Stars

The Main Sequence

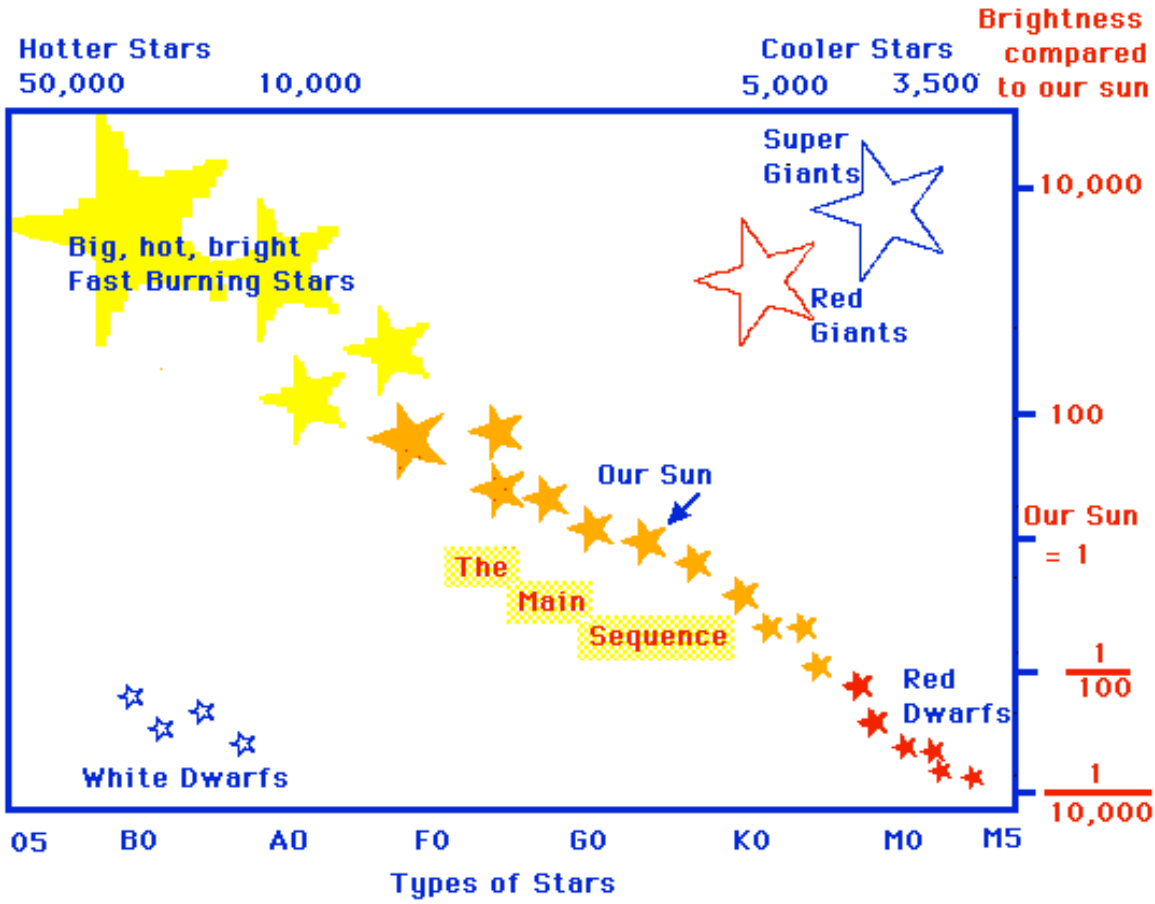
The Main Sequence groups stars by mass, temperature, brightness and projected life span.

Stars vary in size, mass, temperature and brightness (luminosity). Some stars could be good suns for life-bearing worlds, some could not. Here is some information to help you to choose your star.

Stars have life cycles. They begin in clouds of stellar dust and gas, accumulating mass by gravitational attraction. As the dust and gas contract, energy is released, and the mass heats up and begins to glow. Very massive protostars contract rapidly, perhaps taking only ten thousand years to begin the next phase. Smaller stars, like our Sol, may take tens of millions of years to reach it.

In the center of the protostar, the heat increases until nuclear fusion begins. The star is now generating its own heat energy, fusing the nuclei of atoms together to make helium from hydrogen. Carbon, and even iron, can be formed inside very hot stars. As these changes take place, energy is released as heat and light.

Most stars fit a predictable pattern. Once they have started to burn their nuclear fuel, they can be assigned a place on The Main Sequence Diagram (The Hertzsprung-Russell Diagram). These stars have predictable lifetimes and are consistent in their energy generation.



As you can see, there is a sort of diagonal line of stars going from right to left. These are main sequence stars. About nine out of every ten stars are on the main sequence. On the lower right you see the red dwarfs -- small, dim stars with long lifetimes. Most stars have less mass than our sun. Close to the center we see our sun, and other stars like it: their lifetimes are about ten billion years. In the upper left we see big, bright, hot stars: these burn up quickly, and there is not enough time for life to develop on their planets.

Finally, the star burns up most of the hydrogen in its core and begins to die. Our own sun will grow hotter (due to gravitational forces) and expand almost to the orbit of the earth, destroying any life that may be on the planet then. The sun will lose perhaps half its mass, and grow smaller and fainter as it cools.

Life forms adapt to their environments, and so must have a dependable environment to adapt to. Main sequence stars are stable as they live out the mature period of their lives. Stars are grouped by temperatures. Going from hottest to coolest, the groups are called O, B, A, F, G, K, and M.

Each group is divided into sub-categories with 0 the highest and 9 the lowest. The numbers below are really a continuum as the stars in each category are not all exactly the same **size.**

Star Class	Temperature in Kelvin	Remarks	Life Span in Years	Color
O	Above 30,000 K	Very, very hot stars that burn up fast	Less than 1million years	
B	10,000 – 30,000 K	Not enough time for life	10 million years	
A	7,500 -10,000 K	Not enough time for life	400 million years	Bluish
F	6,000 - 7,500 K	Life could get started here	4 billion years	
G	5,000 - 6,000 K	Our sun is a G2 star	10 billion years	Yellow
K	3,500 - 5,000 K	Lots of time, not much heat	60 billion years	Reddish
M	Below 3.500 K	Lots of time, not much heat	More than 100 billion years	Reddish

As you can see, our life bearing planets probably orbit G or K type stars. These stars have long enough lives to permit the development of life on their planets, provided that the planets are in the life zone. The life zone is that region where a planet orbiting the star will experience temperatures that permit liquid water to exist. It is possible that life might be able to evolve with some other compound than water, but we must leave that possibility to those who have a background in organic chemistry.

Source: Elizabeth Viau: World Builders
http:/www.world-bulders.org/