we4u Insights

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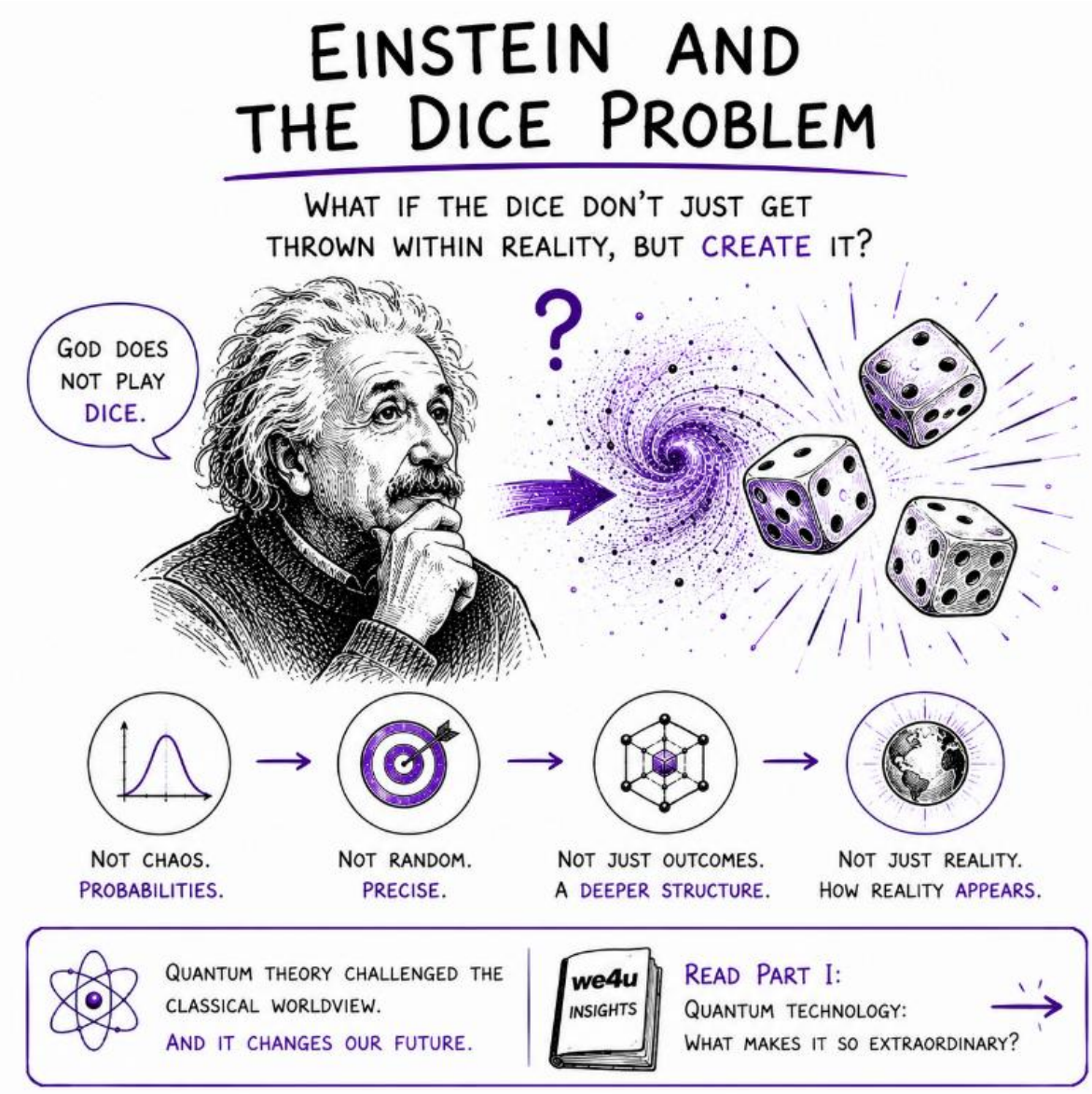
Quantum technology

God doesn't play dice, does He?



Einstein did not like the idea that God plays dice. But what if the dice are not just thrown within reality, but create it?

Want the full story? Read our we4u Insights edition.

