

Ancients on Time

IT TAKES a shockproof, water-proof anti-magnetic watch to keep the wheels of modern civilization going. Time was when a knotted rope did just as well.

Certain primitive tribes, who never split a second, carried the practice of dividing time by knots into the twentieth century, the National Geographic Society says. On planning a party, a Guiana Indian chief sent identical strands to the coterie. Each guest untied one knot every morning. And when he worked past the last one, it was time to honor the invitation.

Debtors and creditors used the same twist. Should the day of reckoning come too fast, the debtor might wheedle a new cord or get leave to retie a few knots in the old one.

Since the dawn of society, every civilization has been preoccupied with finding a better way to tell time.

Cave man no doubt watched the movements of sun, moon, and stars. He gauged short spans of time by the shadows of trees and cliffs. It occurred to him one day that he could cause a neater, sharper shadow by setting up a pole in a clearing, with a stone or stones to measure the march of the image. Ipso facto, the first crude sundial.

The sundial's shortcomings are apparent, especially on dark days. Nonetheless, it has served man long and well. The science of dialing was taught in British schools as late as the seventeenth century. It is possible to buy a modern sundial with a swiveling base, adjustable to daylight or standard time.

MANY THOUSANDS of years ago, an early hydraulics expert figured out a means of calculating time without sunlight. Of unknown nationality, perhaps Chinese, the genius came up with the water clock or *clepsydra*—"thief of water." In its simplest form the *clepsydra* is a bottlenecked vessel

that gradually loses water through a tiny hole in the bottom.

The water clock reached its peak of usefulness in the golden age of Greek and Roman oratory. Some speakers were suspected of putting muddy, sluggish water into their clepsydras to steal a bit more time.

In time clever mechanics added wheels, dials, and ingenious gadgets to the clepsydra. One of the most famous was given to Charlemagne by the Shah of Persia. This gold-inlaid water clock featured twelve doors that opened in sequence and remained ajar to mark the hours visually. At 12 o'clock, miniature horsemen popped out to close all the doors.

Throughout its long service, the clepsydra had distinct disadvantages. Water freezes and evaporates. The clock was expensive and bulky.

Sand was the answer. Origin of the handy, portable, non-freez-

ing sandglass is lost in time, but it may have been used in Alexandria at least two-and-a-half centuries before the Christian Era. The hourglass inspired a mode of dress in later years, and became a symbol in Father Time's hand.

Fire has always been a convenient timekeeper. Chinese and Japanese burned knotted ropes. Alfred the Great regulated his activities with banded, time-keeping candles. In recent times Dutch and German farmers used lamp clocks with calibrated-glass oil vessels.

Invention of the truly mechanical clock is generally credited to the tenth-century monk Gerbert. Nowadays people everywhere depend more and more on it, and less on the old devices or natural phenomena.

"It is past the time of the cock crow" may be a delightfully poetic phrase, but it hardly helps the harassed commuter catch the 7:02.

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Centrifugal Force

Much has been learned about the nature of gravitation through its resemblance to another phenomenon, inertia, especially in the form known as centrifugal force. Centrifugal force is independent of material, is not a function of temperature, and cannot be cut off by any form of screen. In fact, centrifugal force, like gravitation, seems to be a function only of the mass involved and the space and time coordinates of the system.

—S. Aroneta

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