

Limiting Magnitude of a Small Telescope Observational Astronomy

Name: _____

Introduction

Because of the limited sensitivity of your eyes, you can only see stars above a certain brightness. When brightness is measured in magnitudes, this is referred to as the *limiting magnitude* of your eyes. Since this concept can be applied to other instruments besides the human eye, this case is called limiting *visual* magnitude. For the dark-adapted eye in a dark location, the limiting visual magnitude is about 6.

Telescopes can clearly gather much more light than a human eye. In this activity, you will attempt to determine the limiting magnitude of a small telescope/eye combination, as well as investigate how it depends on aperture size.

Observing

In order to determine limiting magnitude, you will use the small telescopes to observe the region around the double star Epsilon Lyrae, which is near the bright blue star Vega (see Figure 1). Find, center, and focus on this double star. You want a fairly wide field of view: the 32mm or 40mm eyepieces work well on the 6-inch, and the 25mm eyepiece works well on the 3-inch.

Carefully observe the area around the double star. You will see fainter stars. Figures 2-6 show what you should be seeing based on your limiting magnitude. For example, Figure 2 is what you would see with a limiting magnitude of 6, while Figure 6 is what you would see with a limiting magnitude of 10. The figure that most closely resembles what you can actually see tells you what your limiting magnitude is.

1. What does your limiting magnitude appear to be? Note the telescope and eyepiece combination you are using:

Experimenting

Now, cover half the telescope aperture and make the same observations of the faintest stars you can see.

