

## Chapter 3

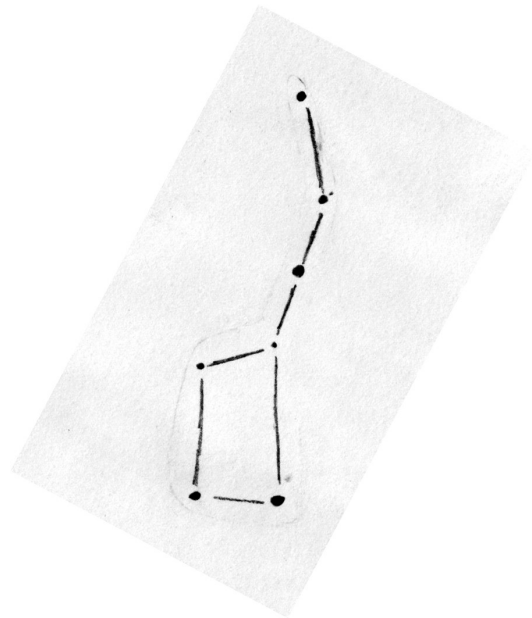
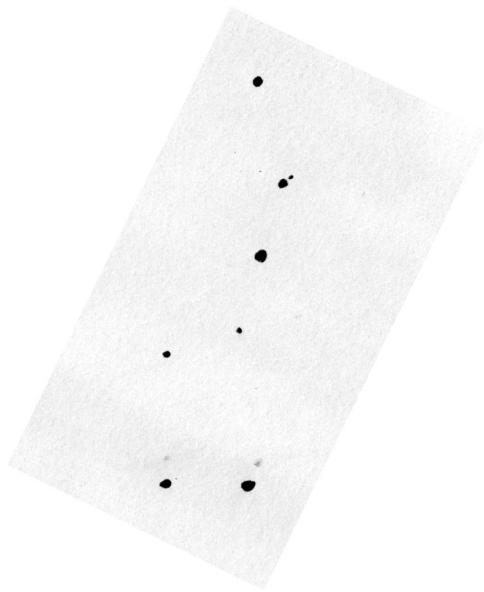
### A longer look at the heavens

In the previous chapter we looked at what we could learn about the heavens based on just a few nights of observing sunsets. We could learn a lot! However, there are some important things that take a longer time to notice, and in this chapter we will talk about these. These require a greater level of dedication to astronomy, but recall from last chapter that people had a very good reason to be dedicated -- that reason being that time is money. Also, what we are going to learn here is still generally what you could learn on your own simply by studying the heavens, especially if you have a grandmother or grandfather who is interested in the sky!

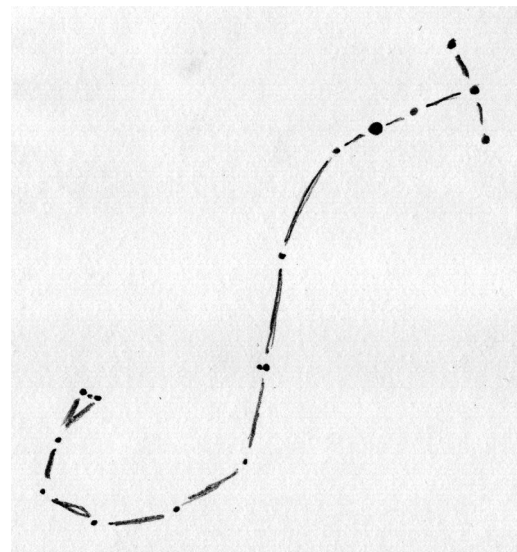
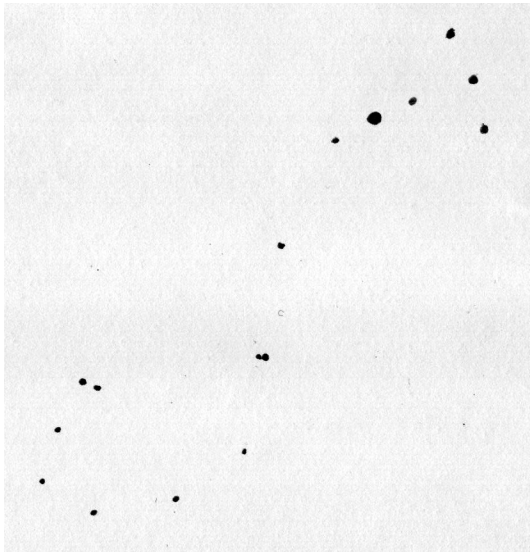
Why a grandmother or grandfather? Because one thing that anyone who watches the sky will eventually notice is that, while the stars do rise and set and rise again, they don't change much. They don't move around with respect to each other. They pretty much always look the same. And since they always look the same, people have picked out patterns in the stars and have given them names -- patterns we call "constellations". Most of the constellations don't look much like the things they are supposed to be -- the constellation Hercules, for example, absolutely does not look like the Greek mythological hero Hercules, or like anyone else, for that matter. But a few constellations do look something like the things they are supposed to be. For example, the "Big Dipper", a constellation which Kentuckians see in the northern sky throughout the year, actually looks like a dipper or scoop or ladle.<sup>1</sup> The same is true for the constellation Scorpius, the scorpion (see the astrological illustration in the last chapter), which Kentuckians see in the extreme southern sky during the summer. Scorpius actually bears some resemblance to the stinging creature whose name it carries.

