

# ***TIME-BINDING TIME: A History of Time-Measurement and Time-Management in America***

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ACCORDING TO GENERAL SEMANTICS, *time-binding*—our ability to use language and other symbols to transmit information across time—is a unique characteristic that defines us as humans. That definition piqued my interest and I decided to do some historical research on how time-measurement and time-management have developed in America. (1)

## **Measuring and Managing Time: Pre and Post-Revolution**

In the eighteenth century, America was largely a nation of small farmers and fishermen, and time was closely related to agricultural tempos, tides, weather, and seasons. Most Americans lived on farms and rural life consisted of lots of hard work tempered by impediments such as advancing darkness, inclement weather, and the vicissitudes of the growing season. Timekeeping, in the main, was ruled by the sun.

The sun appears to move across the sky from east to west and, in the eighteenth century, a community a few miles east of another would mark noon first and remain a few minutes and seconds ahead of its western neighbor—e.g., Albany, New York, a little to the east of New York City, was one minute one second ahead of Big Apple time. To know whether the sun had reached noon for the day (crossed the local meridian or line of longitude), one could consult

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a south-facing noon mark—the simplest noon-mark was a line running north-south scratched into the horizontal surface of a floor or windowsill. Sundials were ubiquitous and measured time with accuracy that was close to the mechanical timepieces of the period.

Rural life did not cease at night—firelight, candles, and moonlight could be used for illumination. Almanacs forecast phases of the moon, as did mechanized indicators on clock dials (the dial of a tall case clock tracked the moon's waxing and waning). Almanacs also provided data that presumed a reader's capacity to recognize the brightest stars in the sky, to track the planets, and to use the heavens as a way to mark time.

Notions about time went beyond pragmatic use. The clock had become a compelling metaphor to explain how the universe operated (like a giant clockwork—rationally and in an orderly manner). Although Isaac Newton never employed the metaphor, he buttressed the idea of the orderly functioning of the cosmos through his magnum opus *Philosophiæ Naturalis Principia Mathematica* (1687). Newton postulated that matter moved in regular, predictable ways through space and time under the influence of gravity.

Newton's ideas about the disciplined working of the universe strongly influenced Enlightenment thought and science in the Colonies. By the middle of the eighteenth century, Newton's "natural philosophy" was a dominant doctrine in American colleges. To support texts that advanced the Newtonian view that time was absolute and one-way, advancing and constant everywhere, colleges hired master craftsmen to prepare three-dimensional teaching aids to link clocks, calendars, and nature. These clockwork-driven models demonstrated the relative motions of the solar system, the workings of the Newtonian universe.

Few clocks were made in America before the Revolution—most were imported from England. Although clocks could keep time to the second, there were clocks that only came with an hour hand. These clocks were usually reliable to the closest quarter hour—agricultural work did not have to be calibrated to the minute. But some individuals wanted to keep more accurate time. Thomas Jefferson installed a clock at Monticello in 1805 that had a dial with three hands to indicate hours, minutes, and seconds for scheduling indoor household chores.

Watches were also used in America to tell time. They were intriguing little mechanisms, somewhat expensive, and fashion accessories. A man wore his watch in his fob, a pocket with a horizontal opening below the waist of his breeches—consulting the time drew attention to the fact that a man was wealthy enough to own a watch. A woman typically wore her watch openly at the waist, on the right side. Thomas Jefferson gave each of his granddaughters, on their

twelfth birthdays, a personal slave and a gold watch. The present of the watch symbolized the children's entry into the time-conscious world of grownups.

Colonial businessmen had more flexibility in scheduling than today's executives. A typical workday might consist of three hours of business duties, with the balance of the day spent on government, church, or social obligations. But as the new republic began to shift from agriculture and commerce to an industrial economy, success depended on the timely trading of goods. Benjamin Franklin advised his countrymen: Time is money.

The U.S. Postal Service exemplified the new focus on time. The Post Office Act of 1792 established a nationally coordinated system to quicken mail delivery. Four years later the Post Office announced a day-by-day timetable for the post mail that ranged from Canada to South Carolina. A relay of post riders and stagecoaches operated on a regular schedule, with specific days and hours of departure. Until the arrival of the telegraph in 1844, these mail carriers were the archetype of speed and celerity.

