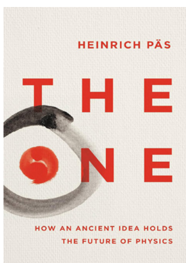
Journal of Scientific Exploration
Anomalistics and Frontier Science

BOOK REVIEW

The One: How an Ancient Idea Holds the Future of Physics

Fred Alan Wolf
fawolf@ix.netcom.com



ISBN 978-1541674851

https://doi.org/10.31275/20232995

PLATINUM OPEN ACCESS

Heinrich Päs, a German physicist, has put forward perhaps a somewhat conflicting point of view of today's physics. Surprisingly, this "One" view, pointing towards the possible future of physics, rests on an ancient concept called *monism*—the idea that oneness or singleness is the basis for all that is.

The One is a well-researched and very well-written treatise containing nine chapters, 357 pages, 741 footnotes, and numerous references and recommendations for further reading. Päs, although a native German speaker, writes very well in English and is an engaging story-teller about the early discoverers and discoveries of quantum physics—which proves to be the important cornerstone to his monistic thesis. But just how and why this singular viewpoint arises takes the reader along many different and sometimes entangled paths. Nevertheless, this is an interesting and valuable book for anyone interested in the history of ideas and especially how our modern views of physics, and especially quantum physics, play a very special role. Let me explain a few of the points he raises—there are several I won't cover in this review dealing with the religious views brought forward by Päs.

In "The Hidden One" he offers several perhaps surprising anecdotes about the "fathers" of quantum physics, circa 1920s, struggling with what this "new physics" had to mean. Included in the list are, of course, Albert Einstein and his many discussions with Niels Bohr, Werner Heisenberg, and many other luminaries of this *new* physics. Up to then, it was widely believed that observed phenomena—brought forward by experiments—simply existed "out there" regardless of what idea or theory we had about them. Einstein upset this point of view when he declared, "it is the theory that determines what we can observe." In other words, without any idea or concept of what is out there, we cannot really know what we are observing. But what to do when the theory gives two contradicting points of view? This dichotomy—that may be well-known to some of you readers as the "wave-particle" duality—makes complementary observations that provide information either about the wave (so-called wavelength measurements indicating the momentum of the particle) or the particle (so-called location measurements indicating the position of the particle), but never both accurately at the same time.

This dichotomy led to the idea that whatever was accurately revealed in a measurement, there was always a hidden reality. (Observe the momentum of a particle, and its position cannot be seen with any accuracy and vice versa.) The analogy of Plato's cave comes to mind—the slaves in the cave are chained, so they can only see shadows of things passing across the sunlit opening in the cave, while outside the cave, real things exist casting those shadows. Due to their chains, the slaves' reality is only what they observe—for them, nothing else exists. In a similar light, the viewing of the momentum of the particle means the position of the particle doesn't quite exist—or else it constitutes a hidden reality.

In "How All is One," Päs takes us farther into his vision of *the One* by explaining how quantum physics tells us that this is so in spite of how ridiculous it appears. Quantum physics is indeed a strange business for all of us, including not only lay readers, perhaps such as you, but also we physicists who have studied it for many years now. In its early conceptualization, its founders began to recognize that quantum physics did not describe reality as we commonly see it. For example, the universe we experience in our ordinary lives consists of separate objects that may or may not interact with each other but nevertheless remain separately distinct as far as each of them possessing certain complementary attributes. The common complementary attributes of any object "out there" are its momentum, describing its movement, and its position. In the pre-quantum worldview, these attributes were supposedly simultaneously knowable and, therefore, simultaneously real. But quantum physics introduced a new idea labeled *entanglement* that made that simpler view untrue.

WHAT IS ENTANGLEMENT?

With entanglement, quantum physics changed all that, but what that change resulted in has been and continues to be debated today. The key idea that *entanglement* introduced was a new concept—it meant that if two or more firstly deemed separate objects, as commonly understood, were to interact with each other, no matter how briefly, and then separate, they became entangled—each object could no longer behave as if the other, long ago left behind object(s), was no longer acting as an influence on it. Even though each object was not involved any further with the other object or objects with which it had previously interacted, each object seemingly depended on the other(s) observed possible behavior.

