INVITED PAPER

AN ANNULAR SOLAR ECLIPSE

DENNIS ENGLIN* AND GEORGE F. HOWE**

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Abstract

The annular eclipse of May 30, 1984 provided an opportunity to study the unusual phenomenon.

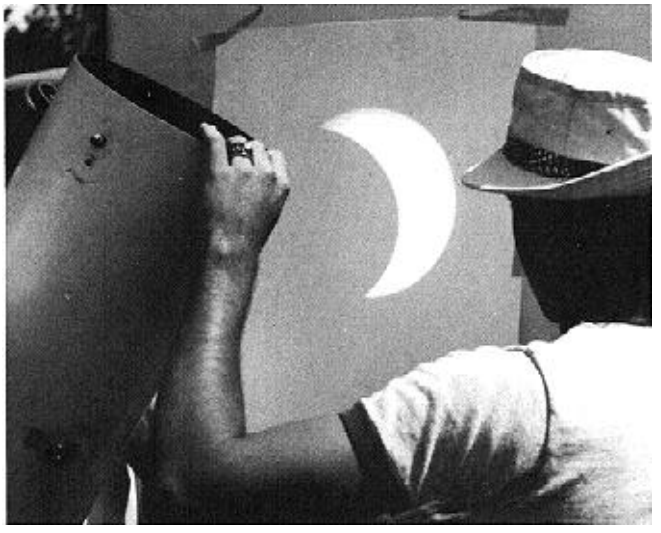

Figure 1. Members of the astronomy club from a nearby high school set up a screen and cardboard for viewing the reflected image of the eclipse, shown here at about 40 minutes before the actual event. Photo by G. Howe.

Observing an annular eclipse of the sun is a rare and striking experience. On May 30, 1984, however, the opportunity to do just such a thing presented itself to people along a certain narrow band across Louisiana, Mississippi, and some other southeastern states. The path of this particular eclipse was scheduled to move right over the town of Wiggins, Mississippi.

A local roadside rest park along the main highway at Wiggins was anything but restful on that day. People had come early from as far as California and Texas to set up telescopes and view the amazing event. Some of those present had reflecting devices whereby the image from their telescopes could be projected onto cardboard (Figure 1). One member of a Houston, Texas astronomy club was graciously passing out small pieces of mylar with which to view the eclipse without harm.

Long before the eclipse was at its peak, the image of the moon began blocking out a sector of the sun (Figure 2). During this time the pine-studded landscape nearby was becoming progressively darker. At one point, a few minutes before the peak of the annular eclipse, automatic switches turned on the lights in the buildings and along the access road. One viewer called our attention to the fact that nearby birds were no longer singing and had evidently begun to roost.

At 11:08 a.m., when the eclipse at this locality was at its maximum, a gentleman allowed others to take

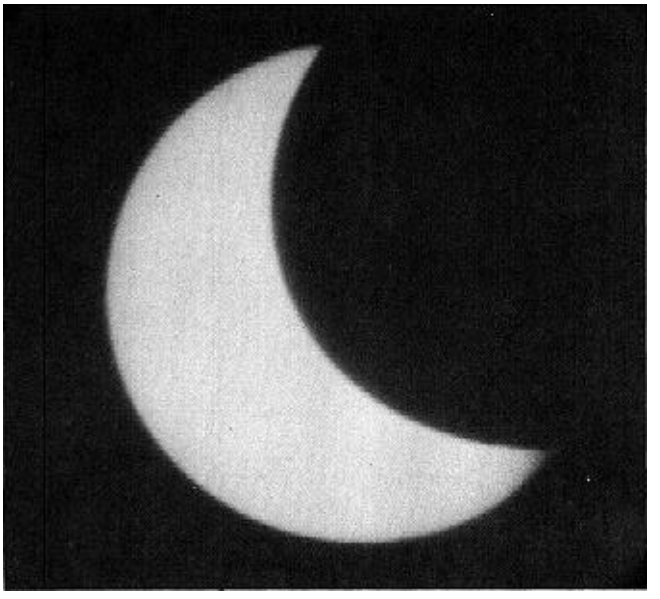

Figure 2. Ralph Phillips of Houston, Texas, permitted others to view and photograph eclipse through his telescope which he said was operating at about 30 power. This picture was taken through his equipment about 40 minutes before the maximum blackout and one can observe the image of the moon encroaching on the sun. Note sunspot also. Photo by G. Howe.

