

# Time Explained to Dummies and the Others

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ISSN: 2688-836X



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**Submission:** 📅 February 02, 2023

**Published:** 📅 February 07, 2023

Volume 13 - Issue 4

**How to cite this article:** Patrice Dassonville F\*. Time Explained to Dummies and the Others. *Nov Res Sci.* 13(4). NRS.000819. 2023.  
DOI: [10.31031/NRS.2023.13.000819](https://doi.org/10.31031/NRS.2023.13.000819)

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## Abstract

About how Sumerians invented the month over 4500 years ago: this first trace of temporality allows one to define the month, the day, the year and time itself.

**Keywords:** Biological aging; Birth of time; Time is not a phenomenon; No experiment about time; Time felt

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## Introduction

In order to understand the matter of time, it is advised to make a critical analysis of what is repeated and what we believe we know about: all assertions must be proven. It is crucial to renounce everyday language and received ideas. In that purpose, some basic rules, specific to this topic, are reminded below. The way time appeared, leads to define the units and time itself, and to uncover a few unprecedented consequences.

## How to Proceed

### Mistakes to avoid

Using « time », « duration », and time units, is not allowed as long as these words are not defined [1-12]. In the following examples, forbidden words are crossed out and it is explained why:

- The second is the of ... (beginning of the definition of the second by CGPM in 2018) [13]: « duration » is not defined; the wording of this international definition must be revised.
- The duration of a phenomenon is that passes between ...: time and duration designate the same thing; therefore, defining one by the other is a sophism. Metaphors (from the Greek metaphor: transposition), like « time that passes », are not allowed for they don't teach anything.
- The duration of the present: « the present » means a « present event » instead of « present time », because duration of present time is a sophism.

### Reality and concept

Understanding the difference between a reality (an object, an event, a phenomenon, or a fact) and the corresponding concept (concept: idea built from a reality) is crucial: objects, events, phenomenon, facts, are observable, detectable, measurable, whereas the corresponding concepts are not, because they are mental constructions [14-22]. Four examples:

- All artists (... Masaccio in 1427, Durer in 1504, Cranach the Elder in 1513, Titian in 1550 ...) draw and paint Adam and Eve with a navel, which is an anachronism (from the Greek ana: opposite). We see their navel, but we don't see the anachronism because an anachronism is a concept that is not observable. Art history did not notice this strangeness. EVE'S NAVEL (reality) ---> ANACHRONISM (not observable).

B. We see somebody who is afraid (reality observed), but we see no fear (concept not observable): FRIGHTENED SUBJECT ---> FEAR (not observed). Hence the definition of fear: « Fear is a concept corresponding to somebody who is afraid »

C. The physician sees the patient who is suffering (syndrome observed), but he does not see the pain (concept not observable): SUFFERING PATIENT ---> PAIN (not observed). Hence the definition of pain: « Pain is a concept corresponding to a patient who is suffering »

D. Can we measure the length of an object? No, it's impossible, for length does not exist in nature; we can neither see it nor measure it. In fact, we measure what separates the two ends of the object: the result is called « length of the object ». WHAT SEPARATES THE TWO ENDS ---> LENGTH OF THE OBJECT. Hence the definition of the length of an object: « The length of an object is a concept corresponding to what separates its two ends ».

### Define time

Defining something is saying what it is. A definition is a basic requirement of knowledge, failing which we hold forth without knowing what we are talking about. Everything is definable, except what we don't know, and which only leads to simplifying opinions. The Greek biographer Plutarch (c. 46-c. 126) warns: « Opinion has great power for erasing reason » [12, Life of Cicero 23, 3].