Such entangled behavior resulted in 1935 with the appearance of a paper published in the *Physical Review* written by Albert Einstein, Boris Podolsky, and Nathan Rosen (abbreviated as EPR), entitled "Can Quantum-Mechanical Description of Physical Reality Be Considered Complete?" In it, EPR, all then with the Institute of Advanced Study at Princeton University, argued that quantum physics indicates that if the two objects mentioned above were so far apart that no signal could pass between them quickly enough, nevertheless any measurement performed on one object of either its momentum or its position, the other object would instantly possess the same attribute. Not only would that occur, but the act of measurement would bring either attribute instantly into reality. Since in quantum physical theory, such attributes are described by a mathematical entity called the *quantum wave function*, the action of measurement was called "the collapse of the wave function."

Even though quantum physics says neither object after interaction with the other could possess both momentum and position simultaneously, a measurement of either position or momentum performed on one object would seemingly instantaneously cause the other object to have the same attribute. Since Einstein, nearly 30 years earlier, had shown that no form of communication could travel at speeds greater than lightspeed, this entanglement between the objects violated "the special theory of relativity."

Entanglement, although a new and unexpected result in physics, actually had its roots in ancient ideas of monism—an all-encompassing unity in common with many indigenous religions in separate regions of the globe—indicating a sacred or spiritual concept of the natural world. Nearly all (and perhaps all) ancient spiritual belief systems indicated that underneath the mundane appearance of the natural world lies a hidden realm, out of which springs the world of appearances. But what do we make of this hidden world? And how many of them are there?

WHAT ARE MANY WORLDS?

In "How One is All" the author continues with his thesis, showing how quantum physics continuously points us to his monistic view. Here, he takes up a revolutionary paper of Hugh Everett, a Ph.D. thesis under the tutelage of John Wheeler, a visionary Princeton physicist who called himself a "radical conservative." Everett's radical thesis says we should take quantum physics seriously and not deal with the inconsistent "act of measurement" that somehow occurs when one of the attributes, position, or momentum, of either object is observed.

Before Everett came on the scene in 1957, Niels Bohr, the well-known co-discoverer of quantum physics, told us that observation of an object's attribute instantly brings that attribute into existence—the so-called "collapse of the wave function." Instead of a collapse, Everett envisioned the quantum wave function as containing the whole enchilada—every possibility, each in its own world, that could occur together with its observer. Thus, when an observer measures momentum in one world, that same observer would split and observe position in another. Both the object and the observer would be duplicated into as many worlds as there were possibilities.

Such a viewpoint was called the many-worlds interpretation or parallel universes interpretation. Taken together, entanglement merges the possibly infinite number of worlds into a single "all-encompassing one." The question is, "how does this parallel universes view turn into the commonly observed world of objects that we see every day? To answer that, Päs next considers the work of physicist Heinz Dieter Zeh, who, among others, postulated a process called *decoherence* that seemingly converts the scramble of entangled worlds into a single world—*The One* and seemingly only.

WHAT IS DECOHERENCE?

To understand how decoherence does this, let me use a metaphor of my own (not found in *The One*). Here, we will consider only two worlds, although the same argument could apply to as many worlds as there are possibilities. Suppose we had an ordinary two-sided coin that, if flipped, could land heads (H) or tails (T) with equal probabilities of 50%. After flipping, in the world we see around us each day, we would observe either possibility and think nothing weird had occurred even though we could count these possibilities as possible worlds. In either of these possibilities or worlds, we would have the experience of knowing what we had seen—either H or T, never both entangled with each other. It is that experience of knowing that beclouds the issue.

In the quantum physical universe, after flipping, it would land both H in world one (call this H1) and T in world two (call this T2). But since the coin has not been observed, no one knows which world has arisen. Now, suppose you come along and observe the coin. Here is where the many worlds view of Everett enters. In the world in which you see a result, say H, the other world with T becomes hidden from you and *vice versa*. But why does this happen?

To see why may take a little patience for the reader. Accordingly, you too would split into two observers: observer one is seeing H (I write O1H shorthand for observer seeing H in his or her world 1), and observer two is seeing T (similarly observer two seeing O2T). Because these worlds entangle, the result would come out to be a sum O1H plus O2T, yet only one of these worlds would appear to be real to you.

