



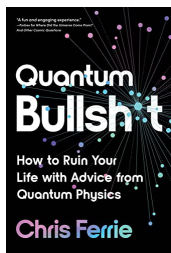
**BOOK AND  
MULTIMEDIA  
REVIEW**

# Quantum Bullshit: How to Ruin Your Life With Advice From Quantum Physics & Farewell to Reality: How Modern Physics Has Betrayed The Search for Scientific Truth

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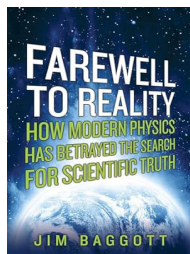
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Farewell to Reality: How Modern Physics Has Betrayed The Search For Scientific Truth Pegasus Books

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## CONTEXT AND AUTHOR DISCLOSURES

Ever since I encountered quantum mechanics while studying chemistry, I have felt uncomfortable and culpably ignorant about it, not only because I don't know how to do the calculations but because I simply don't understand such things as "the collapse of the wave function," and Schrödinger's cat which is neither dead nor alive, and the phenomenon of entanglement, to mention just a few of the points.

I regretted my ignorance even more as quantum matters were referred to by speakers at SSE meetings and by authors in the *Journal of Scientific Exploration*. At the same time, I could discern that a host of writings for a general audience invoked quantum matters in ways that were surely inappropriate and intended to impress rather than to expound and explain.

So when it was suggested that I review a book entitled *Quantum Bullshit* (henceforth "QB"), I welcomed that as the opportunity to become enlightened.

But the book immediately made a bad impression when what is presumably the preface bears the title, "What the F\*\*\* is this book?" But I persisted and read the whole book, in which every paragraph is sprinkled with four-letter nouns or their adjectival forms.

I remain puzzled by this, as the author is an apparently acclaimed and successful author of children's books that are published by the same publishing house as QB: "Sourcebooks' mission is to reach as many people as possible through books that will enlighten their lives. **We are an independent, women-led publisher bound together by the idea that Books. Change. Lives.** ... We're proud to be your hometown publisher [bold in original]."<sup>1</sup>

Since QB not only offended in its presentation but also failed to dispel my ignorance about Quantum matters, I looked elsewhere, and came upon the truly excellent *Farewell to Reality* (henceforth FR) published a decade earlier and also reviewed in the following.

## CONTENT OVERVIEW

QB has no table of contents, index, or bibliography, and those lacks are not properly made up for by two-and-a-half pages of end-notes, about half a dozen for each of four (out of eight) of the chapters.

I can only suppose that the book was intended to be written in a conversational style to make it widely accessible, but I doubt that anyone has ever spoken in this fashion. Four-letter words, used appropriately, can surely serve as emphasis; but any such



purpose is lost with such constant repetition.

The substance of *QB* is also entirely disappointing. Chapter 1 purports to explain energy and does so by means of the famous equation  $E=mc^2$ . "It's measurable. It's precise. An ancient life force permeating the universe, on the other hand, it is not. ... [though] The idea of a supernatural energy source survives today ... [and] is demonstrably *nonscientific*, meaning it can be shown to have no basis in reality" (p. 3).

If this were really a conversation, I would ask the author to comment on how exactly this was shown. And what might his opinion be about the "dark energy" presently so beloved by cosmologists?

The apparent intention to keep things simple also leads to wrong statements: "The color with which the thing glows is the same *no matter what it is made of*" (italics in original; p. 5).

No. That is true only of *hypothetical* "black bodies". Were the author a chemist rather than a quantum physicist, he would know that an excellent way of identifying a non-hypothetical substance is by observing the spectrum of colors emitted at sufficiently high temperatures — a spectrum, by the way, whose interpretation was an important result of the development of quantum mechanics.

Chapter 2 is about particle-wave duality.

Chapter 3 is about the uncertainty principle and includes a diatribe against physicists who "earn a lot of money spilling pretentious words and deep thoughts on pages in the hopes of being admired as public intellectuals" by writing popular quantum-physics books like those in "the list in the preface" (p. 74).

But only five titles are cited in that preface, and Ferrie writes, "I've read at least one of these . . . and it wasn't all bad" (p. xiii). Those titles are compared to titles of books on economics; "Notice the difference?"

