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Prolog

I admit it. I have a love for stars. As an astrophotographer, I have many targets I can choose from on any given night, and there is so much beauty in the universe, it is a hard decision. But I have always had a fascination with stars. They are, after all, the home of planets and the destination of explorers. With this book, I am attempting to convey some of that fascination. I hope you enjoy.

All pictures in this book are original works of the author taken at Starmaker Observatory located on Camano Island in Washington State, USA.

Introduction

intro

Arcturus

stats: type: K0 III orange giant age: 6-8.5 billion years old magnitude: -0.04 absolute magnitude: -0.30 mass: 1.08 +-0.06 solar masses metallicity: 17-32% Sol population: Population II distance: 36.7 ly +-2.3 ly constellation: Bootes other names: Alpha Bootis

intro: Arcturus is the brightest star in the northern hemisphere.

location: Close to earth. Nearby stars include Eta Bootis (3.3 ly). It is moving rapidly towards earth (proper motion = 2 arc seconds per year). It is part of a group of 52 stars that appear to be moving together known as the Arcturus stream.

history: Arcturus is currently in the late stages of the main sequence. It has likely exhausted all its hydrogen fuel and is in hydrogen shell burning phase. It

has expanded into a giant star and is likely to continue expanding as it ages and dies.

planets: Some early indications exist that a planet 12 times the mass of Jupiter may exist 1.1 astronomical units from the star, within the habitable zone. But this is debated and not confirmed.

future: Arcturus has likely already begun fusing helium into oxygen and carbon in its core. This stage occurs after most of the hydrogen fuel has been consumned and leads to a swelling or expansion of the star into a giant star.

As an aging star, Arcturus exhibits very little instability. “Star quakes” have been deteced on the order of microseconds to a few seconds at most. This is common in red giants as they age. The surface of the star actually vibrates creating short-scale variations it the spectral signature. As the star ages towards the M class of stars, it’s variability and thus its instability will increase.

After its helium supply is exhausted, it will expand further, eject its outer shells of gas, and become a white dwarf star inside a planetary nebula.

Epsilon Lyrae