But which world is real? According to the rules of quantum physics, we must determine the various probabilities of these events, and that comes about by multiplying the sum of O1H plus O2T times itself (for those with some knowledge of quantum physics, actually multiplying the sum with its complex–conjugate).

There would be as a result four terms (O1H)*(O1H) plus (O2T)*(O2T) plus (O1H)*(O2T) plus (O2T)*(O1H). The first two terms are what you would expect based on commonsense (O1H)*(O1H) equals 50%, and so does (O2T)*(O2T).

If these were the only terms arising from such quantum physical consideration, we would say, of course, there are two possibilities or worlds, if you wish, arising from observing a flipped coin. This would be no more mysterious than our commonsense viewing of a flipped coin—as such, we would label this as the view from a classical physics viewpoint. The effect of having an observer present in these terms O1H*O1H just leaving H and the same for O2T*O2T just leaving T with equal probabilities of 50%.

But the cross terms O1H*O2T and O2T*O1H do not cancel out—they remain as messy mathematical entities dependent on time. This is where the idea of decoherence enters. These cross terms depend on the mathematical representation of an observer who must also be in entanglement with his or her environment containing the coin. Given that the entanglement of human brains with environments are quite complicated, the values obtained from (O1H)*(O2T) and (O2T)*(O1H) will be largely random and would differ in value when repeating the flips several times.

Consequently, these cross terms, on average, over several times would only yield random errors slightly muddying the H or T result. Hence, the so-called classical worlds of H or T but not both would emerge, as commonly observed, even though they remain in this entangled way. Out of the many interacting objects, composing the universe consisting of the coin and its many observer-environmental possibilities would emerge the world we commonly observe simply because the cross-interfering terms decohere or cancel out over time. Of course, the two possible worlds containing H and T would still be there, just as they would appear to you if quantum physics didn't exist—called the classical physics viewpoint.

Let me summarize: What is "really out there" is the complete sum of all of those terms, including all cross terms. But what is observed is an illusion of either the H world or the T world disentangled from all the rest. In this way, we see a classical world even though that viewpoint is still a part of the whole many worlds ensemble. In actuality, all observations are entangled with everything—it is the limited perspective of any observer that brings out a particular observation and, in so doing, seemingly hides the observer's connection with the other possibilities. In the example I just gave, the O1 and O2 worlds are disconnected from each other such that in world 1 H is seen while in world 2 T is seen as if the other possibility is not present. But understanding entanglement and decoherence in quantum physics allows us to recognize that all possibilities are yet present, composing a monistic view—a grand oneness or unity.

WHY IS THIS VIEWPOINT IGNORED?

In "The Struggle for One," the author poses the question: How is it possible that such a revolutionary viewpoint was ignored for so long? The answer seems to be that the accepted view of quantum physics, as put forward by Bohr, Heisenberg, and others, labeled the Copenhagen dogma, basically told physicists, who tended to think about the monistic view to simply "shut up and calculate." Any physicist who brought themselves to think about the monistic-parallel universes-entanglement-decoherence concept of quantum physics—the implied meaning of quantum physics—were most often criticized and may have indeed found it difficult to find jobs after getting their Ph.D.'s. Like racial discrimination, this was considered being found guilty of "thought-crimes" as George Orwell put it.

But hundreds of years earlier, any such monistic "thought-criminals" faced more serious punishment, such as being burned alive, tortured, or killed like Giordano Bruno. It wasn't that monism was then a new idea that sprung into these "thought-criminals" minds. The idea of monism had been around for perhaps thousands of years earlier.

In the remaining very detailed chapters, we are led further down the path of monistic enlightenment through quantum physical entanglement and decoherence. The subject of human consciousness is also considered, but this proves to be beyond the scope of quantum physical monism or any physics theory to date.

The author concludes with the thought that monism, even though arising from ancient spiritual belief systems, is perhaps the only correct view as it is based on scientific reasoning. However, he adds the sobering thought that if quantum monism is indeed based on scientific reasoning, it must have an experimental foundation. As such, any single experiment or logical extension of quantum monism that disproves this theory would toss the theory into the junk bin—as any theory based on science must be able to be proven wrong.

So, this leaves us with the opening question: If *nothing* is *something*, then what is it?