

Altrincham and District Astronomy Society

Meeting number **611** held on 1st November at 8pm

At Timperley Village Club

Apologies: None

Members Present (in person): 31

The meeting began with the Chairman welcoming several new attendees.

PRESENTATION

The presentation was given by Dr Steve Barrett and was entitled "The Beginning of Everything". It began with a "fly through" of the 3D atlas from the Sloan Digital Sky Survey and a snapshot of the Hubble Deep Space Field. Dr Barrett explained that the presentation would be covering the creation of the universe and answering the question "where did all that stuff come from?".

In an introduction he said that he would take a look at the laws of physics that determined how the universe had evolved i.e. "The Rules of the Game", that simple rules could lead to complex results but complex did not mean incomprehensible. He outlined the basic flow of thought, from observation through interpretation to experimentation.

He then went on to cover some basic ideas related to the simplified atomic structure, fundamental particles and how their energy profile (hot to cold) reflected building them up from the small to the large.

Once this had been established Dr Barrett covering the timeline of the evolution of the universe and the critical timepoints.

- $t = 10^{-35}$ s; the universe was the size of a golf ball but it was not smooth and contained fluctuations in temperature/density that would ultimately give rise to large scale structures.
- $t = 10^{-12}$ s; the universe was now the size of the solar system and was essentially a "quark soup". It is from this point onwards that theories could be tested because energy levels had dropped to that achievable in the Large Hadron Collider (LHC).
- $t = 10^{-3}$ s; the universe had cooled sufficiently for protons and neutrons to form.
- $t = 1$ s; protons and neutrons became "fixed" in a 75:25 ratio.
- $t = 100$ s; due to neutron instability some decayed into protons and the ratio became 14:2, at this point nuclei could form i.e. 1 helium nucleus to every 12 hydrogen.
- $t = 3$ mins; neutrons could no longer decay and the relative abundance of hydrogen to helium was set. This prediction of the relative abundance of hydrogen to helium could be confirmed by observation.
- $t = 380,000$ years; the universe had cooled to around 3,000K and nuclei were able to hold onto electrons to make atoms. The universe became transparent to light. This light could still be seen today but it had become so stretched that it was visible as microwaves. Dr Barrett then shared a picture of the cosmic wave background, showing the fluctuations embedded within it and a simulation to show how these had evolved into a cosmic web of filaments and voids, very similar to that seen in the Sloan Digital Sky Survey at the start of the presentation.

The presentation finished with a summary of the timeline and the gaps that remained in our understanding. What had caused the asymmetry of matter and antimatter particles, where matter had triumphed over antimatter, what was dark matter (ordinary matter only made up 5% of the total universe) and what was dark energy?

The presentation was followed by a Q&A session.

ITEMS OF BUSINESS

1) Events

a) 60th Anniversary Party

The Chairman reminded everyone of the planned 60th Anniversary party and reiterated that all were welcome.

2) Any Other Business

There was no further business

Next meeting

The next meeting would be on 7th December 2024