Here the link: https://we4u.io/we4u-Insights-Quantum-Technology

Here is the short answer:

Einstein's famous objection to quantum mechanics is usually summarized as: "God does not play dice."

The sentence captures something important about his view of nature. Einstein did not reject probability as a practical tool. He objected to the idea that probability might be fundamental. He believed that behind the statistical predictions of quantum mechanics there had to be a deeper, fully determined order.

In the classical worldview, this intuition makes sense.

As described in our **we4u Insights** on Quantum Technology in chapter "From the clockwork heavens to the quantum world", Newtonian physics gave us a universe that looked, at least in principle, calculable. If one knew the positions, velocities and forces of all relevant objects, future motion could be predicted. Nature appeared like a precise clockwork.

Einstein changed that picture profoundly with relativity, but he did not abandon the idea of an objective, law-governed reality. In fact, relativity made the universe stranger, but not random. Space and time became spacetime. Gravity became geometry. But the theory remained deterministic.

Quantum mechanics created a deeper discomfort.

In the chapter "The second crisis: Light, heat and atoms do not fit with classical physics", we explain how classical physics failed to describe blackbody radiation, the photoelectric effect, atomic stability and spectral lines. Planck's quantization and Einstein's light quantum hypothesis opened the door to a new physics in which energy, radiation and matter no longer behaved as smooth classical quantities.

The real break becomes visible in the chapter "The quantum paradox".

In the double-slit experiment, a photon or electron is not simply a tiny classical object that secretly takes one definite path. As long as no which-path information is physically available, the quantum state evolves as a coherent structure of possibilities. Only when measurement information becomes available do we obtain one definite outcome.

This is where the dice enter the story.

Quantum physics does not usually tell us which individual result must occur in a single measurement. Instead, it gives us probabilities for possible outcomes. But these probabilities are not arbitrary guesses. They follow extremely precise mathematical rules. Quantum mechanics is one of the most successful predictive frameworks in all of science.

That is why the phrase “God plays dice” can be misleading if it suggests chaos.

Quantum randomness is not disorder without structure. It is not nature being sloppy. It is probability governed by a strict formalism. The individual outcome may not be predetermined in the classical sense, but the probability structure is astonishingly exact.

This is the deeper question behind the LinkedIn post:

What if the dice are not merely thrown inside reality?

What if the probabilistic structure of quantum physics is part of how definite reality appears?

That does not mean that “anything can happen”. It means that the transition from quantum possibility to classical fact may be more fundamental than our classical intuition expects.

The **we4u Insights** chapter “Quantum state” explains why this matters for technology. Quantum technologies work precisely because quantum states are not ordinary classical information. They can exhibit superposition, interference and entanglement. They can be manipulated, preserved and measured, but they are also fragile. Once uncontrolled interaction with the environment occurs, coherence is lost and the system behaves more classically.

So probability is not a weakness in the theory. It is part of the machinery.

Quantum computing, quantum sensing and quantum communication all exploit the fact that quantum systems do not merely encode fixed classical facts. They operate with structured possibilities, amplitudes, correlations and measurement outcomes.

Einstein wanted a deeper order behind quantum randomness.

Modern quantum physics does not fully remove that question. It sharpens it.

Perhaps the deeper order is not a hidden classical clockwork underneath quantum events. Perhaps the deeper order is the mathematical structure of quantum probabilities itself.

So the real shock is not that nature "throws dice".

The real shock is that the dice may belong to the architecture of reality.

If this has caught your interest, just follow us and learn more about the strange world of quantum technology in our in our **we4u Insights** edition "Quantum Technology: What makes it so extraordinary?", we explore exactly this shift.

Part I starts with the foundations, from the classical worldview to quantum states, entanglement, emergent spacetime and the speculative idea that information may be the deeper level of reality.

Part II then moves to the technological implications for quantum computing, post-quantum cryptography, quantum key distribution, network security, digital sovereignty and the long-term prospect of a quantum internet.

We Endeavor for you

Ruediger Koester

Managing Director and Co-owner
Endeavor 4U GmbH

ruediger.koester@we4u.io
+43 676 8200 7700
www.we4u.io

Thomas Stuettgen

Managing Director and Co-owner
Endeavor 4U GmbH

thomas.stuettgen@we4u.io
+49 151 5235 7509
www.we4u.io