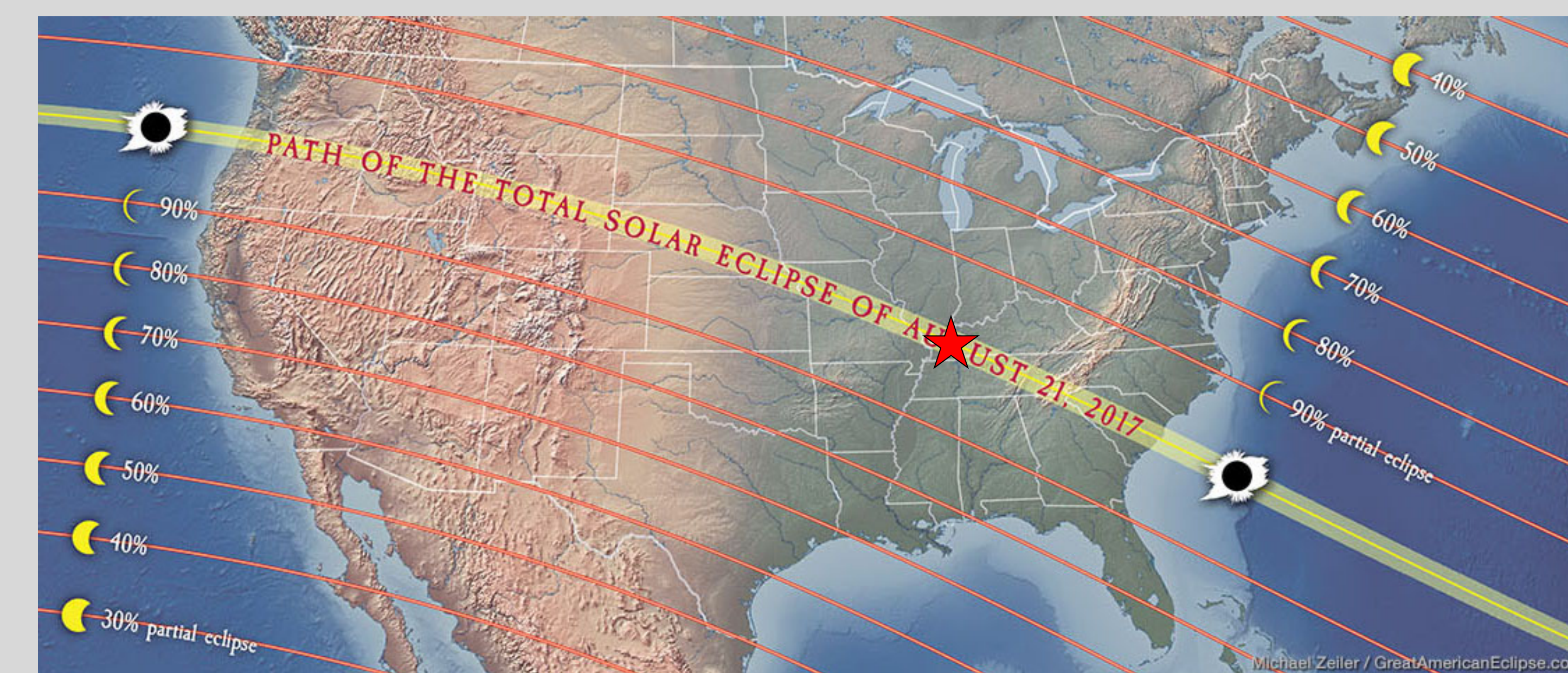


### The Science of an Eclipse

The Moon's orbit around the Earth is tilted by 5° relative to the Earth's orbit around the Sun. When the planes of the orbits intersect during a new Moon (Positions A & C) a solar eclipse is possible. The unlikelihood of this coincidence accounts for the rarity of solar eclipses. When the planes intersect during a full Moon, a lunar eclipse is possible. More typically, new and full Moons occur when the Moon is above or below the plane of the Earth's orbit (Positions B & C). The 2017 eclipse was "Position A" eclipse with the Moon intersecting Earth's orbit from above.