What is the nature of time? Is it a physical phenomenon, like heat or noise? Or a concept, like fear or pain? For example, can we measure a race duration? Let's observe the timekeeper: he watches what the chronometer does between departure and arrival (reality measured). Although the result is called « the race duration », there is no measure of duration because it's a concept. WHAT THE CHRONOMETER DOES ---> RACE DURATION. The duration of an event is a concept corresponding to what separates the beginning and the end of this event »

Given that time resists definitions, the difficulty will be circumvented by seeking the first traces of temporality (Temporality designates what is in relation with time) in the oldest writings, in order to use what they are likely to reveal. In « Life of Cesar », Plutarch writes: « Cesar was at leisure (instead of: spare time), he was reading a book about Alexander » [11,5] and in « Life of Alexander », he writes: « When Alexander was at leisure » (instead of: spare time), as soon as he got up, he offered a sacrifice to the Gods, and, immediately after he ate, seated [22,3].

### A Time Precursor

#### The advent of writing

The gradual advent of writing put an end to the « tempus *mutum* a *litteris* », silent age without writing, lamented by the Roman scholar Cicero (106-43 BCE) [14]. It allows one to find out a major precursor of temporality: eternity.

The ideographic (from the Greek idea) writing uncovered at Sumer in lower Mesopotamia (from the Greek *mésos* (between) and *potamos* (river)), uses simplified images of common objects, stylized pictures of plants, animals, basic artifacts (from the Latin *artis factum*: know how). The geometrization of ideographic writing gives birth to pictographic (from the Latin *pictura*: paint) writing shortly before 3300 BCE (Before Common Era), then to cuneiform writing from 3300 BCE onwards [5].

In ancient Egypt, there are three kinds of writings: hieroglyphs (sacred engraving, from the Greek *hieros*: sacred, and *gluphein*: engraving) appeared about 3100BCE; hieratic writing, a cursive writing which is a simplification of hieroglyphs, appeared about 2400BCE; demotic (from the Greek *dêmos*: people) writing after simplification of hieratic writing, that is used by people from the 7th century BCE onwards [5].

The Greek historian Herodotus (484-425BCE) reports that during his travel in Egypt, he had some hieroglyphs translated; unfortunately, he did not bring anything back: he would have initiated Egyptology. Nevertheless, his description of the country shows what Greece, Roma and the whole world owe to ancient Egypt [6].

### Eternity

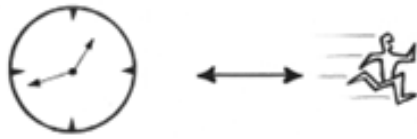
Lucretius notes « the misfortune of humans who have attributed so many things to the Gods [3, Song V, 1194]. Logographers (storytellers, from the Greek *logos*: speech) tell that Gods created humankind to serve and honor them. Actually, they were disappointed by the result, and as they feared being overtaken, they made their creatures deadly thanks to aging.

The Greek founder of historical science, Thucydides (c.465-c.395 BCE) notes: « ... by writing history, logographers were keener to please their readers than to establish the truth » [2, Book I, 20 & 21]. The rejection of the idea of death has led to the reassuring idea of life after death: eternity is the first hieratic (from the Greek *hiéros*: sacred) trace of temporality. REJECTION OF DEATH ---> IDEA OF LIFE AFTER DEATH ---> INVENTION OF ETERNITY. Monarchs possessed a divine character. Their proximity to the Gods made them immortals under certain conditions.

### In Egypt

These conditions are described in detail, in ancient Egypt, through hieroglyphic texts and a virtuoso iconography (from the Greek *eikon*: image) painted or incised inside mastabas (grave of a VIP) (Figure 1). On the composite hieroglyph (Figure 2), the winged sun figures the sun God Re, creator of living things; the course of the sun, with alternations of day and night, symbolizes the rebirth after death; hence the idea of eternity. The two adjacent cobras protect against evil [7]. We find this hieroglyph in Persia, in Mesopotamia, in Phoenicia, in the Hittite Empire (center of modern Turkey). Greek and Roman architecture and numismatics display no trace of it. *Djed*, a pillar shaped amulet (Figure 3), allows the pharaoh to live

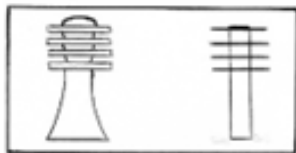
forever in the afterlife [8]. It symbolizes the backbone of Osiris, the god of rebirth after death [9].



