

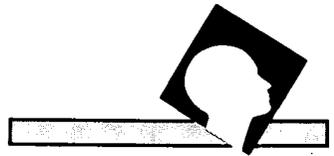
Observing Stars During the Daytime: The Chimney Myth

RICHARD SANDERSON

A belief has come down through the ages that stars can be glimpsed in daytime if the observer peers at a small section of sky from the bottom of a tall chimney or a deep well. The chimney or well supposedly shields the direct light from the sun. This reduces the amount of light entering the eye, causing the eye's pupil to open as it does at night, allowing more light to fall upon the retina.

One day nearly 20 years ago, while I was working as a teenage apprentice in the planetarium at the Springfield (Massachusetts) Science Museum, several colleagues and I got into a discussion about this old belief. We were overheard by the museum's director, the late Frank Korkosz, and he invited us to settle the question by performing an observation. Korkosz led us down into the museum's basement to the base of a tall, narrow chimney. A small door near the floor allowed access to the chimney—it was just big enough to stick your head through. I recall a feeling of wonder at the prospect of seeing the nighttime stars simply by looking upward through this long shaft.

The idea that stars can be seen during the day dates back at least to the time of Aristotle in the fourth century B.C. Aristotle wrote that stars had been seen in broad daylight by persons looking at the sky from deep within a cavern. Pliny, who lived nearly 2,000 years ago, had heard that a similar phenomenon occurred when the sky was observed from the bottom of a deep well. This concept found its way into literature, thanks to writers like Kipling, who wrote about "the gorge that shows the stars at noonday clear," and Dickens.



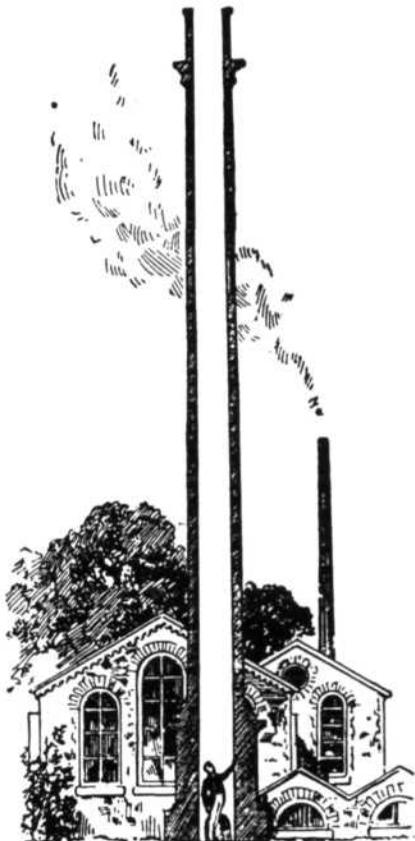
*It's an old idea,
and an
appealing one.
But does it work?*

Alexander von Humboldt, the noted German scientist and naturalist, repeatedly tried to observe stars during the daytime from mines in Siberia and America. He failed every time.

Even the great astronomer Sir John Herschel had heard of this belief. He knew an optician who became interested in astronomy after observing the "regular appearance at a certain hour for several successive days, of a considerable star through the shaft of a chimney." This, of course, was secondhand evidence, and it appears that Herschel never bothered to repeat the observation for himself.

Astronomer E. Walter Maunder, writing at the turn of the century, described the chimney myth as a "widespread tradition." This myth no doubt was perpetuated by such accounts as the following, which appeared in Sir Robert Ball's popular 1889 book *Star-Land*: "[The stars] can sometimes be seen in daylight in rather an odd way. If you can obtain a glimpse of the blue sky on a fine day from the bottom of a coal pit, stars are often visible. The top of the shaft is, however, generally obstructed by the machinery for hoisting up the coal, but the stars may be seen occasionally through the tall chimney attached to a manufactory when an opportune disuse of the chimney permits of the observation being made. The fact is that the long tube has the effect of completely screening from the eye the direct light of the sun. The eye thus becomes more sensitive, and the feeble light from the stars can make its impression, and produce vision."

The stars do shine in the daytime sky, but they are completely overpowered by the brilliant glare of the sun and the atmospheric scattering of sunlight. In space, where there is no air to scatter the sun's light and brighten the sky, the sky is black and



This illustration appeared in the 1899 edition of Sir Robert Ball's 1889 book *Star-Land*, with the caption "How the stars are to be seen in broad daylight."

stars can be seen near the sun. But let's confine our discussion to the earth's surface.

Venus, the brightest of the planets as viewed from earth, is occasionally visible during the day. I once sighted Venus during an early summer afternoon from the mountaintop site of the annual Stellafane telescope-maker's convention in Springfield, Vermont. The sky was unusually transparent that day and appeared deep blue, with Venus shining as a tiny pinpoint of light if you knew exactly where to look. Sirius, the brightest star in the nighttime sky, was above the horizon at the time but remained invisible.

