

From the Birth of Time to Felt Time

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Received: April 28, 2022; **Published:** May 27, 2022

Abstract

The riddle of time is solved thanks to the effectiveness of multidisciplinary.

Keywords: *Duration; Duration Felt; Time*

Introduction

Defining something is saying what it is. Otherwise, we don't know what we are talking about. Everything is definable, except what we do not know, which leads to simplifying beliefs.

In addition, a good definition often provides theoretical extensions.

In that purpose, we have developed a multidisciplinary research which shows where, when and how the temporality appeared in human history, and that it was invented.

A sensitive subject

The debates pertaining to time continue to be parasitized by tirelessly repeated platitudes, gross fallacies, formal defects, and the fact that time remains a sensitive subject. The Latin philosopher Lucretius (c.96-55) already emphasized: "the misfortune of humans who have attributed so many things to the Gods" (Song V, 1194) [1] ("Gods is written with a capital letter, because theirs are not inferior to ours: we owe them respect).

The invention of the month

In lower Mesopotamia, archaeology has uncovered a clay tablet dated between 2800 and 2500 BCE (Before Common Era), on which a cuneiform (from the Latin "cuneus", corner) sign "arhue" is engraved (Figure 1): "arhue" means "month" [2]. A discovery that has surprisingly eluded researchers.

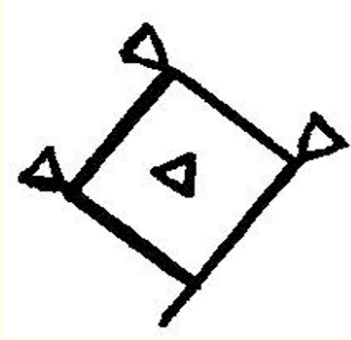


Figure 1: The cuneiform sign for "arhue" (month).

The Sumerian approach is simple: they have observed a repetition of the movements of the moon (the "lunation"). They started using "arhue" in their everyday life... as a unit.

It must be emphasized that the "lunation" is observable and measurable: it's a phenomenon, while the "month" is an invention of thought, a concept; the difference is crucial.

Lunation (phenomenon) >>> **Month** (concept).

It leads to an elementary definition of the month: The month is a concept corresponding to a lunation.

The accurate wording is very important; using words like "time" or "duration" is a semantic infraction because these two words are as-yet undefined: consequently, "the month is the duration of a lunation" does not provide any information. It must be emphasized that "time" and "duration" are semantic nuances of the same concept; they are expressed with the same units.

The other units

This way of defining allows one to define the following concepts in relation to the corresponding specific phenomena. These definitions are simplified in order to highlight the transition from "phenomenon" to "concept".

The "year" is not the duration of a terrestrial revolution; it is defined in relation to the terrestrial revolution.

One terrestrial revolution (phenomenon) >>> **one year** (concept).

Hence the definition: The year is a concept corresponding to one terrestrial revolution.

The "day" is not the duration of a terrestrial rotation; it is defined in relation to the terrestrial rotation.

One terrestrial rotation (phenomenon) >>> **one day** (concept).

Hence the definition: The day is a concept corresponding to one terrestrial rotation.

The "second" is not the duration of 9,192,631,770 cycles of cesium 133; it is defined in relation to cesium cycles in fundamental state.

9,192,631,770 cycles (phenomenon) >>> **one second** (concept).

Hence the definition: The second is a concept corresponding to 9,192,631,770 cycles of cesium 133.

Definition of time

Lucretius already wrote that "... nothing stays the same, everything passes ..." (Song V, 830) [1].

We have shown that time could be defined in relation of the states of any system [3].

Two states of a system (phenomenon) >>> **time** (concept).

Hence the definition: Time is a concept corresponding to what separates two states of a system.

Time has no physical properties, but it owns mathematical properties. For example, in classical physics, it is continuous and invariant, in relativity it is continuous and covariant, in quantum physics, it is invariant and stochastic (conjectural), etc.

The felt time

In "As you like it", the English dramatist William Shakespeare (1564-1616) writes: "Time travels in divers paces with divers persons" (Act III, Scene II) [4]. Psychology use the word "heterochrony" for describing the important concept of "felt time", which deserves a more in-depth technical study.

Conclusion

Thanks to interdisciplinarity, we have shown that the Sumerians scholars are the inventors of temporality: indeed, "arhue" is the first trace of time in history. The analysis of their mental approach proves that the nature of time is that of a concept instead of that of a phenomenon. In addition, this analyse allows defining all the units and time itself. Note that "space-time" does not exist in the universe: it was invented by Einstein in 1905.

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Volume 11 Issue 6 June 2022

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