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1 Technically speaking, the Big Dipper is not a true constellation. It is a grouping of stars, an "asterism", that is contained within the constellation Ursa Major, the great bear. Ursa Major does not look much like a bear -- although it looks more like a bear than Hercules looks like a man. The Big Dipper looks like a dipper, and is more familiar to more people than the bear.



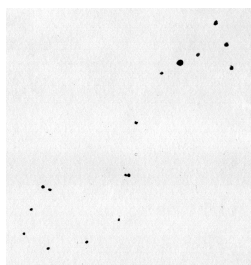
The Big Dipper as it appears in July after sunset.



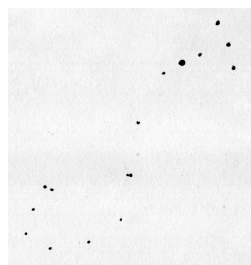
Scorpius as it appears in August after sunset.

Its shape suggests a scorpion with a curled tail and a stinger.

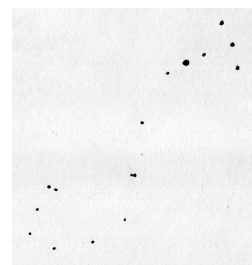
Chances are that Grandma knows the dipper or the scorpion. They look the same now as when Grandma learned them as a little girl. They actually have looked pretty much the same for all of human history. The scorpion and many other constellations have been recognized for thousands of years. The scorpion you see today is the same scorpion Grandma saw 50 years ago. It is the same scorpion Christopher Columbus saw 500 years ago. It is the same scorpion that the pharaohs of Egypt saw 3000 years ago. The stars just don't change much.



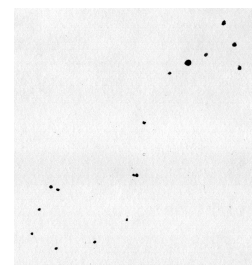
**The scorpion as it appears today.**



**The scorpion as it appeared to Grandma 50 years ago.**



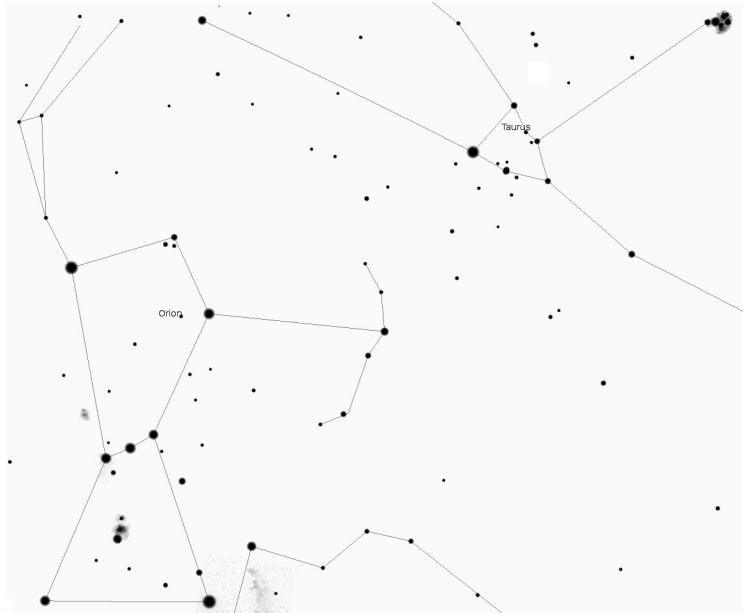
**The scorpion as it appeared to Christopher Columbus 500 years ago.**