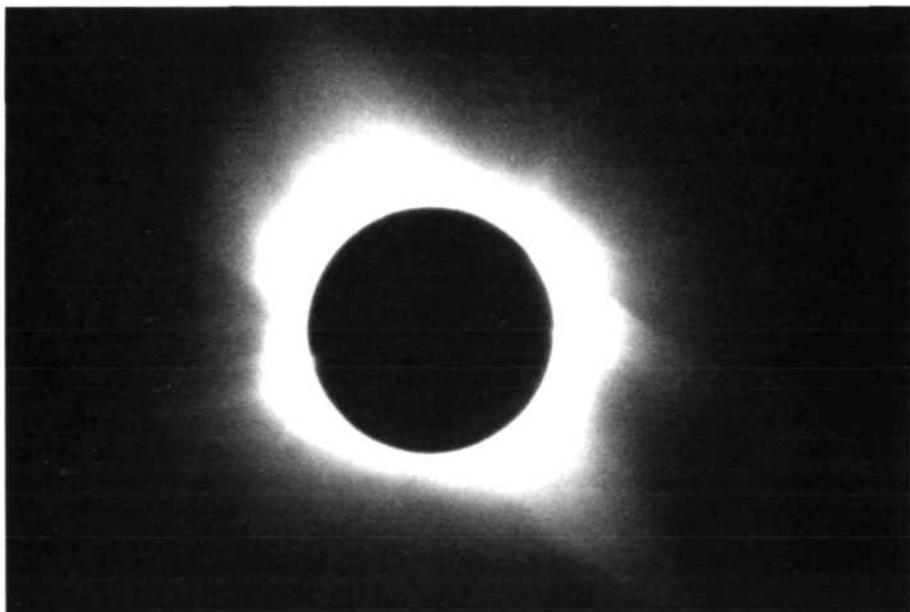
Venus blazes about ten times brighter than Sirius.

Some observers claim to have observed Jupiter with the naked eye in the daytime sky. Since Jupiter shines almost twice as brightly as the star Sirius, we cannot rule out the possibility that under ideal conditions, such as from a high mountain summit, a couple of the brightest nighttime stars might barely be visible during daytime. However, I've never heard of an observation that verifies this.

There are rare circumstances when one or more stars can become visible during the daylight hours. When an aging star explodes in a gigantic cataclysm known as a supernova, its brightness can increase millions of times until it becomes a daylight object. The supernova observed by the Chinese in 1054 was seen in the daytime sky for several weeks. Nearby supernovas are extremely rare, and nobody alive has ever seen one.

Astronomers have long known that stars can be glimpsed during the day through a telescope. Stars are so distant that they appear as pinpoints in ordinary telescopes, regardless of the magnification. High magnification reduces the "surface brightness" of the sky by spreading a tiny section of sky across the telescope's large apparent field of view, and this increases the contrast between the star and the background sky, rendering the star visible.

A total solar eclipse affords the only opportunity to observe stars sprinkled across the daytime sky. During totality, when the moon completely covers the sun's disc, the brightest stars can easily be seen twinkling in the dark blue sky. The darkness of the July 11, 1991, total eclipse revealed bright winter stars like Sirius, Betelgeuse, and Capella. A total solar eclipse produces this effect because the sun's light is blocked before it enters the



Total solar eclipses provide unique opportunities to view stars sprinkled across the daytime sky. This photograph, taken by the author at the July 11, 1991, total eclipse from Baja California, shows the beautiful solar corona surrounding the moon's silhouette.

earth's atmosphere. You can block out the sun's disc simply by holding up your thumb, but by the time the sunlight reaches your thumb, part of it has already been scattered by air molecules to give the sky its bright blue luster.

I experienced feelings of exhilaration and intense wonder when I saw stars in the daytime sky for the first time, during the total phase of the 1973 total solar eclipse in Kenya. Anyone who has witnessed a total eclipse cannot fail to be moved by this "forbidden" view of the nighttime stars. This phenomenon was described by a teenage sailor named James Fenimore Cooper, who was destined to become a famous author, when he observed the great total solar eclipse of June 16, 1806, from his home in the Finger Lakes region of New York State. Years later Cooper wrote:

Looking westward a moment, a spark appeared to glitter before my eye. For a second I believed it to be an optical illusion, but in another instant I saw it plainly to be a star. One after another they came into view, more rapidly than in the evening twilight, until perhaps fifty stars appeared to us, in a broad dark zone of the heavens, crowning the pines on the western mountain. This wonderful vision of the stars, during the noontide hours of day, filled the spirit with singular sensations.

Because of the relative sizes of movements of the earth, moon, and sun, the absolute maximum duration of totality during a total solar eclipse is only 7 minutes 31 seconds. In addition, the spectacular total phase of an eclipse can only be seen by individuals situated along the path of totality, the path of the moon's shadow across the earth, which is generally 50 to 200 miles wide and thousands of miles long. Even though

a total eclipse occurs once every year or two, the path of the moon's shadow often falls upon remote parts of the globe, making this a rare spectacle.

The ability to see stars in the daytime sky is an exotic and captivating concept for most people, which may account for the popularity of the chimney myth. The myth itself may have been born when someone looked upward through a chimney or a well and mistook Venus, which can be seen during the day, for a star. This would certainly explain the observations made by Herschel's optician friend.

As Korkosz stood watching, I looked upward through that museum chimney 20 years ago and saw a brilliant circle of sky surrounded by the inky blackness of the chimney interior. The pupils in my eyes did dilate, for the tiny section of visible sky was almost blindingly bright. I immediately realized that I would never see stars during the daytime by using this technique. As we left the museum's basement, Korkosz reminded us that there is only one star that can easily be seen during the daylight hours of any clear day, and that is the nearest and most important star, our sun!

Bibliography

- Ball, Sir Robert Stawell. *Star-Land*. Boston: Ginn & Co. 1899 (revision of 1889 edition).
- Cooper, James Fenimore. "The eclipse" *Putnam's Magazine*, September 1869.
- Mauder, E. Walter. *Astronomy Without a Telescope*. London: Knowledge Office, 1902.
- Rao, Joe. *Your Guide to the Great Solar Eclipse of 1991*. Cambridge, Mass.: Sky Publishing, 1989.

Richard Sanderson is an avid amateur astronomer and past president of the Springfield (Massachusetts) Stars Club. He is an astronomy columnist for the Springfield Journal. Address: P.O. Box 54, Monson, MA 01057.