

Please note – This is an extract from one student’s response

**Red Dwarfs and Barnard’s star.
Their origin and significance to astronomy.**

What is a Red Dwarf?

A red dwarf is a small and relatively cool star on the main sequence, being a M spectral type. Red dwarfs range in mass from a low of 0.075 solar masses (M_{\odot}) to about 0.50 M_{\odot} and have a surface temperature of less than 4000 K. Our sun has 1 solar mass (M_{\odot}) and a surface temperature of 6000 K

Red dwarfs are by far the most common type of star in our galaxy but because they are dull, individual red dwarfs cannot easily be observed. From Earth, not one is visible to the naked eye. Proxima Centauri, the nearest star to the Sun, is a red dwarf, as are twenty of the next thirty nearest. Red dwarfs make up three-quarters of the stars in the Milky Way. ①

What processes are taking place in a Red Dwarf?

Red dwarfs are very-low-mass stars. Consequently they have relatively low temperatures in their cores and energy is generated at a slow rate through nuclear fusion of hydrogen into helium. These stars emit lots of heat instead of light. ②

Barnard’s star. An ancient Red Dwarf.

Barnard's Star is a very low-mass red dwarf star about six light-years away from Earth in the constellation of Ophiuchus. Barnard's Star is the fourth-closest known individual star to the Sun, after the three components of the Alpha Centauri system. Despite its proximity, Barnard's Star, at a dim apparent magnitude of about nine, is not visible with the unaided eye; however, it is much brighter in the infrared than it is in visible light. Barnard's star is thought to be 10 billion years old and older than our galaxy. It must have been captured from elsewhere. Barnard's star is travelling towards us at a very high speed. It will become closer to us than Proxima Centauri. ①

The significance of Red Dwarfs to astronomy.

Although intelligent life formed around a “G” star for us astronomers think that life will most likely be found around a Red Dwarf. Primarily because their energy loss is consistent over time and the long age they can exist too. Many red dwarfs are orbited by extrasolar planets. Planetary habitability of red dwarf systems is subject to some debate. In spite of their great numbers and long lifespans, there are several factors which may make life difficult on planets around a red dwarf. First, planets in the habitable zone of a red dwarf would be so close to the parent star that they would likely be tidally locked. This would mean that one side would

be in perpetual daylight and the other in eternal night. Red Dwarfs are the most common star type in our galaxy. They emit energy as heat and can be long lasting. ①

They can potentially survive trillions of years. They tend to be stable because they convect heat from the core. Intelligent life could be found on planets or moons around a Red Dwarf.