Chapter 1: Time

The concept of time is one of the most fundamental concepts in physics. In Newton's time, physicists implicitly assumed that time existed in a single, unified form. That is, it was believed that time flowed the same way throughout the entire universe. This type of time is called absolute time, but Einstein and others challenged this idea, arguing that an unobservable concept like absolute time should be eliminated from physics. They proposed a different definition of time. According to Einstein, the synchronization of time in spatially separated locations is impossible unless the speed of light is considered constant and this speed is used. Special relativity was developed from this idea. This special relativity made the understanding of time extremely complex, to the point where it became something that no one could truly comprehend.

Is Einstein's idea truly correct? In this chapter, we will discover a common time that exists in spatially distant locations, without using the speed of light. Using this time, we can prove that special relativity is a theory that does not reflect the real world.

1.1 What is time?

What is time? In dictionary terms, it would be "time is the interval of the flow of time." But then, new questions arise: where does this flow of time occur, and is it the same throughout the entire universe? Newtonian mechanics implicitly assumes that time flows at the same interval throughout the universe, but there is no clear basis for this. If we follow the idea that "physical quantities should be expressed using only those that can be clearly measured," then time requires the precise measurement of its intervals and the clear definition of where that measurement takes place.

How do we perceive the passage of time?If we didn't age, the universe didn't change (the Earth neither rotates nor revolves), and clocks hadn't been invented, would we be able to perceive the passage of time? Or what if the universe were completely static and no motion could be observed? That space would seem completely dead. In this case, we would have to admit that we have no means whatsoever to perceive the passage of time. At the very least, we wouldn't be able to use any of the time measurement methods known to date.

If we could perceive the passage of time in such a situation, we might be able to acknowledge that time is independent of space and that the flow of time is the same throughout the entire universe. However, I cannot think of a way to do this. As a result, time must be defined by some kind of motion.

Conversely,

> "Time can be quantitatively determined by observing some kind of motion."

This suggests that time is dependent on some form of motion, that space is necessary to perform any form of motion, and that time is not a concept completely independent of space.

This is our current perception of time, and the various methods described below.This also follows this idea. Generally speaking, time is

> "They are seeking the basis for this in some kind of periodic phenomenon."

It can be said that...

1.2 Various methods of measuring time

As mentioned in 1.1, measuring time requires moving something, or utilizing something that is already in motion. Furthermore, that motion should be considered dependent on its local space. The various methods of time measurement currently known can be broadly categorized into the following three types.

(1) A method using periodic motion (waves) without damping

Examples of phenomena belonging to this method include pendulums, hourglasses, sundials, and atomic clocks. All of these can be represented as undamped waves expressed by sine curves. Of course, this assumes that the pendulum has no motion resistance and that the Earth rotates with a constant period.

(2) A method using the relationship distance = speed × time

This method determines the time taken for an object moving at a constant speed to travel a certain distance. For example, if we assume that the speed of light is constant, then the distance traveled by light and the time taken are proportional.

Although methods (1) and (2) may appear completely different at first glance, they are actually based on the same principle. An object moving at a constant speed can be considered as a ball rolling at a constant speed. The ball undergoes periodic motion in the form of rotation, which is also a sine curve (Figure 1.1).

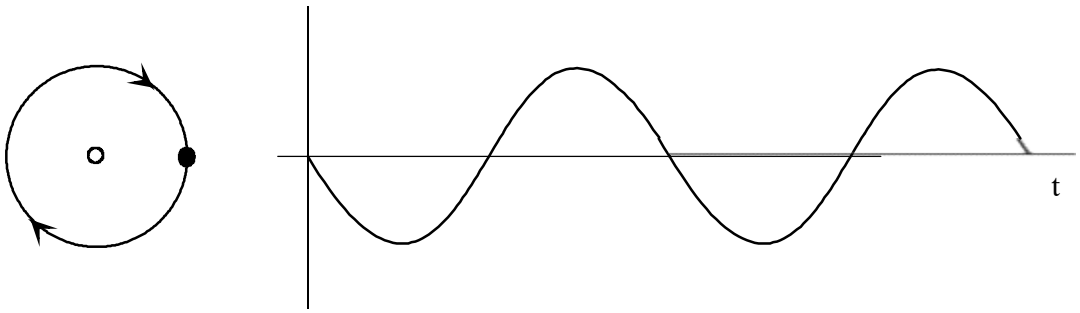


Figure 1.1 Uniform motion and periodic motion

However, as will be discussed later, methods (1) and (2) can only be considered the same if they are measured on the same spatial scale.