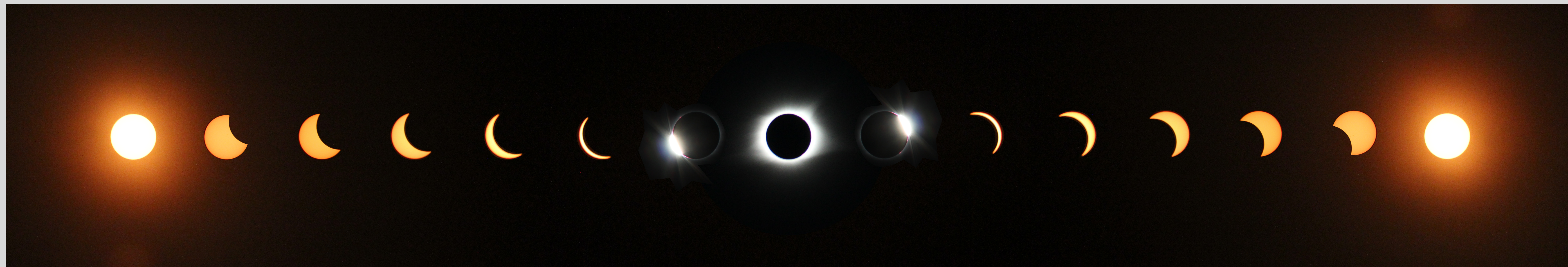
### The Path of an Eclipse

The Moon takes a few hours to cross the plane of the Earth's orbit. During this period, much of the sunlit face of the planet may be in shadow, but only a small region sees the entire Sun eclipsed (and then only for a short time). This region is referred to as the *path of totality*. During the 2017 eclipse, an area near Hopkinsville, KY experienced the maximum duration of totality at almost 3 minutes. Those in Richmond, IN saw 90% of the Sun occluded by the Moon. Even so, the remaining 10% of the Sun was 40,000 brighter than a full Moon.



### The Phenomena of an Eclipse

During an eclipse several extremely rare phenomena are observable. One of these is the "360° sunset" illusion visible only during the moment of totality. This is shown in the above panoramic photo taken by Earlham student Georgia Tillotson. Another phenomenon is the "crescent shadow," easily visible during any partial eclipse by making a pinhole camera. As shown to the right, a pinhole camera can be as simple as the gaps between your fingers. Other visible features include the "diamond ring" (below) visible only for a few seconds before and after the moment of totality as well as the Sun's (usually invisible) chromosphere and corona (or upper atmosphere).



### Earlham's Trip to Totality

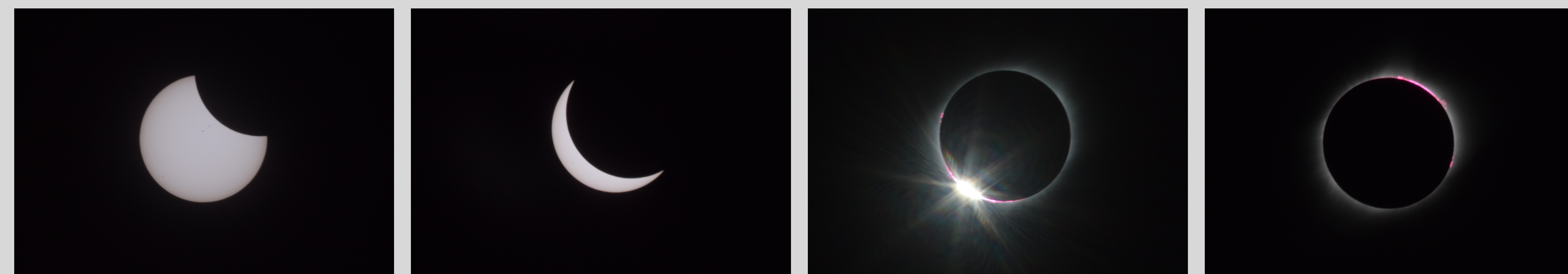
Astronomy professor Seth Hopper led a group of Earlham students, faculty and staff to witness the totality of the 2017 eclipse in Kentucky. The group left Richmond before 5 AM, driving three vans. They arrived in the path of totality about one hour before the beginning of the eclipse. The whole eclipse lasted almost three hours with the moment of totality lasting under three minutes. During the totality, insects sang their night songs while farm animals traveled back to their barns for a very short night.

### Photographing an Eclipse

Capturing the Sun presents a unique challenge to photographers. Our nearest star is so bright in the sky that it can easily damage the CCD of a digital camera. Therefore, a solar filter is necessary whenever taking photos of the Sun. Additionally, it is only about half a degree across (narrower than a finger held at arm's length), so one needs a large lens or a telescope in order to see any detail. The images shown here are a time sequence taken from left (beginning) to right (end). The Moon's shadow appears from the top right, indicating that this eclipse was a "Position A" eclipse (see the diagram above and to the left).

The above photomontage is composed of images captured by Georgia Tillotson. She used a black polymer filter, giving the Sun its orange look. Only for the three center images did Tillotson remove the filter to capture the "diamond ring" and the Sun's magnificent corona.

Below are four higher-resolution images taken using a camera lent by Earlham photography professor Walt Bistline. The first two photographs were taken using Baader solar film as a filter, accounting for the almost-white color of the Sun's photosphere (surface). A careful examination of the photosphere reveals sunspots. The pink around the disk in the right-most image is the Sun's chromosphere, which (along with the corona) is only visible during a total eclipse.



### The Destination

The whimsical nature of weather makes firm, pre-planned eclipse trips ill-advised. Therefore, we only decided to travel to Kentucky after checking the weather the morning of the eclipse. In the end, we were welcomed to the very small town of Fruit Hill by Linda and Glenn Farmer (who gave us the above illustration). The Farmers provided us with generous hospitality and a beautiful locale to witness this rare celestial phenomenon.