### **Measuring and Managing Time: Early to Mid-Nineteenth Century**

As the industrial revolution took hold, and with the development of the automated factory, people began to be governed more and more by machine time. Work steadily moved out of homes and small workshops to large factories and wages based on time became the norm. To maximize work time, management set fixed workday schedules and installed factory clocks and bells to establish operating hours and to call workers.

The earliest factories ran from sunrise to sunset and workers received pay by the day. With the spread of artificial lighting this method of pay became a problem for workers since their working day was lengthened but their remuneration remained the same. Gradually, standard work time was implemented and patterns developed that separated leisure from work.

In the eighteenth century, individuals might work more than a twelve-hour day, but they could take breaks for eating, drinking, conversations, or other non-work related tasks. But nineteenth-century factory-time was geared for work only, so the end of the workday marked the start of free time. Men went home to their wives whose pattern of life had also been significantly affected by the Industrial Revolution.

The new factories of the Industrial Era denied middle-class women their economic role as domestic producers of clothing, food, and other necessities. A new view emerged of a woman's role—"the cult of domesticity." The best-known book on the subject, *A Treatise on Domestic Economy* (1847) by Catharine

Beecher (the sister of Harriet Beecher Stowe, author of *Uncle Tom's Cabin*), emphasized household habits that were designed not to waste time.

Schools were also mindful of the efficient use of time. By the 1830s, white children were attending public schools where they were conditioned to a clock-regulated day. A ringing bell called children to class, a clock in each classroom organized their lessons, and reading the clock dial was taught early-on. Students were punished for lateness and awarded certificates for punctuality.

Concern about shifting notions of time was particularly evidenced in nineteenth-century efforts to preserve a stringent observance of Sunday as a day of rest. At the beginning of the century Sabbatarians failed to keep local post offices from opening on Sundays. They would also fail to stop Sunday railroad and steamboat travel, theater performances, newspaper sales, and openings of saloons, libraries, and museums.

Clock sales increased steadily during the nineteenth century and by the 1870s clock-making had become a full-scale industry in America. With an emphasis on home furnishings, many individuals wanted a clock in their home—even if they couldn't tell time—and they began to think in terms of time “of the clock” or “o'clock.”

Americans also had a strong desire for watches, many of which were imported in the first half of the nineteenth century from England and Switzerland. In the 1850s, at what would become The American Watch Company of Waltham, Massachusetts, the world's first machine-made watches were developed. Waltham watches proved so good that at the Philadelphia Centennial Exposition in 1876, Swiss watchmakers sent a representative to learn American techniques.

Railroads, a major nineteenth-century industry, were particularly interested in accurate timekeeping for the safe running of trains and for scheduling timetables. Slowly but surely, a network of railroad regional times replaced a hodgepodge of local times. In 1873, there were over seventy regional railroad times across the United States. In 1883, on the brink of the railroad's introduction of standard time, there were about fifty. The railroads, and the telegraph, particularly demonstrated the importance of the time-related values of productivity and speed.

### **Measuring and Managing Time: Late-Nineteenth to Early-Twentieth Century**

In 1869, Charles F. Dowd, the principal of the Temple Grove Ladies Seminary in Saratoga Springs, New York, proposed that there be a national system of standardized time zones. Fourteen years later, the railroad industry imple-

mented that vision by agreeing on a system of five distinct time zones in North America—Intercolonial (now Atlantic), Eastern, Central, Mountain, and Pacific.

Most cities and towns quickly adopted the standard time zones and gave up “local time.” But there was some dissent. For example, some cities geographically out of synch with the new time zones demurred, and so did individuals and groups who objected to being “bossed around” by the railroads. There was also opposition by those who thought an artificial system of time zones was against the natural order of the universe—clock time is an abstraction of nature and standard clock time is even more removed from the sun’s actions. However, most people considered the new standard time a practical and useful idea.

In 1884, diplomats and scientists met at the International Meridian Conference, held in Washington, and recommended that the world’s nations decree a prime meridian in Greenwich, England; that longitude be counted east and west from the prime meridian up to 180 degrees in each direction; and that a universal day be adopted beginning in Greenwich at midnight—after the British *Nautical Almanac* was published in 1767 many nations had adopted Greenwich time for navigation and for scientific observations. World time became standardized.