**Figure 1:** The race duration is what the chronometer does between departure and arrival of the runner.



**Figure 2:** Sacred precursor of time and space (3rd millennium).



**Figure 3:** Two representations of Djed.

### In the Hittite empire

Hittite monarchs bear a horn shaped hat, which symbolizes their divine character; therefore their immortality. The seal (Figure 4) represents the emperor Muwatallu who reigned from 1295 to 1290BCE. He wears a tiara adorned with horns; at his side, we see his son Urhi-Tesup, who will reign between 1290 and 1283BCE [10]. Tossup means bull and the hieroglyph bull head, for the syllable mu, is a divine emblem. On the left side, the hieroglyphic writing says: « The great king Muwatallu (the crescent means « great » and the segmented triangle means « king »). On the right side, « great king » is written three times (we would say: « very, very, very great ») under the W-shaped hieroglyph of God, which is under a winged sun. The king pays tribute with his left hand to the « great lunar God ». The royal tenures, written in cuneiform writing, are displayed on the periphery [10].



**Figure 4:** A seal of king Muwatallu.

### In Mesopotamia

The Gilgamesh Epic, a masterpiece dated about 1700BCE, is engraved in cuneiform writing on eleven large clay tablets (+ one

fragmentary tablet) which were uncovered in lower Mesopotamia. One can read: «When Gods created humanity, they included death for humans». But the legendary sovereign Gilgamesh (between 2900-2350BCE) begs the solar God Shamash to spare him and his double Enkidu from death [11].

### The Invention of Time

The use of « time » and « duration » is still prohibited as long as these words are not defined. Two examples:

- a) « The month is the of a lunation »: « duration » is crossed because its signification is unknown.
- b) « The month is the done by the moon for ... »: It's an offence for the same reason.

### Definition of the month

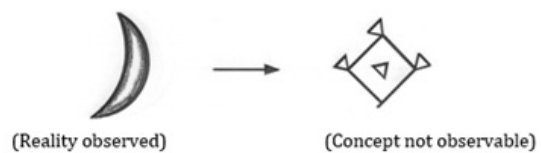


**Figure 5:** «Month » in Sumerian cuneiform writing.

A clay tablet uncovered in Sumer and dated between 2800 and 2500BCE, bears a cuneiform character (Figure 5) which signifies « month »; « arhu » in Sumerian language [11]. How did Sumerian scholars get to such a cultural upheaval?

- A. Observing the movements of the moon,
- B. They noticed that it returned regularly to the same state (same shape and same place).
- C. They called « arhu » what what separates two similar successive states of the moon.

«The month is a concept corresponding to what separates two similar successive states of the moon»



**Figure 6:** The invention of the month (arhu).

The movements of the moon, the repetition of its states, are observable and measurable. On the other side, « arhu », in other word the month, is neither observable, nor measurable, because it is a mental construction (Figure 6). This discovery is prominent and unprecedented because it identifies the appearance of temporality in human history. The Sumerians have gradually introduced and used « arhu » in the organization of their life. Example: «The boat will return within six arhu »; « arhu » is the lunar month which lasts about twenty-nine and a half days. Since Pope Gregory XIII (1502-1585), our Gregorian month has between twenty-eight and

thirty-one days. This major cuneiform sign does not appear in any theoretical study on time; we have introduced it in 2012.

### Definition of the year

Plutarch reminds the erratic (from the Latin erratic us: irregular) values of the year, between one and ten months depending on the countries [12, Life of *Numa*, 18, 6]. Hence the fanciful age of the biblical patriarchs. It also proves the non-existence of the year in the nature. We see the return of the earth at the same position relative to the Sun (configuration) and which is called « year », but we don't see the year. SAME CONFIGURATION (phenomenon observed)->YEAR (concept not observable). The terrestrial revolution is what separates two identical and successive states of the Earth-Sun configuration: « The year is a concept which corresponds to two successive and identical configurations »

### Definition of the second

The new definition of the second decided by CGPM [13], that came into force in 2019, has two formal defects: « The value of the second is defined by setting the value of the number of periods of the radiation ... at 9,192,631,770 when it is expressed in  $s^{-1}$  ». («  $s^{-1}$  » means « 1/s »).

