

Contemporary physicists are researching recent developments such as string theory, which may provide greater insight into time and space and the relationship between the two.

Carol Ellen Kowalik

See also Black Holes; Spacetime, Curvature of; Space Travel; Time Machine; Time Travel; Wormholes

#### Further readings

- Kaku, M. (1995). *Hyperspace: A scientific odyssey through parallel universes, time warps, and the tenth dimension*. Oxford, UK: Oxford University Press.
- Thorne, K. S. (1994). *Black holes and time warps: Einstein's outrageous legacy*. New York: Norton.

---

## TIME ZONES

---

A time zone is one of 24 mostly equal divisions of the earth, created in an effort to standardize time worldwide. For the most part, a time zone is equal to 15 degrees of longitude and operates at exactly 1 hour plus or minus its eastern and western neighboring zones. In any time zone, the zone immediately to its east is 1 hour ahead, and to its west, 1 hour behind.

It was 1879 when Sir Sandford Fleming proposed the use of time zones, which were officially adopted in 1884 at a conference held in Washington, D.C. Prior to the use of time zones, localities kept their own central, or civil time. Usually, towns would set their clocks to noon once the sun reached its high point. The method was not exact and even neighboring cities and towns saw great variation in time within their own boundaries. Some towns had residents who would travel the town every week with watches in hand for people to set their own watches, in order to try to keep a uniform time within the town.

This system worked as well as it needed to and had strong ties to the days when sundials were used to tell time. The sun reaches different points across different places of the earth, so local times were very different, but with relatively sedentary communities, there was no need to keep standardized times. Although travel between towns was not uncommon, there was

little inconvenience in resetting one's clock based on the locale.

With the onset of faster modes of transportation, those needs changed. Railroads were being built and used extensively, and the increase of travel and people being transported across greater distances in shorter times posed a great problem to scheduling and timekeeping. Fleming, a Canadian engineer and surveyor, played a major role in the development of the rail system throughout Canada and the United States. He quickly realized that the need for more accurate scheduling demanded a standardized time.

Fleming used simple mathematics to determine the size of each time zone: with the world comprising 360 degrees, and a day consisting of 24 hours, each zone should equal 15 degrees of longitude—1/24 of the world's circumference. He presented his plan at numerous conferences until a version was adopted at the International Meridian Conference of 1884. Despite Fleming's assertions that time zones allowed for use of local time, the conference rejected the use of time zones. It was, however, agreed that the use of the meridian of Greenwich as the prime meridian made sense, as the majority of maps and charts at this time had already been using it as such.

The United States and Canada adopted the use of their time zones on November 18, 1883, also known as "The Day of Two Noons." Within 30 years, Coordinated Universal Time (abbreviated UTC) and time zones were being used by all major countries. There have been some changes to each zone's size based on local and political considerations, allowing countries and states to remain within a given zone. For example, China, which should span five zones, uses just one, and in the United States, most states are within its own zone, despite geographical boundaries.

Amy L. Strauss

See also Clocks, Atomic; Earth, Rotation of; Harrison, John; Latitude; Longitude; Prime Meridian; Sundials; Time, Measurements of; Time, Universal; Timelines; Timetables; Watches

#### Further Readings

- Blaise, C. (2000). *Time lord: Sir Sandford Fleming and the creation of standard time*. New York: Pantheon.