2. What is the limiting magnitude now? Comment on the amount of the change.

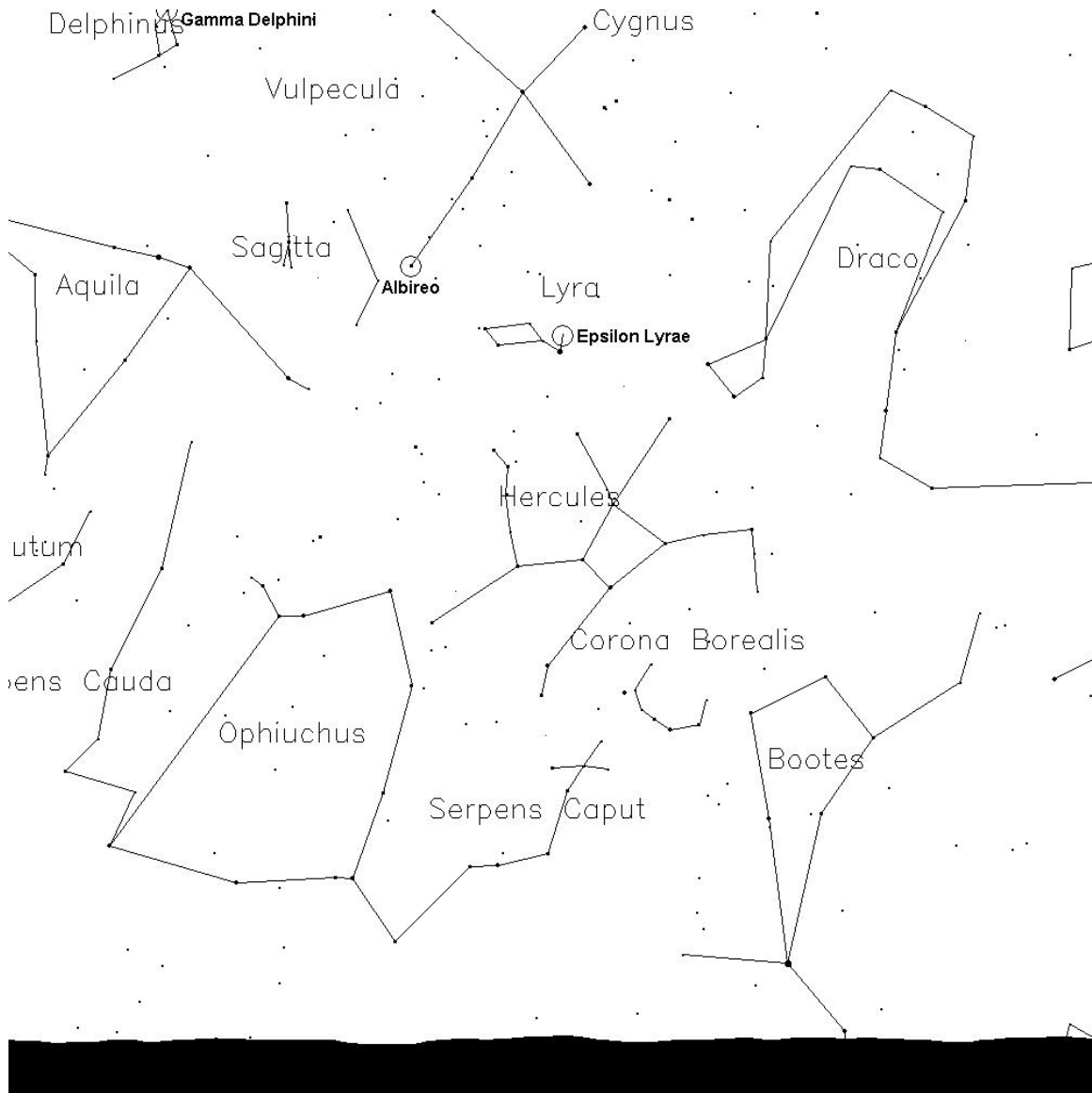


Figure 1: Looking west at 9pm on October 1st. Epsilon Lyrae is marked.