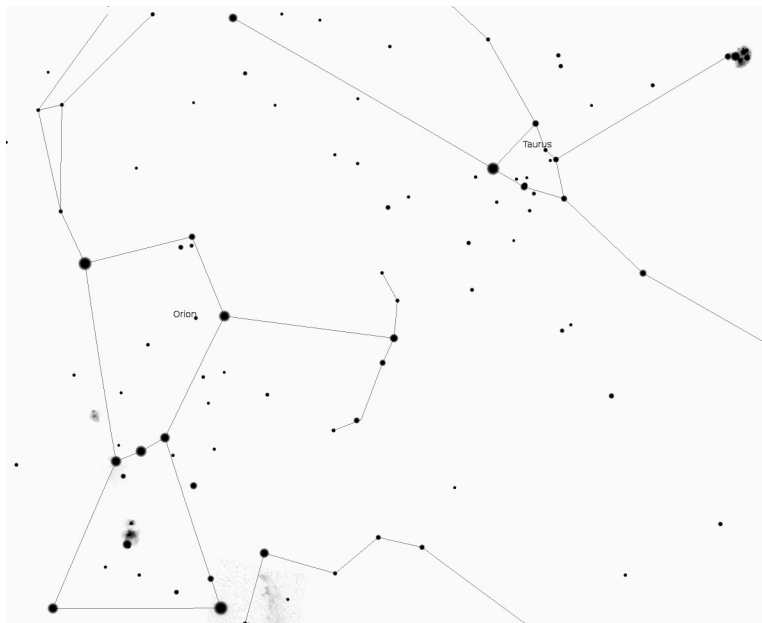
**The scorpion as it appeared to the pharaohs of Egypt 3000 years ago.**

The poem “The Phenomena” was written approximately 2300 years ago by the Greek poet Aratus. It contains descriptions of the same stars and constellations we see today, constellations such as Taurus (the bull), which contains the stars Aldebaran and the Hyades, Orion (the hunter), the Pleiades, and Auriga (the chariot-driver):

*Beneath Auriga, turning to the east,  
The Tyrian Bull, Europa’s treacherous beast,  
His golden horns and snowy neck displays:  
Rivals his splendid head Apollo’s rays.  
Glow his red eye with Aldebaran’s fire --  
With sparkling gems his brow the Hyads tire.  
Auriga and the Bull together meet --  
Touches his star-tipp’d horn the hero’s feet.  
The beast before him to the west descends --*



Above are Orion (left), Taurus (upper right), and the Pleiades (top right corner) as they appeared to Aratus 2300 years ago, as determined by the *Stellarium* planetarium software package. Aldebaran is the most prominent star in Taurus. Below are the same constellations as they appear today.



*Together with him from the east ascends...  
 [Behind the Bull] the Pleiads next are roll'd,  
 Like seven pure brilliants set in ring of gold.  
 Though each one small, their splendour all combine  
 To form one gem, and gloriously they shine.  
 Their number seven, though some men fondly say,  
 And Poets feign, that one has pass'd away.  
 Alcyone -- Celoeno -- Merope --  
 Electra -- Taygeta -- and Sterope --  
 With Maia -- honour'd sisterhood -- by Jove  
 To rule the seasons plac'd in heaven above.  
 Men mark them, rising with the solar ray,  
 The harbingers of summer's brighter day --  
 Men mark them, rising with Sol's setting light,  
 Forerunners of the winter's gloomy night.  
 They guide the ploughman to the mellow land --  
 The sower casts his seed at their command...  
 Athwart the Bull first rise -- majestic sight!  
 Orion's giant limbs and shoulders bright.  
 Who but admires him stalking through the sky,  
 With diamond-studded belt, and glittering thigh?<sup>2</sup>*

The stars are not the only thing in the heavens that remain constant. The cycles of the sun and moon that we deduced in the last chapter do not change. When Grandma was a little girl, the sun didn't rise in the south and set in the north; it rose in the east and set in the west, just like it does today. The days weren't 28 hours long in Columbus's day; they were 24 hours, just like today. The moon didn't take 50 days to go through its cycle when the pharaohs ruled Egypt, or when Aratus wrote *The Phenomena*; it took 30 days, just like today.

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2 From *The Phenomena and Diosemeia of Aratus*, translated into English verse by John Lamb (London: John W. Parker, 1848), pages 40, 43, 46.

The constancy of the heavens' cycles is something that is part of our culture and language. If we want to say that something is certain we will refer to it being “sure as the sun will rise”.<sup>3</sup> There is nothing in human experience as constant as the heavens. Old trees die and fall, and new ones grow up. A stand of Kentucky wildflowers is taken over by invasive species. Structures and monuments raised with the greatest of skill deteriorate and decay. The most finely engineered machines eventually break down and require repair. Forests that have stood for centuries are cut down and made into farmland. Land that has been farmed for generations is abandoned and returns to forest. Rivers that have flowed for ages untold are dammed up into lakes. Mountains that seem as old as the Earth itself are blasted through for highways. Change is part of life on Earth. But the heavens continue on, like nothing else we ever see. This is not something we observe for ourselves in a few nights, but it is something humanity has observed for itself over the ages.

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3 The idea of being as certain as the workings of the heavens even shows up in advertising (Days Inn offers “A Promise as Sure as the Sun”) and pop culture (the theme song from the Disney movie “Beauty and the Beast” makes references to being “certain as the sun rising in the east”).