NEW YORK CITY COLLEGE OF TECHNOLOGY
Physics Department
Center for Theoretical Physics

Why does nature like the square root of negative one?

Presented by:

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Abstract

Quantum mechanics is a probabilistic theory, but the way we compute probabilities in quantum mechanics is quite different from what one would expect from, say, rolling dice or tossing coins. To get a quantum probability, we first compute a complex-valued probability amplitude and then square its magnitude. I begin this talk by looking for a deeper explanation of the appearance of probability amplitudes, or "square roots of probability," in the physical world. It turns out that one can find a potential explanation —it is based on a principle of optimal information transfer—but the argument works only if the square roots are real rather than complex. I then discuss a few of the ideas people have put forward to try to understand why nature favors complex amplitudes. At present no such idea has gained wide acceptance, but the effort to answer this question has produced insights into the structure of quantum theory.

Light refreshments will be served.