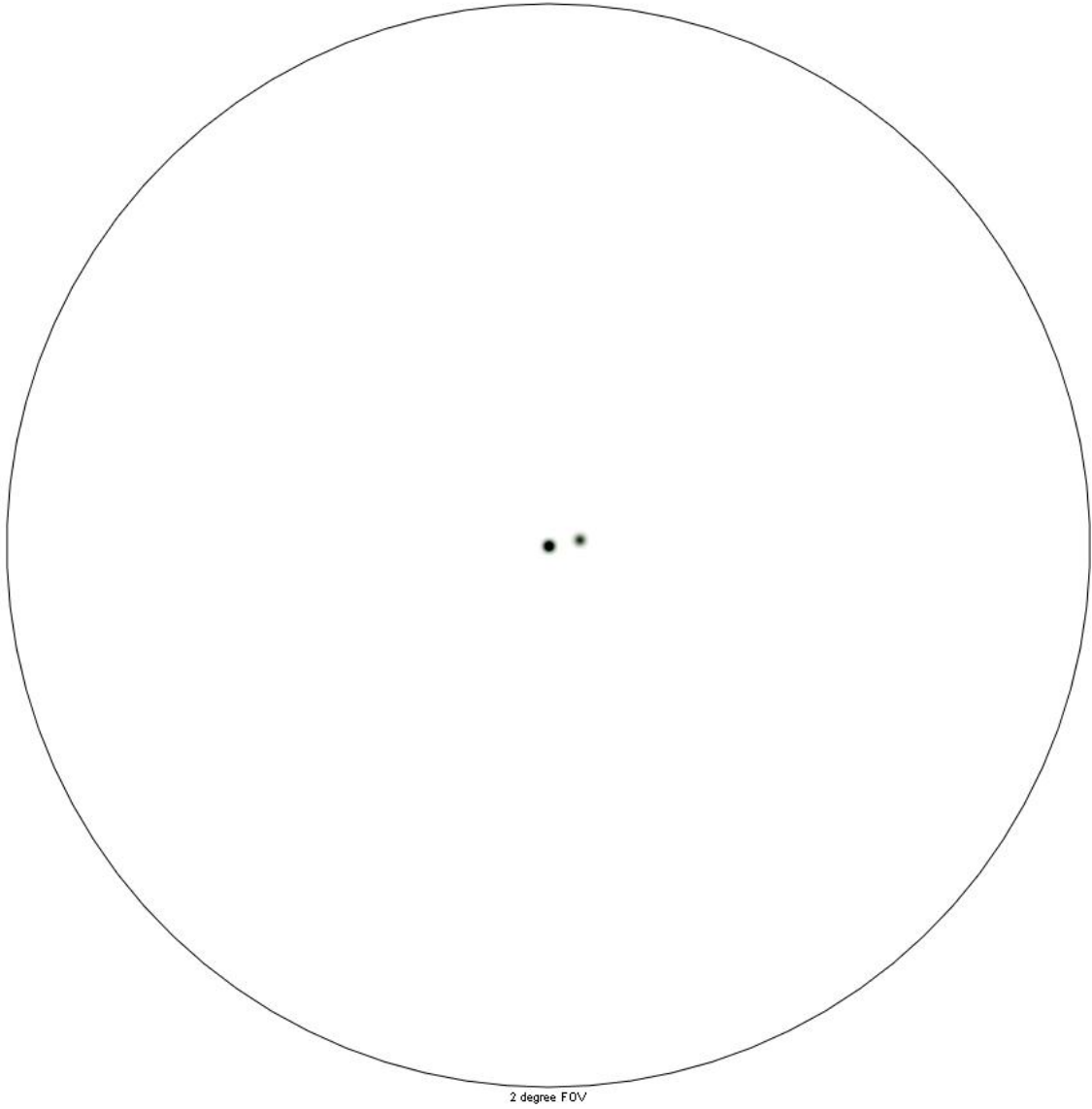


Figure 2: A 2° field of view centered on Epsilon Lyrae, out to magnitude 6.

