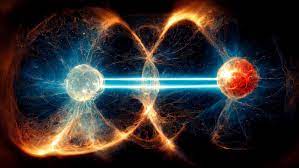
**Intro**   
Entanglement is at the heart of quantum physics and future quantum technologies.  
  
 Like other aspects of quantum science, the phenomenon of entanglement reveals itself at very tiny, subatomic scales.   
  
When two particles, such as a pair of photons or electrons, become entangled, they remain connected even when separated by vast distances. In the same way that a ballet or tango emerges from individual dancers, entanglement arises from the connection between particles.   
  
It is what scientists call an emergent property.



The Einstein versus Bell debate revolves around the conflict between Einstein's local realism and John Bell's inequalities, emerging from the Einstein-Podolsky-Rosen (EPR) paradox. The EPR paradox, introduced in 1935, questioned the completeness of quantum mechanics by highlighting the seemingly instantaneous action at a distance, which violated the principle of locality.

Einstein, along with collaborators, suggested the existence of hidden variables—unmeasured properties of particles—that could determine measurement outcomes and maintain locality and realism. In response to this, John Bell formulated his inequalities in the 1960s, providing a way to experimentally test the limits of quantum correlations under the assumption of hidden variables.

Experimental tests of Bell's inequalities consistently demonstrated violations, indicating that the correlations predicted by quantum mechanics exceeded the bounds set by classical physics. These results challenged the viability of local realism and underscored the non-local nature of entanglement.

The outcome of these experiments has had a profound impact on our understanding of the foundations of quantum physics, emphasizing the inherent non-locality of entangled particles and refuting the possibility of a complete local realistic interpretation within the framework of quantum mechanics. The ongoing conflict between Bell's inequalities and Einstein's local realism serves as a cornerstone in discussions about the fundamental nature of the quantum world.