I confess that I could not understand what this overall difference is supposed to be and to signify. The paired titles are *The Quantum Astrologer's Handbook* and *The Wealth of Nations; Through Two Doors at Once* and *Capital in the Twenty-First Century; Beyond Weird: Why Everything You Thought You Knew about Quantum Physics is Different and Thinking, Fast and Slow; Quantum Enigma* and *Nudge: Improving Decisions about Health, Wealth, and Happiness; Reality is not What it Seems* and *Freakonomics*.

The last section in this chapter is headed "The Real Secret of Quantum Uncertainty — No Jokes This Time". It explains that quantum cryptography is a straightforward application of the uncertainty principle; "Intercepting and reading a message written onto quantum objects, like electrons or atoms or whatever, is a *measurement* . . . the hacker can't actually read the message without forcing a detectable change in the medium it is being transmitted

in. Unlike existing technology, quantum physics makes communication perfectly secure!" (p. 76).

But this does not claim that the hacker cannot read the message, only that its interception will be noticed. That is hardly 'secure communication'. Moreover, I believe that other readers besides myself would like to know how messages can be written onto electrons or atoms.

Chapter 4 is about Schrödinger's cat, though the chapter's title is "That f\*\*\*\*\* zombie cat". Again, I came away puzzled rather than feeling informed; for example, "Once you internalize quantum physics, it's the states of objects in classical physics that seem weird" (p. 87).

Chapter 5 (Faster than f\*\*\*\*\* light) is similarly unenlightening about entanglement, which it would really be good to understand. Chapter 6 quite appropriately denigrates multiverse theories.

Chapter 7, by contrast to the rest of the book, gives a reasonable exposition of everyday applications of quantum theories, including a good description of what a qubit is (p. 159 f.) — it is nice to have since we can expect to hear more about quantum computers and quantum cryptography in the future. And the concluding chapter 8 at last acknowledges that the prime aim of the book was more to expose B\*\*\*\*\* than to expound quantum physics. But there are innumerable types of b\*\*\*\*\* that we need to be on guard against; in my opinion, most advertisements, and perhaps especially those about prescription drugs, are far more dangerous than is misleading appropriation of the term "quantum".

*Farewell to Reality*, by contrast, is a well-written, highly informative account of modern theories in physics.

I have read in many places the caution that what we experience through our senses is not an actual external, objective reality but rather our interpretation of what our senses pick up, a caution often illustrated by Plato's analogy of shadows on the wall of a cave. But I do not recall seeing in other places than *FR* the same caution extended to "scientific" observations.

I had also not learned from other sources that wave-particle duality has actually been demonstrated through wave-like interference effects with objects of dimensions as large as millimeters (p. 55).

*Understanding* something depends on having experience of sufficiently similar things that one's intuitions about it can be reasonably reliable, and Baggott points out that most or perhaps all human beings are unable to have genuinely good intuitions about what physics theorists deal with when "time" is considered to be a "dimension" fully equal in every way to the three dimensions with which we are familiar — let alone the theories that multiply the numbers of purported dimensions.

Physics and science cannot tell us about what things

really are; they can tell us only about “an empirical reality of things-as-they-are-measured” (p. 129). Rather than say, “that was a Higgs boson”, we should say only “that behaved as though it was a Higgs boson”; or even better, “Those observations were what we would have expected from a Higgs boson”.

Part I of *FR* expounds ‘the authorized version’, the contemporary mainstream view. This is an informative exposition of the ‘standard model’, though it makes by no means light reading. Baggott makes quite clear the problems associated with trying to gain an *intuitive* understanding of the basic entity of quantum physics, the wave function. Wave-particle duality, described by the wave function, signifies that what we describe as a particle “can have probabilities for being in many different places (although thankfully, it can’t have a unit or 100 percent probability for being in more than one place at a time)” (p. 132).