In 1918, Congress approved an act to save daylight and provide standard time for the United States. The law was passed as a way to save fuel and promote efficiency during World War I. After the war, America’s farmers, more in accord with the sun than the clock, convinced Congress to repeal the daylight savings part of the legislation. (The nation adopted daylight savings time again at the beginning of World War II—to aid electricity conservation and evening “Victory gardens.” It continued in many states after the war and today the only states that do not observe daylight saving time are Arizona, Hawaii, and parts of Indiana.)

In an expanding urban and industrial world, people were obligated to know the time and to be on time, and this led to an increased awareness of the clock’s time passing and of the need to respond to the dictates of the clock—the workplace time clock first appeared in modern form in the 1880s. By the late nineteenth century, many consumers were actively seeking alarm clocks. Watches had become essential to everyday life.

Men wore watches in their vest pockets and women wore them, as fashion dictated, in assorted ways. As the twentieth century developed, both men and women began wearing watches on their wrists, which provided a more efficient way to tell time. While attaching a watch to one’s wrist offered a new wrinkle on an existing technology, there were many novel technologies in the late nineteenth and early twentieth century that greatly impacted on time.

The automobile, telephone, phonograph, movies, and electric light suggested that time might be experienced in different ways. The car and phone seemed to quicken the pace of life. Sound recordings and the movies appeared to jumble past, present, and future, to gyrate time. Electricity spun night into day. The scientific news of the era led H. G. Wells to write *The Time Machine*, a novelistic exploration of the future. And Albert Einstein cast time as personal and subjective with his notion that time in the cosmos might be relative to the observer, not the uniform and unalterable constant that Isaac Newton had proposed more than two hundred years earlier.

### **Measuring and Managing Time: Mid-Twentieth Century**

The specialized study of job tasks, and the most efficient ways to do them, began with the work of Frederick W. Taylor in the machine shops of American industries in the 1880s. The Taylor method emphasized order, system, and control and it featured new ways of organizing job-time, such as how long the workday should be and how fast employees should work.

By the turn-of-the-century, many managers, enamored with the Taylor method, had become engrossed with how long it took workers to do particular tasks. The Taylor method became a foundation for the new profession of industrial engineering. A favorite tool of that profession was the stopwatch, an instrument that symbolized efficiency and scientific competence to industrial engineers—sometimes labeled “time study men.” (Frederick Taylor had used stopwatch studies of machinists at work in the 1880s. His goal was to plan methods of production to blend people and their equipment into a seamlessly running machine. The Taylor approach was labeled “scientific management” in 1910.)

Efficiency experts also applied the principles of scientific management to the work that was being performed in the home—using a factory analogy, the homemaker was considered a manager and worker. Two such experts, Lillian Gilbreth (a possessor of a Ph.D. in psychology from Brown University), and her husband Frank (the owner of a construction company), pioneered the use of photography to analyze motion in time with respect to performing household tasks.

After the death of her husband in 1924, Lillian Gilbreth concentrated on the study of housework, home management, and women as consumers. In a career that lasted forty-five years after her husband’s death, she worked diligently to increase the efficiency and effectiveness of the household to give modern women more leisure time. (The mother of twelve children, Lillian garnered worldwide

notability for balancing career and family—the 1948 book and subsequent 1950 movie *Cheaper by the Dozen* were inspired by her life.)

With industrialization, most workers had become wage earners and the workplace had become a clock-dominated venue—by 1910 almost every factory and many offices had a time clock. New regulations and new technologies stripped employees of much of the power they once had over how they arranged their work and time spent on the job. One result of this loss of influence was worker advocacy to gain shorter hours.

During the nineteenth and twentieth centuries, organized labor campaigned for shorter hours to increase salaries, employment levels, and working conditions. Non-union workers also wanted shorter hours to enjoy more leisure time. An important effect of this worker activism was a significant workday reduction, from ten-hour days to eight-hour days by the beginning of the twentieth century, although the six-day workweek stayed in place. (In the 1930s, Congress passed laws pertaining to work hours and other aspects of employment in response to the exigencies of the Depression. After World War II, the eight-hour day and the five-day workweek became the norm.)

The spread of the fixed-hour day and increased control in the workplace enhanced the separation between labor and leisure. Many observed the end of the workday by having a drink and so the “cocktail hour,” a stretch between five and seven in the evening as a bridge from work to free time, was born—the term “cocktail hour” officially entered the language in 1927, followed by “cocktail party” (1928), “cocktail bar” (1929), “cocktail tray” (1934), “cocktail dress” (1935), and “cocktail lounge” (1939).

