

What Does a Clock Measure?

"The concept of a clock enfolds all succession in time. In the concept, the sixth hour is not earlier than the seventh or eighth, although the clock never strikes the hour save when the concept bideth."¹

That may seem like a silly question since *everyone knows* what a clock does. It tells time. Of course, that is wrong; we only assume that it tells time. What it really does is something else, but before answering the above question, we first need to think about what a clock really is and how it functions.

Certainly, for everyday common usage, the definition of a clock as given, for example, by the online *Oxford English Dictionary* "as a mechanical or electrical device for measuring time" is completely adequate.² It only becomes inadequate when we delve deeper into the nature of clocks and time.

All clocks are devices that repeat some type of cyclical *motion*. Furthermore, we assume that this cyclical motion repeats at equal intervals. There is just no other way of measuring event intervals except with predictable repetitive motion associated with an object that is external to the object of measurement. That is, if I want to measure a series of events, I, necessarily, have to use a measuring device that is independent of the events being measured.

Clocks, in a monotonous manner, simply repeat mechanical processes with what we faithfully believe are equal intervals. These repetitive processes require an interpretative interface through which the repetitive motion

¹ Nicholas of Cusa (1401-1464), *Vision of God*, 1453, 24.

² To be sure sundials have no mechanical moving parts, in this case, it is the earth's movement that provides the measure of *time*.

acquires meaning. As Nicholas of Cusa wisely observed six hundred years ago, six o'clock is not a characteristic of a clock; but has only a symbolically interpreted meaning that we give to a particular configuration of the clock-human interface.

The human interface of a clock is only a visual mechanism of successive positions and is indifferent to the hour. Although we commonly assume that a clock is *telling time*, what clocks really do is provide a standard measure against which we determine, through interpretation of the clock-human interface, the intervals between events.

To be sure, the history of clocks is rich and varied, and today we encounter clocks in many configurations. Nevertheless, all clocks still have essentially the same purpose, and they all rely on processes that meet our expectation of reliably repeating a cyclical motion with equal intervals. That is, they rely on the repetition of a particular motion with intervals that are assumed to be equal within some acceptable degree of accuracy. This is what all clocks do, whether it is sand falling through a glass tube or a modern sophisticated *atomic clock*.³

³ Even electronic clocks use *cyclical or oscillating motion* as the measure of interval.