Part II of the book, “The Grand Delusion”, describes the attempts by theorists to go beyond the standard model with such mathematical ventures as supersymmetry, or a multiple-universe interpretation of quantum theory, or the notion that the universe is somehow a holograph; all of which Baggott terms “fairy tale physics”, in which he includes the so-called “anthropic principle” in which the fact of human existence is taken to say something about the real universe. Baggott is quite forceful in his critique of “intelligent design”, whose *raison d’être* draws on the same non-scientific concept as the strong form of the anthropic principle (pp. 270 ff., 283)

As Part II of *FR* expounds the far-fetched attempts to ascribe some sort of intuitively meaningful physical reality to mathematical structures and equations, I was reminded of Fred Hoyle’s science-fiction classic, *The Black Cloud*, whose denouement suggests that human minds are incapable of understanding the universe in which we think we exist. *FR* illustrates the floundering of fairy-tale physics with such zingers as “The multiverse theory is justified by superstring theory but superstring theory cannot be proved because we live in a multiverse” (p. 230).

Fairy-tale physics may be nothing more than abstract mathematics; or perhaps “the irreducible stuff of the universe (or multiverse) ... [is] information” (p. 235); and the concept of information has very close ties to our concepts of entropy and probability (p. 242 ff.).

Baggott points out that Grand Delusions have been quite ubiquitous, and that “‘cleverness’ . . . is almost a prerequisite” (p. 289), citing Mackay’s classic, *Extraordinary Popular Delusions and the Madness of Crowds* (1941). As Steven Weinberg noted, referring to post-modernist and social-constructivism, “You have to be very learned to be that stupid”<sup>2</sup>. Baggott gives as an example (p. 289 ff.)

the sophisticated mathematics that led to the financial crash of 2008. He also worries that the pontifications of eminent fairy-tale physicists will erode the understanding that *science* deals with *testable* reality (pp. 291-4).

## PROS, CONS, AND THE BOOKS’ CONTRIBUTIONS TO THE LITERATURE

As already made clear, *QB*, to my mind, is a blot on the published literature, whereas *FR* is a highly informative exposition.

That contrast may make appropriate here a reminder of how *unreliable* are the ratings and ‘reviews’ on Amazon.com: *QB* is rated at 4.2/5 on Amazon.com, with 60% of the judgments at the highest possible level, 5-star; the infinitely better *FR* is rated 4.3/5 with 54% of the ratings 5-star.

Baggott’s analytical discussion makes plain that we should always bear in mind that such postulated entities as electrons are *interpretations* so that a defensible and accurate description of reactions involving “electrons” would be, “that was *as though* electrons . . .”. We are not entitled to presume that the real stuff of objective reality consists of things like the particles or waves with which we are familiar. Perhaps, as Baggott suggests, the stuff of reality is *information* — which reminded me that Bob Jahn ventured to suggest some explanations of some of his experimental results in terms of information.

Also worth taking away from *FR* is the reminder that information, entropy, and probability are closely coupled concepts. Perhaps attempts at an intuitive understanding of quantum matters would become better if couched in those terms rather than in imaginary mathematical structures.

One aspect of quantum phenomena that has always bothered me is that those phenomena are supposed to pertain only at some sub-microscopic level. But where is the dividing line of dimensions above which “normal” non-quantum effects are observed? It seems inconceivable that such a sharp discontinuity could be real.

I described this dilemma or conundrum long ago, with reference to electrode potentials and solubility products (Bauer, 1990). All experimental results are consistent quantitatively with the equations or calculations describing these phenomena, and there seems to be no reason to expect or to postulate that these relationships break down at some point when the electro-active species, or the soluble substances, are present in amounts that the equations would calculate as less than an atom or molecule.

Drawing on Baggott’s analysis, this conundrum could be resolved if one habitually used the language of “as

though". Indeed, that is what Martin Fleischmann did when he pointed out that a sufficiently large electrode over-potential (away from equilibrium) would correspond to the sort of pressure environment that subsists in the core of the Sun and would therefore make possible nuclear transformations at ordinary temperatures, what was at first described as "cold fusion"; and which does seem to have garnered impressive empirical support (Goodstein, 1994).

### RECOMMENDATION

Get *FR* and recommend it to others. Warn everyone you know against *QB*.

### ENDNOTES

- <sup>1</sup> <https://read.sourcebooks.com/about-us.html>  
<sup>2</sup> *Bull. Amer. Acad. Arts & Sciences* 49 (#3, December 1995) 51-64(at 63).

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