- a) The « period » is the « duration of a cycle »; therefore « number of periods » is « number of durations of a cycle »; what is senseless.
- b) « ... when it is expressed in  $s^{-1}$  »; well,  $s^{-1}$  is the inverse of the second, so that the second is defined in relation of the inverse of the second; it's a sophism.

In fact, the value of the second is defined by 9,192,631,770 cycles of radiation .... 9,192,631,770 CYCLES (measured)->SECOND (concept). Hence a coherent definition: « The second is a concept which correspond to 9,192,631,770 cycles ... »

### Definition of time

The word « system » designates any object, such as an atom, a bacterium, a runner, the couple Earth-Moon, etc. A system is described by its state, which changes permanently. The Latin philosopher Lucretius (c.96-55) expresses it brilliantly: « a state after another concerns all things, and nothing remains the same: everything passes » [3, Song V, 826]. Month, year and second being defined from the state of a system, time can also be defined from the state of any system: TRANSITION FROM ONE STATE TO ANOTHER (observed) -> TIME (concept). It leads to a definition: « Time is a concept corresponding to what separates two states of any system » This definition looks quite basic, but as far as I know, there is no other; despite that, it's going to lead to numerous theoretical extensions, among which some are described later. For the same reasons as for the units, time is not observable, not measurable and without physical existence: it's not a phenomenon, instead, it's a concept. Four thousand five hundred years after the feat of the Sumerians, Einstein invents the concept of space-time.

## Consequences of Definitions

A short inventory of some consequences among numerous results, emphasizes the importance of defining the subjects we are talking about.

### The time felt

Everyone is convinced that time is a phenomenon: it passes, it flows, it flies. In addition, everyone has the feeling that time passes more or less quickly, depending on where we are, what we do, etc. The disorder resulting from this conviction and this feeling, goes away thanks to the introduction of the more precise concepts of « felt time » and « felt duration » [20]:

A. Heterochrony (from the Greek *heteros*: other): The Latin poet Horace (65-5 EC) writes: « *Fugaces labuntur anni!* » (years pass quickly) [1, Book II, XIII]. In « As you like it » the English playwright William Shakespeare (1564-1616) writes: « Time travels in diverse paces with diverse persons » [4, Act III, Scene II, 321]. Affirm that time passes slowly or quickly, supposes that time has speed. Well, by definition, speed is always expressed compared to time; obviously, the speed of time compared to time is a sophism. We have introduced the concept of « time felt » to explain exactly what is happening.

B. Time felt: These are the events that pass, instead of time or duration. An unpleasant event seems to pass slower than a pleasant event of the same duration, in reason of physical pain or moral suffering. Circumstances are felt more or less pleasant, or more or less unpleasant; so that « felt time » and « felt duration » are from the field of psychology.

PLEASANT EVENT ----> FELT DURATION SHORTER

UNPLEASANT EVENT ----> FELT DURATION LONGER

### Aging and time

Medicine makes a distinction between the chronological age of a patient and its biological age:

- a) Chronological age: The chronological age of a person is « what separates his birth from today »; the information, limited to a simple number, is very poor. The chronological age can't be observed, and it increases at the same speed for everyone. Someone whose age is high is considered an old person whatever its state of health; it does not provide any health data.
- b) The verb « age » has a double meaning: become aged (age increase) and become old (deterioration of the state of health).
- c) Biological age: The biological age is about the physical state of a person; it is observable, measurable in a way, but quite difficult to appreciate and synthesize, given the large number of data and evaluation criteria.
- d) In figure 7, the chronological age curve of a person is a bisector line, while its estimated biological age has an erratically shaped curve. In this simulation, at a date « t », the biological age

of the patient is higher than its chronological age: he looks older than his age. Shortly before we see an era in which he looked younger than his age.

e) Biological aging: In 2017, we have introduced the concept of biological aging, which results from the degradation of health. It's a consequence instead of a cause. Three examples of biological aging:

i. The gradual coloring of teeth is not caused by aging; instead, it's caused by food, smoking, lack of hygiene. SMOKING ---> TEETH COLORING ---> BIOLOGICAL AGING

ii. Wrinkles don't come from biological aging; they are caused by the Sun and lack of care, when the cells have exhausted their capacity for duplication. Wrinkles lead to biological aging. SUN ---> WRINKLES ---> BIOLOGICAL AGING

iii. Arthrosis doesn't result from biological aging; instead, it's caused by antecedent factors. ANTECEDENT FACTORS ---> ARTHROSIS ---> BIOLOGICAL AGING.

