

## Problems with our current understanding of how nature works

[Nematrian website page: [PhysicsSmolin5Problems](#), © Nematrian 2015]

[Smolin \(2006\)](#) poses five key unsolved problems in physics set out below.

### **Problem 1. The problem of quantum gravity**

Combine general relativity and quantum theory into a single theory that can claim to be the complete theory of nature.

### **Problem 2. The foundational problem of quantum mechanics**

Resolve the problems in the foundations of quantum mechanics, either by making sense of the theory as it stands or by inventing a new theory that does make sense.

### **Problem 3. Unification of particles and forces**

Determine whether or not the various particles and forces can be unified in a theory that explains them all as manifestations of a single fundamental entity.

### **Problem 4. Explain the values of the free constants in the Standard Model**

Explain why the value of the free constants in the Standard Model of fundamental particle physics take their observed values.

### **Problem 5. Explain dark matter and dark energy**

Or if they don't exist, explain how and why gravity is modified on large scales.

### References

[Smolin, L. \(2006\)](#). *The Trouble with Physics: The Rise of String Theory, the Fall of a Science and What Comes Next*. Allen Lane (an imprint of Penguin Books)