pictures of the reflected image using his equipment. At the instant of maximum eclipse (see Figure 3), he spoke out in clear and audible voice to the large crowd clustered at his telescope, "Now, who can say that there isn't any God?" Surely this was a beautiful view and as such, a tribute to the Creator. But is there another way in which a Creationist can see evidence for design in such an event as this?

A solar eclipse occurs whenever the Moon comes between the Sun and the Earth. This can only occur during the eclipse season because the orbit of the Earth Moon system is tilted at 5.2° to the plane of the Earth's orbit around the Sun. See Figure 4.

*Dennis Englin, Ed.D., is Associate Professor of Biology at Los Angeles Baptist College and he teaches an astronomy course.

**George F. Howe, Ph.D., is Professor and Chairman, Division of Natural Sciences and Mathematics, Los Angeles Baptist College and Director, Grand Canyon Experiment Station, Creation Research Society.

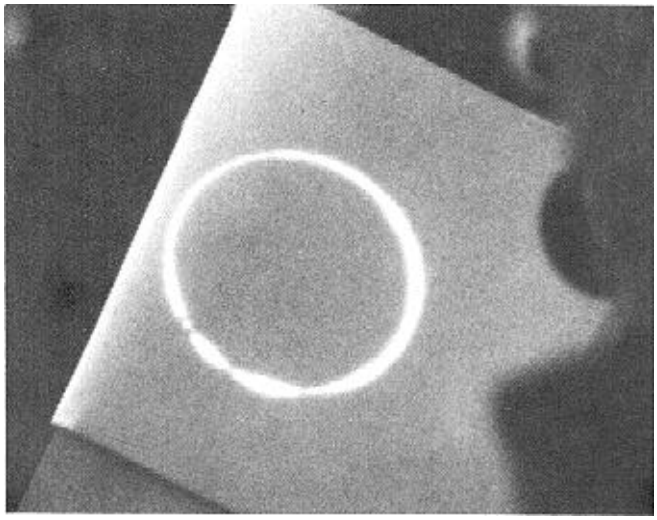

Figure 3. Another astronomer permitted photographs of the reflected image at the instant of maximum eclipse, 11:08 a.m., Central Daylight Time, May 30, 1984. The halo of the sun is seen here as the moon shields the sun itself. The little dark bands seen at about 6, 7, and 8 o'clock in this view are Bailey's Beads. Photo by G. Howe

At points A and B the Moon crosses the plane of the Earth's orbit and could potentially come between the Sun and the Earth during a New Moon.

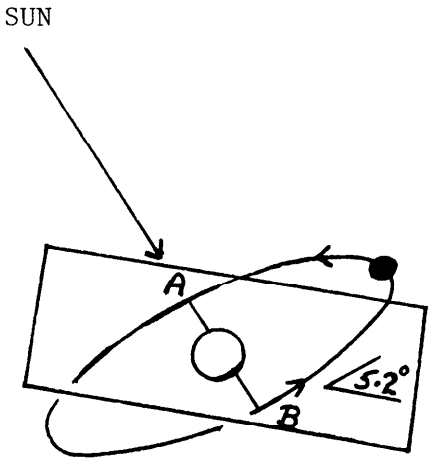

Figure 4. The plane of the Earth-Moon system revolving about a common center of mass is tilted at about 5.2° to the plane of revolution of the Earth about the Sun.