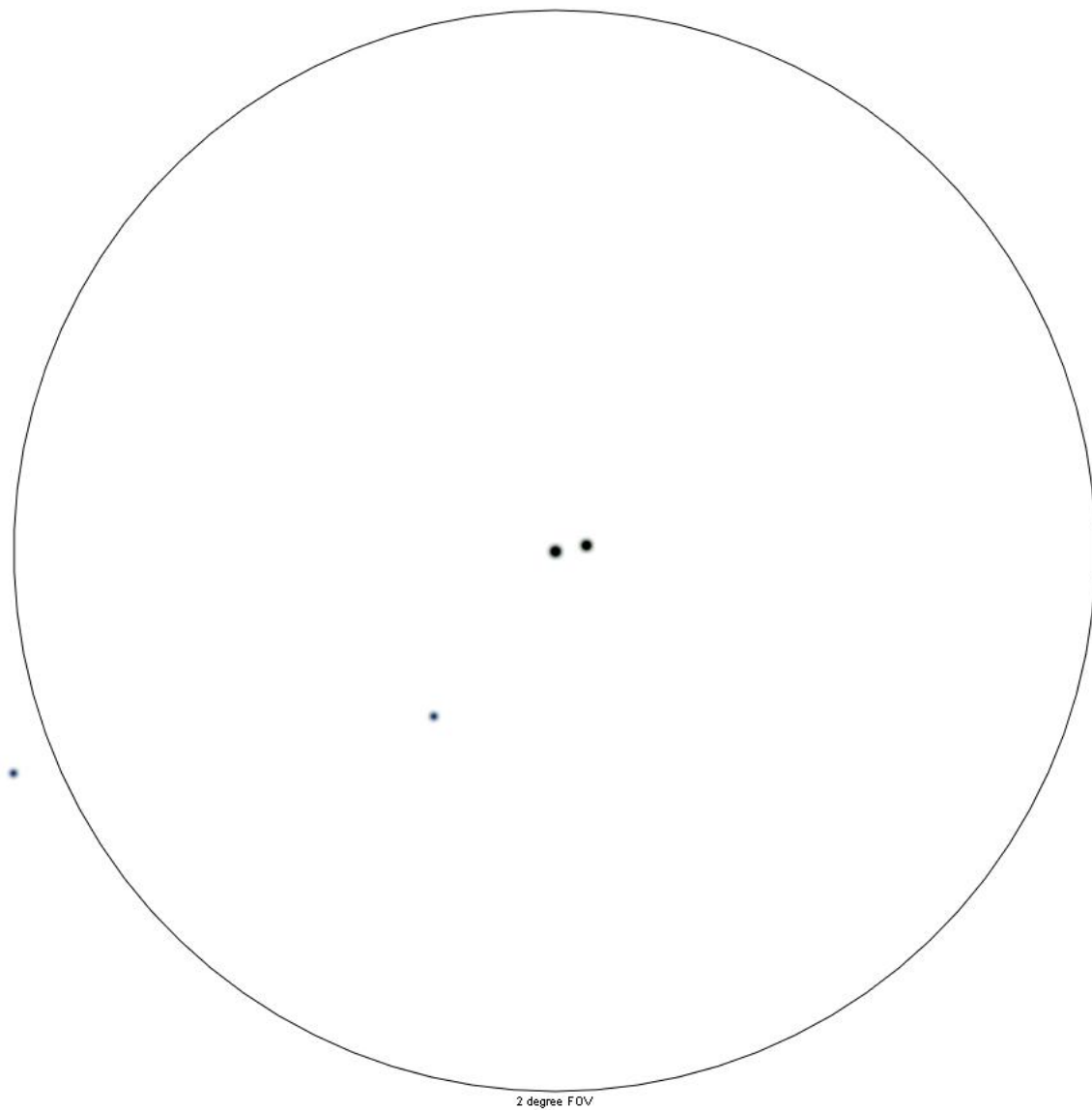


Figure 3: A 2° field of view centered on Epsilon Lyrae, out to magnitude 7.

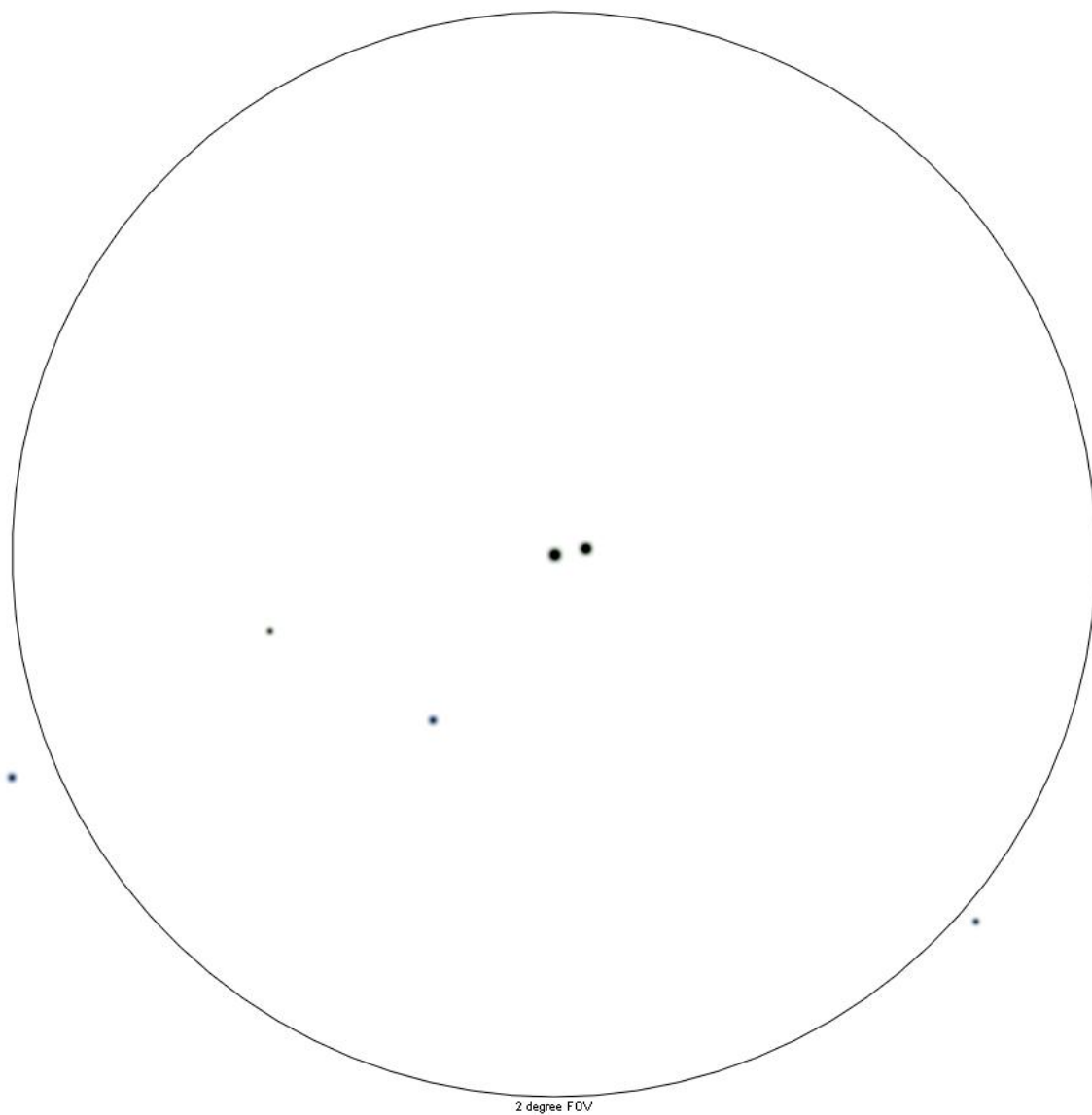


Figure 4: A 2° field of view centered on Epsilon Lyrae, out to magnitude 8.