Cocktail culture, with well-provisioned home bars, burgeoned in the 1950s and 1960s and in the 1970s commercial bars introduced the “happy hour” with reduced prices for drinks and food. A century earlier, in many workplaces, drinking alcohol and socializing had been a normal part of the workday.

### **Measuring and Managing Time: Mid-Twentieth Century to the Present**

The in-vogue cliché 24/7, short for 24 hours a day, 7 days a week, officially joined the American lexicon only recently. It is adverbial slang for “continuously” or “unceasingly” and implies that every minute is open for use. Technology, in the last three decades, has been especially powerful in creating and serving that use—e.g., overnight air delivery and computer networks have made on-line shopping accessible at any hour; the Internet offers immediate access to people, shopping, and information around the clock.

Sunday has taken on new meaning in our 24/7 society. In the 1960s and 1970s, under heavy lobbying from businesses, state legislatures and courts in

most jurisdictions abolished Sunday closings, or “blue” laws. With their demise came the expectation that we can shop, or do anything else, on any day of the week—and at any time of the day or night.

These days people seem to have more to do than ever before and many feel obligated to do it all. Some believe they can create more time by getting organized. They segment their days into fractional usable parts. They keep detailed personal calendars and schedules to make the most of every minute and be consistently on time. They buy time-management advice books and tools—Filofaxes, handhelds, etc.,—and go to time-management trainings. (Many time-management experts counsel self-management. The idea is that *you* must gain control of your time.) Yet, even with decades of time-management guidance, people still seem to lack time.

We can not fault our timepieces for depriving us of time. In the 1920s the quartz clock was introduced. It kept time by counting the vibrations of a quartz crystal in an electric circuit and subdividing those vibrations. This technique proved far more accurate for telling time, losing a few seconds every three or four years, than pendulum and mechanical driven works. Today, quartz watches outsell mechanical ones by a huge margin.

Interestingly, quartz watches with analog dials sell more than those with digital displays. This may be because our knowledge of time is so entrenched there that we cannot simply discard it. Also, the digital display offers an added level of abstraction. (The traditional clock dial bears some resemblance to the sundial. With the digital display, only numbers symbolize the apparent movement of the sun through the sky.)

For those who need to measure time more accurately than quartz technology allows, there are atomic clocks. Since 1967, by international agreements, the length of a second is defined by the frequency of an isotope of cesium. Cesium’s signature frequency divides the second into almost 10 billion parts—the present generation of cesium clocks are said to lose a second every 20 million years. With the measurement of the atomic second so exact, the earth is not in synch with atomic time. Beginning in 1972, every two or three years, a single second has been added to the calendar—more than twenty times—to keep atomic time, civil clock time, and the globe coordinated. (No one clock sets time for the world—The *Bureau International des Poids et Mesures* [BIPM] in Sevres, France, groups data from about 260 atomic clocks at approximately thirty locations worldwide to determine the official average international time, UTC [Coordinated Universal Time].)

In the twenty-first century we have the capacity to divide the second into much smaller pieces and this has made an important difference in the technologies we depend on—e.g., computers, cell phone networks, radio and television



broadcasting, deep-space vehicles, and power transmissions. We can also buy watches that receive electronic messages and telephone pages, watches that store information about appointments, watches that prompt their owners to remember birthdays, and watches that pick up GPS signals to provide latitude and longitude—the term “wristwear” has come into use for these new combination gadgets.

On the Internet front, for the past five years, Swatch has declared local time and place irrelevant. The Swatch internet day starts at what would be midnight local time in Biel, Switzerland—Swatch’s headquarters—where the time is, Swatch style, @000. Nicholas Negroponte, a father of the Internet and director of MIT’s Media Labs, has proclaimed the new system the ultimate Web tool—he helped Swatch launch internet time in 1998. Beyond the hype and new terminology one can detect that time-boundaries between people are shifting and perhaps even disappearing. While it is still too early to forecast how this new development will play out, it should be interesting to see what happens. I suppose “time will tell.”

#### NOTE

1. Much of the information contained in this article is more fully developed in Carlene E. Stephens, *On Time: How America Has Learned to Live by the Clock*. (Boston: Bulfinch, 2002). This book, put out by the Smithsonian Museum of American History, provides lively and insightful history on how Americans have thought about time over the past 300 years.

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