Figure 5 shows that during certain times of the year solar and lunar eclipses are more likely to occur. An eclipse season occurs about every six months. A lunar eclipse can occur only at a Full Moon and a solar eclipse can only occur at a New Moon. At least two solar eclipses occur every year, and never more than five. A cyclic pattern of solar and lunar eclipses repeats itself every 18 years 11 days and 8 hours. This is called the Saros cycle.[1]

In Figure 6, the Moon casts a partial shadow (penumbra) and a total shadow (umbra) upon the Earth. Anyone outside of the path of totality will observe a partial eclipse (perhaps only a half or a third of the Sun will be covered). Professional and amateur astronomers travel great distances to view the total eclipse in the path of totality.

A "remarkable coincidence" occurs during a total eclipse. The observed size or apparent size (also called the angular size) of the Moon is the same as that of the Sun.

On page 17 of the popular text, *Discovering Astronomy*, by Jeffreys and Robbins, the authors state that:

> This remarkable coincidence between the angular sizes of the Sun and Moon means that when the Moon happens to pass directly between the Earth and Sun, a total eclipse of the Sun can take place. At such a time, the bright disc of the Sun will be just covered by the Moon, and the faint tenuous outer atmosphere of the Sun, called the *corona*, can be seen. The corona is only one-millionth as bright as the Sun's disc and therefore is usually lost in the glare of the Sun. Only at the time of a total eclipse can it be seen. For this reason, astronomers often go on long and arduous eclipse expeditions to out-of-the-way parts of the globe to study the corona.

The Sun and Moon both have an angular size of 0.5° during a total eclipse. This is a combination of their distances from the Earth and their respective radii. This is not an accident or a combination of cause and effect phenomena that can be explained by complementary tidal effects or similar physical interactions. This is, rather, a beautiful example of the design of a gracious Creator.

The eclipse observed on May 30, 1984, was an annular eclipse. Figure 7 shows the difference between an annular and a total eclipse. In the annular eclipse, the umbra of the Moon comes to a focus before it reaches the Earth.

Because of the intensity of light that is still allowed to pass around the Moon, the corona and daytime stars around the celestial sphere region of the Sun are not appreciably visible during an annular eclipse. Nevertheless, it was a spectacular event showing Bailey's Beads (see Figure 4) caused by the higher mountain ranges and craters of the Moon that project above its surface.

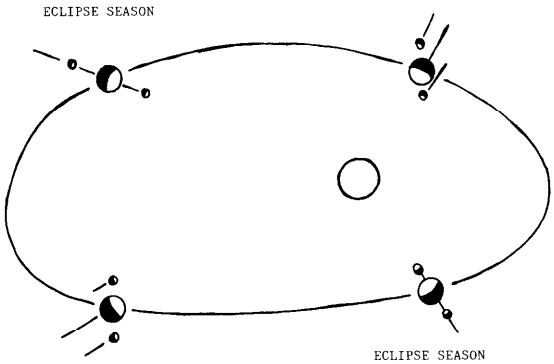

Figure 5. The eclipse seasons only occur at about six month intervals because of the alignment of the Sun, Moon and Earth.

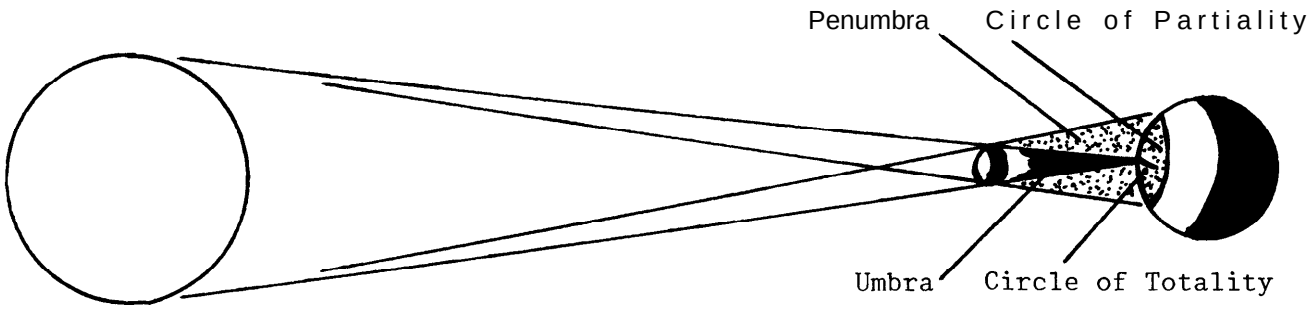

Figure 6. The total eclipse results when the umbra of the Moon falls upon the Earth.

