Understanding matter, the stuff our universe is built out of, is far more important in practice than ephemeral things like politics or stars! In this short series of lectures we will look at a history of our understanding of **What is Matter?** This is loosely classified under 6 headings, which won’t correspond to actual lectures

1. **Stones to Alchemy.** We'll speculate about the beginnings of our understanding of matter and go from the stone age through the discovery of fire and how our ancestors used it to the beginnings of atomic theory.

2. **Atoms and Fields.** Boyle is sometimes called the last alchemist. Dalton is often called the father of modern chemistry; he was certainly the first person to take atoms seriously. Maxwell showed how atoms worked in reality. But Newton, Faraday and Maxwell told us that fields could exist in empty space.

3. **The Death of Classical Physics.** By the end of the 19th century, we had a wonderful classical theory of physics. Over 20 years it all fell apart. We put it back together with the crazy idea that particles are waves are particles. This is the beginning of Quantum Mechanics: is it for real?

4. **How things work.** We'll look at a variety of modern applications. Can we decide if nuclear physics is good, evil or indifferent. Our information revolutions requires new materials, unlike anything that existed 50 years ago, which is why you own many bits of Nobel prizes! We have a host of new materials, starting with rayon and going to graphene.

5. **What is fundamental?** Physicists have been obsessed with the idea of finding what are the most basic objects. We'll start by breaking up the atom, then by breaking up the nucleus and end up by breaking the proton. This is sometimes called the Cosmic Onion: how many layers does it have?

6. **Why is Nothing Complicated?** An ironic view of the progress of science is shown by the simplest problem we cannot solve. Newton couldn't solve the 3-body problem. Schrödinger couldn't solve the 2-body problem. Feynman couldn't solve the 1-body problem. We can't solve the zero-body problem: the vacuum is REALLY hard and contains more than we thought possible.