The gradual reduction in the gap in lifespan between men and women that is observed during these last decades is explained by the increase in consumption of tobacco and alcohol by women. Data collected in India at the end of the 1980s, show a reversal of average lifespan: 45 for men, 43 for women [19]; it comes from men eating first, women and children sharing the leftovers, in addition to heavy female smoking.

### Biorhythms and chronobiology

There is a rhythm when a phenomenon, an event, or the state of a system repeats. Lunar and solar alternations, as well as Cesium oscillations, have regular rhythms. On the other side, rhythms produced by living systems, such as heartbeats, sleep, need to eat, are irregular and inaccurate. They can't be considered biological clocks, because the biological rhythms do not meet the regularity and accuracy requirements of a clock: instead, it comes to biorhythms, not chronobiology [21].

### Experiments about time

#### Experiments on clocks

a) Gravity on the moon's surface is about 6 times weaker than on the earth's surface. A quartz watch is not altered, a pendulum clock moves 2.45 times slower, an atomic clock is almost unmodified, except for increasing its accuracy [23, Ch. 6].

b) Gravity on the sun's surface is 28 times more intense than on the earth's surface. A pendulum clock would go ahead 4.6 times faster. An atomic clock would go ahead about one minute per year [23, Ch. 6].

c) In microgravity, such as inside a vehicle in orbit around the earth, the clepsydra, the hourglass and the pendulum clock stop working, while the accuracy of an atomic clock increases.

Gravity alters the functioning of clocks according to their technology; therefore, experiments on clocks are in no way experiments about time; they are but experiments on technologies of these clocks

We watch the Eve's navel, but our eye does not see the anachronism of its representation.

#### Langevin's experiment

The fictitious experiment (1911) of the French physicist Paul Langevin (1872-1946) belongs to the false flag tactic: according to calculation, a twin returning from an accelerated relativistic travel would become less aged than his brother waiting for him in the lab [15]. This paradox results from the ignorance between chronological aging and biological aging: indeed, chronological data can be subjected to relativistic calculations, but not to physiological experiments; beside that, biological data resist calculations, but not relativistic stresses. Less aged (number of years) does not mean younger (better health condition): the relativistic stresses would lead to an additional biological aging that calculations are unable to evaluate.

The Langevin's experiment confirms the impossibility of making experiments about time.

#### Demography and aging of a population

Demographers lament about the high average chronological age in rich countries, and they praise the demographic dynamics in poor countries. In rich countries, the rise in the standards of living leads to a higher average chronological age. In poor countries, the alleged dynamics (low average chronological age) results from an important biological aging related to three main factors: high birth rate, infant mortality between the ages of 0 and 6 close to 50%, high mortality rate among adults because malnutrition, lack of hygiene and under-medicalization. For example, a 70-year-old European is in better health than a 35-year-old Yemeni. It suggests the theorem: a low average chronological age suspects under-development. Given that time is a failing demographic indicator (including chronological age and chronological aging), these parsing errors could be avoided by taking into account two much more accurate concepts: the biological age and the biological aging.

### Conclusion

The way temporality appears, demonstrates that time is not a phenomenon. Semantic rigor is necessary to write the essential definitions of units, then of time. The definition of time leads to unprecedented consequences among which some have been shortly described: the time felt; the biological aging; time is not the cause of aging; chronobiology is a wrong idea; no experiment about time; demography and aging.

Philosophers, most scientists and people at large, are not yet ready to hear such a statement, which they consider scandalous, unacceptable, impossible, false. But the facts must be faced, even if they don't conform to our personal convictions.

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