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## A LESSON IN QUANTUM PHYSICS by LeXman

Since the NPL is, at its heart, an educational nonprofit institution, I present here my first in a proposed twenty-four-part series of cryptic crosswords that are designed to instruct as well as entertain.

Lately, I have been reading the works of all the great minds in quantum physics (Bohr, Chopra, Bellisario). Basically, quantum theory discusses the strange and counterintuitive ways in which matter and energy behave at the sub-atomic level. This cryptic crossword illustrates three basic principles of this scientific theory.

1. **HEISENBERG'S UNCERTAINTY PRINCIPLE** – This principle states that you cannot simultaneously measure a particle's position and its motion. This puzzle embodies this principle. For the answers to each the Down clues, you will know their position (where on the grid to enter them) but not their motion (whether to enter each answer from top to bottom or from bottom to top). Contrariwise, for the Across clues, you will know their motion (you enter all of the answers from left to right), but it is for you to determine their position (which clue corresponds to each Across entry in the grid).
2. **DUALITY** – Quantum physics states that, at the subatomic level, it is possible for something to be in two different states at once. A photon, for example, is simultaneously both a particle and a wave. Another example familiar to the layperson is Schrödinger's Cat: that, until you open the box, the cat is both alive and dead.

In the same way, my puzzle is actually two puzzles at one, one superimposed (or, as quantum physicists would say: "superposed") over the other. The cryptic clues will help you fill in the white squares, but, for the second puzzle, letters must go in the shaded squares as well. It is for you to find the second, hidden puzzle and determine which letters go where.

Fortunately, you have some help:

3. **QUANTUM ENTANGLEMENT** – Quantum physics states that, if two particles are linked in some way (for example, opposite spins) but the link contains a duality (that is: until they are measured, the two particles are spinning both clockwise and counterclockwise), whichever choice you impose on one particle will determine what you measure in the second particle.

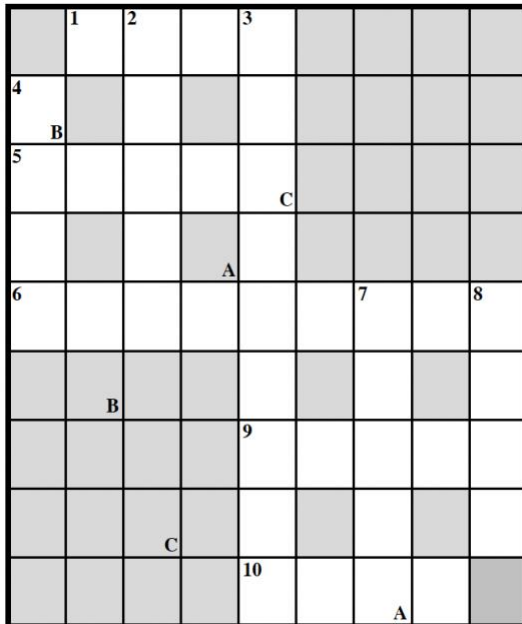
In my grid, several squares are quantum entangled with one another (as indicated by the matching letters in the lower right-hand corner of those squares). Whatever letter you enter into one of these squares you will also enter in the other.

As I said above, it will be up to you to determine which letters go in the remaining shaded squares. I offer no other help here except to say that the addition of a few extra parameters may help you see the second puzzle superimposed over the first.

Stay tuned for my next educational cryptic, which will teach solvers about the generals who fought in the Ottoman Empire's army during the Crimean War.

1	2	3	4	5	6	7	8	9	10	11	12
LeXman's Cryptic Crossword Page											

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**Across**

- I'd left an excellent woman
- Smiling once more – a becoming Romeo
- Sometimes, they're inclined to drop in appropriations
- The thirteenth or fifteenth side hustle?
- Without fail, the Greek system produces contemptible people

**Down**

- 2. Sentient computer linked to 450 THz broadcast
- 3. *Dragnet* is recast – bigger stars
- 4. Performed in Los Angeles
- 7. Retrospective: *Paintings in Sequence*
- 8. *Rock of Ages*: it's magical – I can't help myself