

Astronomy Talk 9th February 2021

The Sun's Life Story

This was a "Zoom" talk given by the chairman. There were 99 attendees.

The early days covered the formation of the Sun from a dust and gas cloud. It addressed the subjects of the Jeans criterion, rotation and magnetic fields, ionisation, and the T Tauri stage leading to protostars. This was followed by the Hayashi track, the Henyey stage: finally reaching nuclear fusion.

For most of its life the Sun is burning hydrogen on the so-called "Main Sequence". After a definition of nuclear components, the processes involved were covered, including binding energy; the hydrogen to helium reactions PPI, PPII & PPIII and the CNO bi-cycle. As time progresses the Sun becomes slowly more luminous.

Eventually the Sun will become a Red Giant, burning hydrogen in a shell round the helium core. At this point there will be the first dredge-up, where material from the deeper regions reaches the surface through convection.

The helium in the core undergoes a helium flash as helium starts to burn to make carbon, followed by steady helium burning. Eventually this becomes helium shell burning. Thermal instabilities arise at this stage and the Sun puffs off much of its outer layers. Heavier elements can also be made at this point through the s-process.

Finally, the Sun will become a White Dwarf. Some of the characteristics of these was described, including the radius-mass relationship. The Sun's will end up with about 55% of its present mass and will very slowly cool to become a Black Dwarf over billions of years.