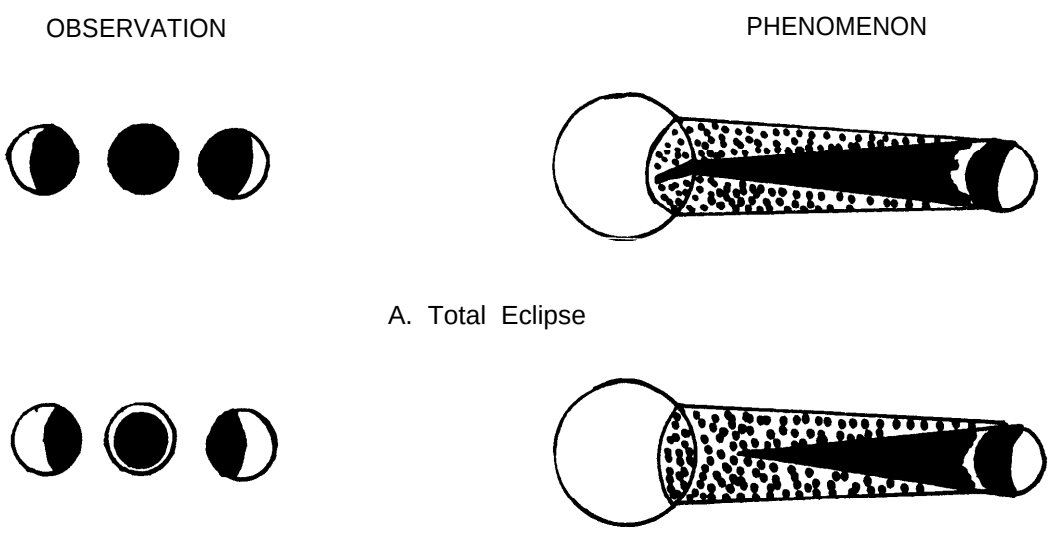

Figure 7. A total eclipse occurs when the umbra falls upon the Earth. An annular eclipse occurs when the umbra focuses to a point before it reaches the Earth resulting in a "ringed" Sun rather than a "totaled' Sun.

Another total solar eclipse occurred in New Guinea on November 22, 1984 and lasted for 2.0 minutes of the total phases. Later, on March 18 of 1988 a total eclipse will occur in Indonesia and the Philippines that will have a total phase of 3.8 minutes.

The eclipse is one of Godš fingerprints in the universe to remind us of who He is— the great I AM.

References

1. Duffett-Smith, Peter. 1981. Practical astronomy with your calculator, second edition. Cambridge University Press, New York, pp. 154 and 155.
2. Jeffreys, William H. and R. Robert Robbins. 1981. Discovering astronomy. John Wiley, New York, p. 17.

QUOTE

What specially attracts liberal arts students to naturalism is its emergence in the form of humanism, a philosophic system that adds to the naturalistic agenda a program of social ethics. Humanism emphasizes not only manš duties to his fellow man and to nature, but also certain expectations from his fellow man and from nature. Human beings ought to champion social justice, promote human rights and racial equality and be concerned, we are told, about poverty; they ought, moreover, to preserve natural resources and avoid polluting the cosmos. Humanism emphasizes also certain human expectations from nature, which is assumed somehow to uphold personal worth and security. Although most secularists abandon any expectation of individual immortality, some have assigned their bodies to deep freeze at death in the hope that science in the next century will be able to retrieve them for endless life on earth.

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