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**Learning to Learn: The Art of Doing Science  
and Engineering, Session 27:**

Hamming, Richard W.

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# Richard W. Hamming



## Learning to Learn

The Art of Doing Science and Engineering

### Session 24: Quantum Mechanics

# Can we understand everything?



**“... in all of the science there are only descriptions of how things happen and nothing about why they happen.”**

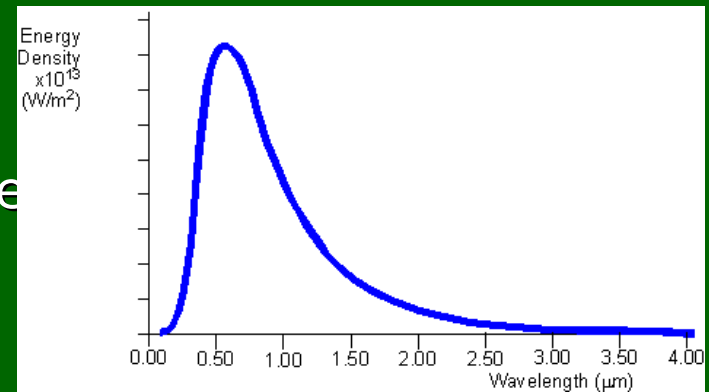
# Can we understand everything?



## Max Planck - Black body radiation

Experimental data fitted with empirical curve

Planck created new theory because approximating curve fitted well and had the proper form



## The proof of correctness:

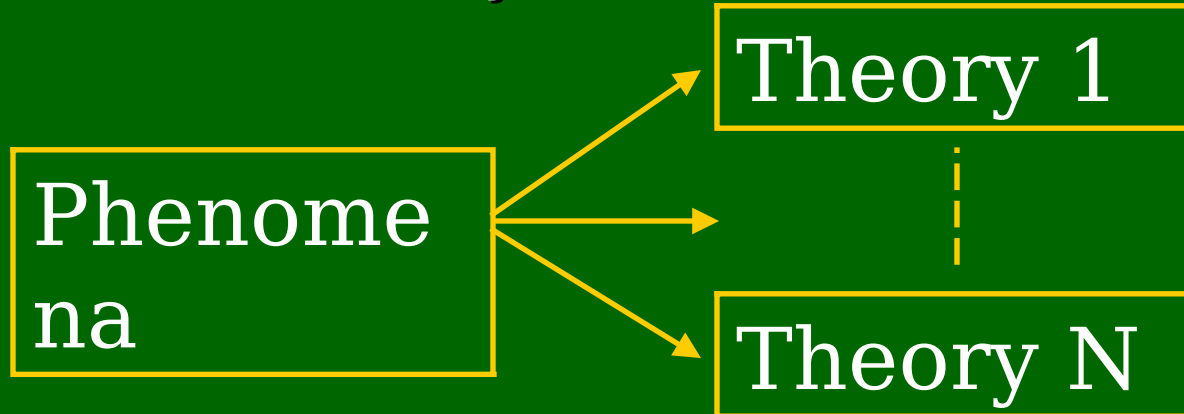
Einstein - Photoelectric effect  
Bohr - Atomic model

**The problem should be represented in terms of functions which are proper for the field.**

# Can we understand everything?



There need not to be a unique form of a theory to account for a body of observations

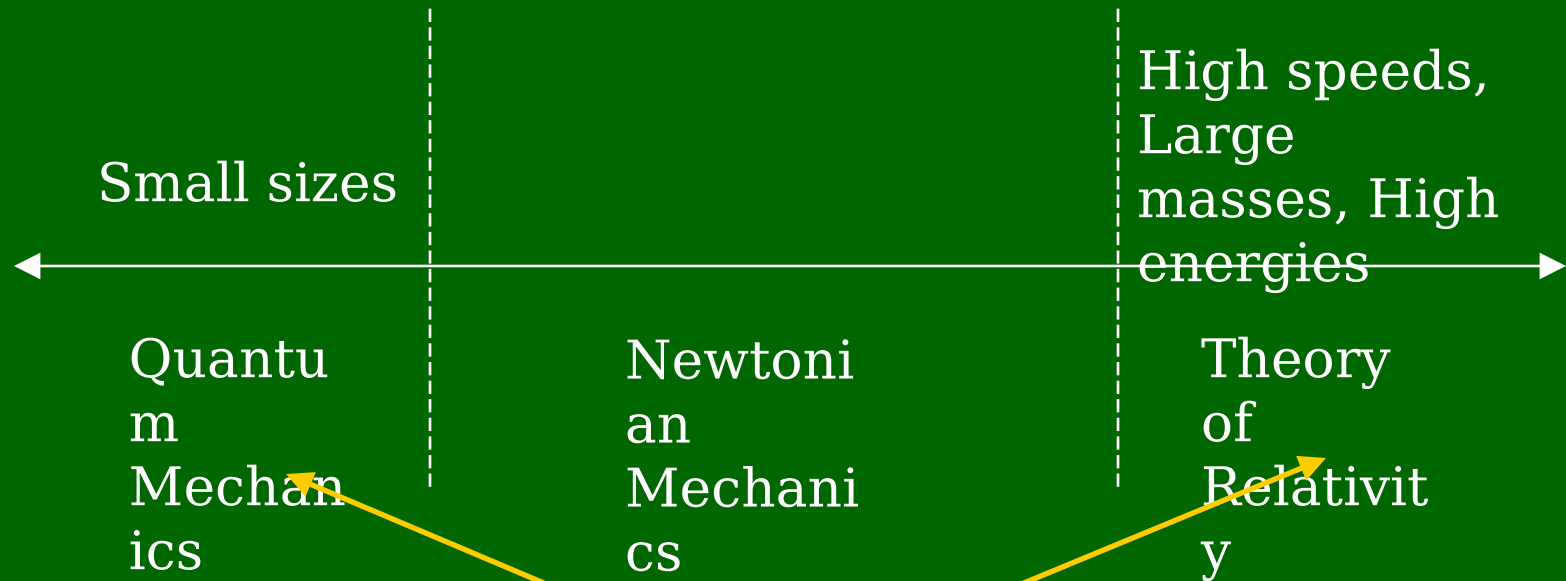


**Both quantum-mechanic theories are equivalent:**

- **Heisenberg - Uncertainty Relations**
- **Schrödinger - Wave equation**

You cannot go from a body of data to a unique theory.

# Can we understand everything?



**Are Quantum Mechanics or Theory of Relativity thoughts our brain cannot think?**

Example:

**Wave-particle duality** – “I cannot explain this, you will get used to it”.

# Can we understand everything?



## Probabilistic base of Quantum Mechanics:

The square of the Schrödinger wave function is to be interpreted as a probability of observing something.

- **Is there anything below it ?**

Perfectly definite structure vs. No lower structure

- **Do we have free will?**

If there is no free will why do we believe in God's punishment, justice or mercy?

- **Do we know everything?**

Democritus - "All is atoms and void." If it is true, how interact psychical and physical world together?

# Can we understand everything?



**If non-local effects in quantum mechanics exist how can we explain immediate effect, which contradicts both the special and general theories of relativity?**

**If we understand something, can we explain the meaning of “understand”?**