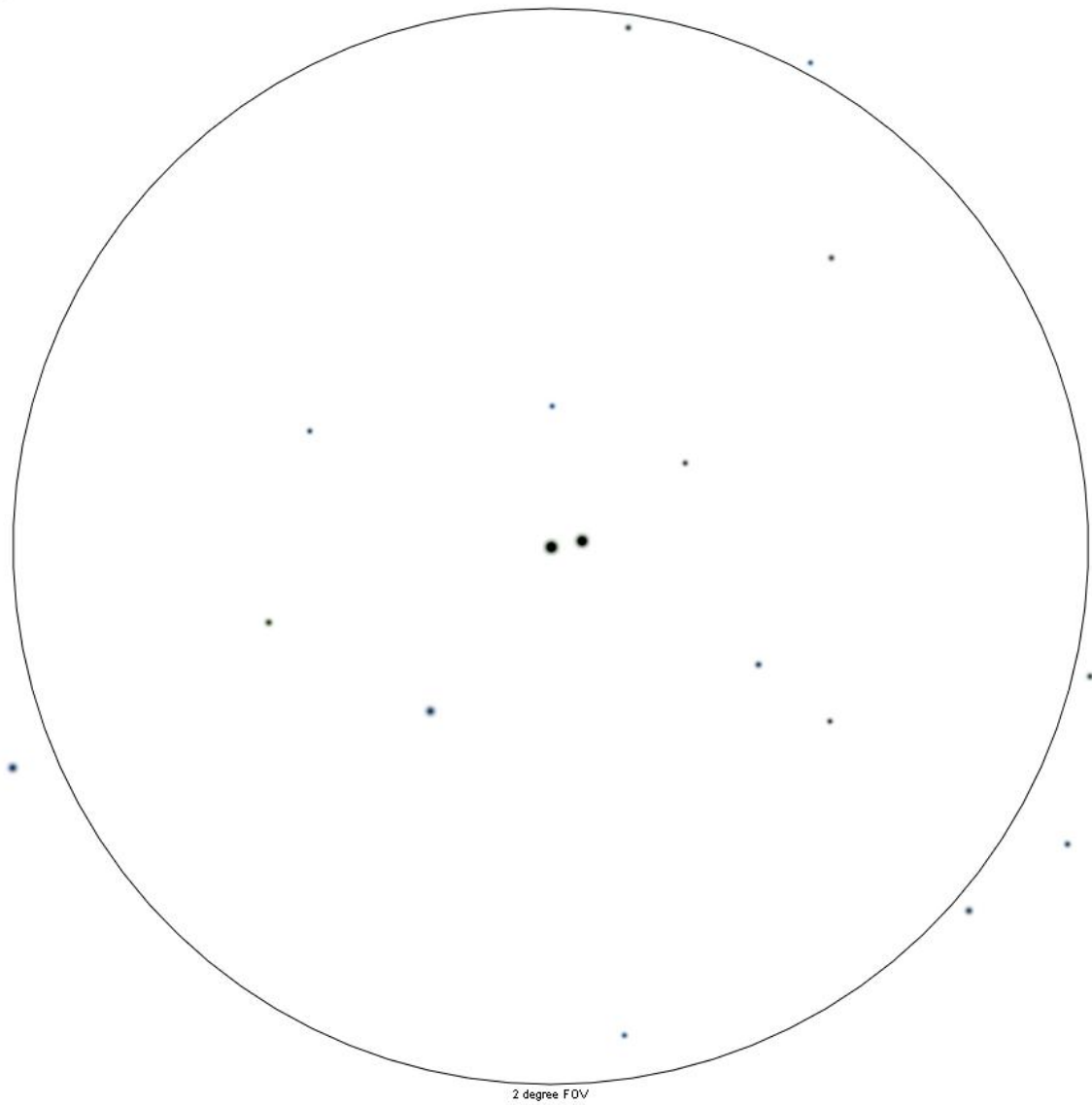


Figure 5: A 2° field of view centered on Epsilon Lyrae, out to magnitude 9.

