

## **Author's Note**

My previous assignments for this course have been focused around the Sun (probability involving solar events, the Parker Solar Probe, and space weather). I wanted to continue that theme for this paper while also finding a topic that had a connection to math. When doing a Google search for possible topics I stumbled upon the paper *The Material Culture of Astronomy in Daily Life: Sundials, Science, and Social Change* by Sara Schechner of Harvard University. Schechner's paper inspired my topic choice, and although this report is supplemented with other sources, much of what is written below is a summary of Schechner's paper.

## **The Social Impact of Sundials and Timekeeping**

### **Physical Evolution**

As mathematics and astronomy evolved, so did sundials. As early as 3500 B.C. the shadow cast by certain obelisks marked the half-day point as well as the longest and shortest days of the year. The oldest surviving sundials are from 1500 B.C. in Egypt. Egyptian priests developed one of the first systems for a 24 hour day, twelve equal parts in the night and twelve equal parts in the day. In the third century B.C. hour-recording sundials became common in Greece and Rome. Until the 1390s, sundials continued to divide the day into 12 equal parts, ignoring the actual length of the day. As technology evolved and trigonometry developed, sundials became more precise, smaller, and more portable. They were no longer large structures that needed to be placed in an open area. Vertical sundials could be placed on the side of buildings, and eventually, sundials became so easy to create that they were incorporated into everyday objects such as rings, necklaces, and book covers. Although sun dials have now been replaced by watches and clocks, new patents for sundials continue to be submitted to this day.

### **Social Evolution**

So how did the physical evolution of sundials affect the social fabric of society? In ancient times, agrarian societies had no need for specific time telling. Their eating, sleeping, and natural chore habits determined their sense of time. However, in ancient cities, which lacked the same natural patterns necessary for survival as the rural areas, sundials provided "a tool for scheduling" (Schechner, 2001, p. 192). This new sense of time keeping and scheduling in the ancient world would not have occurred without the development of the sundial.

Let's fast forward to the emergence and eventual height of the Christian church. In Western culture, the Christian church, sundials, and therefore astronomers, were closely intertwined. As Schechner (2001) noted, "Perhaps the most disciplined time-finder was the Christian church" (p. 192). The Christian church played a powerful role in the development of Western society and their devotion to scheduled prayers and holidays, based on calendars and time keeping instruments developed by astronomers, had a profound impact on the social dependence on timekeeping. Because of this close relationship between the church and astronomy, cathedrals of the 15<sup>th</sup>, 16<sup>th</sup>, and 17<sup>th</sup> century were also astronomical

instruments. One example of this is the work of Gian Domenico Cassini, the namesake of the Cassini spacecraft. Cassini placed holes in the cupolas of the Vatican's Tore dei Venti and Bologna's basilica of San Petronio so that sunlight would fall along meridians that he constructed. One reason for this was so that Cassini could calculate the diameter of the sun and the eccentricity of Earth's orbit.

Interestingly, there is a correlation between changes in the societal emphasis on time keeping and changes in how time was portrayed in the fine arts. In the Classical era, time was "portrayed as a joyful, winged youth holding a sundial" however in the Renaissance era time was personified as "a ruthless old man, an inescapable force causing ruin and decay" (Schechner, 2001, p. 207). Whether it was the refinement of sundials that lead to this change is up for debate, but it is clear that cultural views on time were shifting and evolving.

### **Sundials Today**

Despite the fact that the functionality of sundials is essentially obsolete today, their legacy of creating a system of timekeeping, and embedding the need for timekeeping within our social structure, has been cemented within our society. National sundial societies around the globe have been formed, from North America to Portugal to Austria to Japan, for those who want to share their passion for sundials. It is also fascinating that the physical structures of sundials still serve as a source of curiosity and inspiration. McDonald's used their logo to create a sundial billboard in Chicago. The Sundial Bridge was built in Redding California. A sundial was even included on NASA's 2001 Mars Surveyor with the inscribed motto, "Two Worlds, One Sun."

## McDonald's Billboard

Image Source: <https://mymodernmet.com/mcdonalds-brilliant-sundial-billboard>



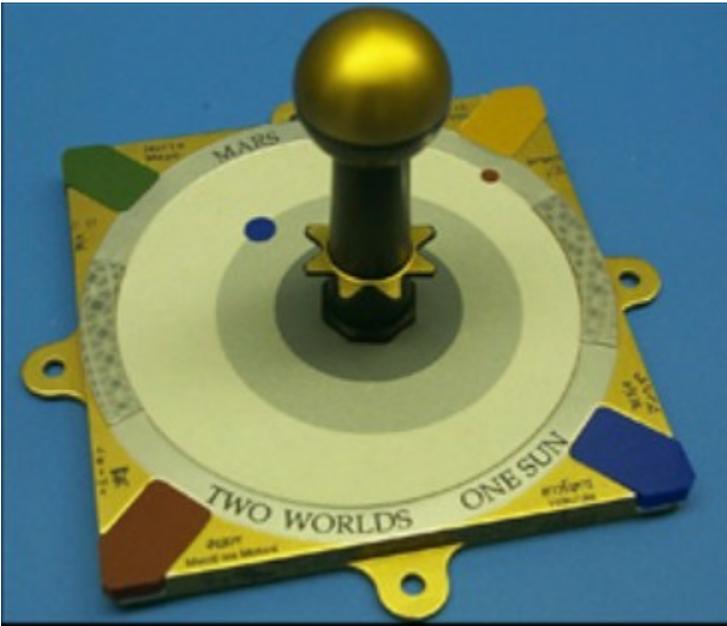
## Sundial Bridge

Image source: <https://www.visitredding.com/sundialbridge>



## Mars Surveyor Sundial

Image source: [https://mars.nasa.gov/mer/mission/spacecraft\\_instru\\_calibr.html](https://mars.nasa.gov/mer/mission/spacecraft_instru_calibr.html)



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