. J. Theor. Phys.* **21**, 471 (1982). ■