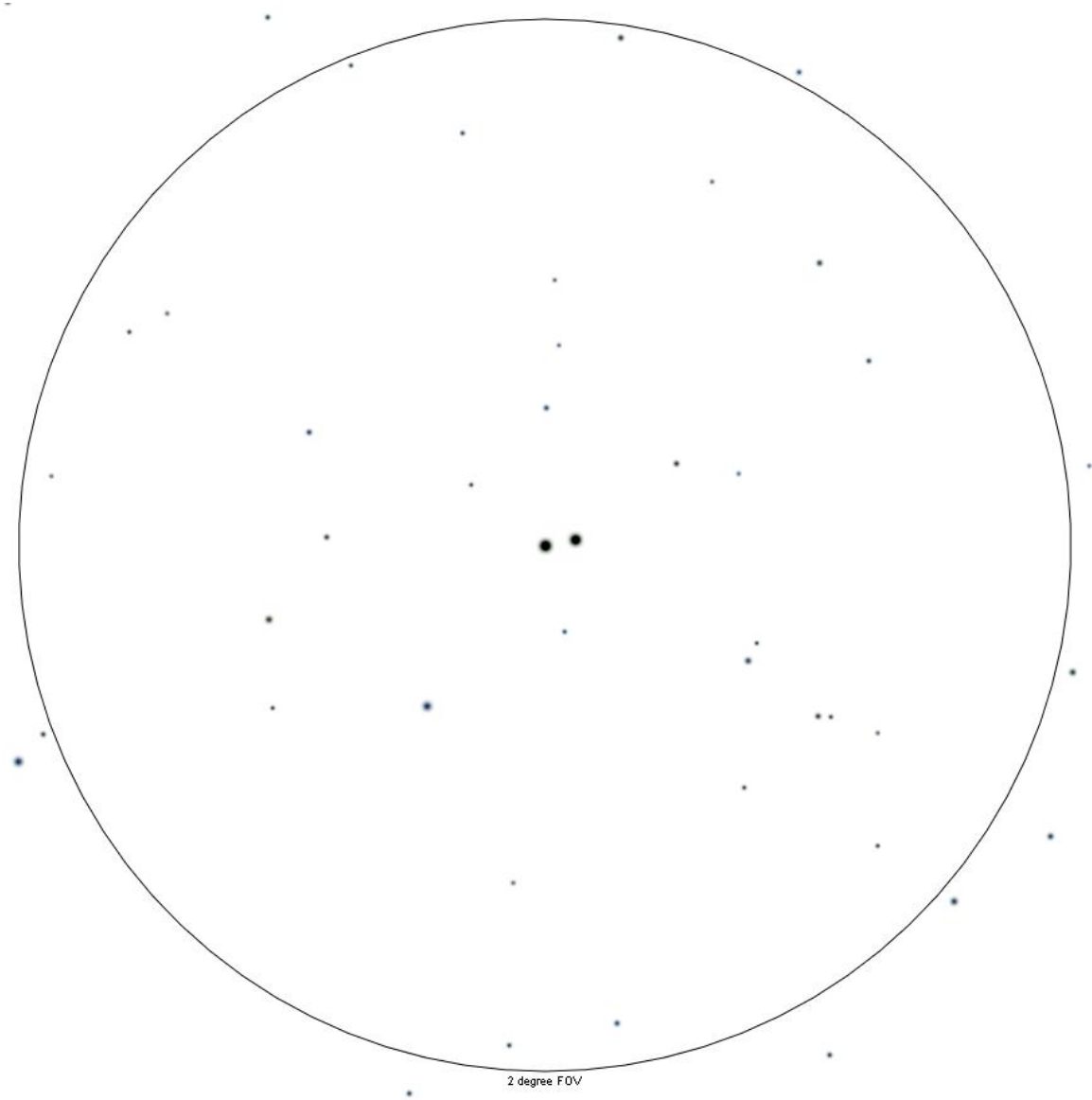


Figure 6: A 2° field of view centered on Epsilon Lyrae, out to magnitude 10.