(3) A method using damped periodic motion

By measuring how much a periodic motion, known as a damped oscillation, decays under constant resistance, we can determine how much time has passed. For example, time can be measured by measuring the amount of radioactivity emitted by a radioactive element. By utilizing the decay of radioactivity in naturally occurring uranium, it is possible to measure long periods of time, such as 10^9 years. Such decaying motion is a long, periodic motion with one cycle, and can be considered a periodic motion.

1.3 Astronomical time and local time

I stated that since measuring the flow of time depends on the motion of objects, time must generally be considered a space-dependent concept. However, if we apply this idea strictly, the flow of time in space is not equal from place to place, and comparing two events occurring in different places in terms of time becomes meaningless. Since this makes it unusable as a physical quantity, the synchronization of time measured in different places is required. Anyone familiar with special relativity will know that considering such concepts is of great importance in special relativity. Let us also consider how we can synchronize time existing in different places.

Historically, the standard of time was determined by the periodic motion of astronomical phenomena. For example, one second was defined as "1/86400 of a mean solar day" or "1/31556925.9475 of a solar year." More recently, one second has been defined as the duration of 9192631770 periods of radiation corresponding to the transitions of cesium atoms. This change in definition is possible because the time intervals of both are considered to be equal on Earth. Whether this is also true on the Moon is questionable, and according to relativity, the passage of time on the Moon and the passage of time on Earth are not considered to be equal due to the difference in their gravitational potentials. Thus, with a little careful consideration, it seems that it is generally not possible to change the time interval determined by astronomical phenomena to a time interval using some kind of atomic period. If the time due to the periodic motion of astronomical phenomena is called astronomical time, then, for example, if the Earth's orbital period is adopted as astronomical time, then the astronomical time on Earth and on the Moon can be considered to be equal. This is evident from the fact that the time interval of one year on Earth and one year on the Moon are observed to be exactly the same.

If we define local time as time that differs depending on location, such as time on Earth or time on the Moon, then local time and astronomical time are not strictly equivalent. Because local time and astronomical time are different, they cannot be considered the same. There are two types of time: local time and astronomical time. Both are still time, and it cannot be said that one is correct and the other is incorrect. The laws of physics must take this into consideration.

1.4 Definition of Common Time

Since astronomical time, determined by the period of Earth's motion relative to the sun, cannot be determined at locations far from the sun, let's consider a more general case.

Suppose there are two points P and Q in space, each containing an atomic clock with identical characteristics capable of accurately indicating local time, and the readings of these clocks are denoted as t_p and t_q We will assume, for the sake of argument, that the scales

of local time flow at tp and tq are generally considered to be different, but that the scales of flow themselves do not change over time, and that P and Q are stationary systems. Now, suppose there exists a phenomenon in which a wave (e.g., radio wave) of an arbitrary constant frequency is continuously emitted from point P. If the frequency observed at P is f_p, then the frequency v_p observed during local time Δt_p is

$$v_p = f_p \cdot \Delta t_p \qquad (1.1)$$

It is expressed as. If we formally denote the unit local time observed at P as τ_p, then the local time Δt_p is the product of the unit local time τ_p and its proportionality constant,

$$\Delta t_p = \Delta t'_p \tau_p \qquad (1.2)$$

where Δt_p is the proportionality constant of the unit local time.

It can be written formally as.Furthermore, if we denote the frequency observed during a unit of local time as v_p, then formally,

$$v_p = f_p \cdot \tau_p \qquad (1.3)$$

It can be written as. Since frequency × time is the frequency observed during that time interval, frequency × unit local time is the unit frequency during that unit local time.

Substituting equations (1.2) and (1.3) into equation (1.1),

$$v_p = \frac{v_p'}{\tau_p} \cdot \Delta t_p' \tau_p \qquad (1.4)$$

This can be written as. Therefore, even if τ_p changes locally, the τ_p in equation (1.4) cancels out, and thus the frequency v_p is not affected by local time.

If we rewrite equation (1.4),

$$\Delta t_p' = \frac{v_p}{v_p'} \qquad (1.5)$$

It can be written as. Now, using the local time at point P as a reference, for example, if the frequency of the local time at point P for 1 second is observed to be v_0, then this frequency v_0 corresponds to v_p, and the frequency during the time to be measured If v is observed, then v/v_0 is a temporal element unaffected by local time.

In other words, to obtain a time common to both point Q and point P, instead of using the local time at point Q, one should count the frequencies observed during the time interval to be measured and determine how many times greater they are than the frequency v_0, which was arbitrarily set as the unit at point P.

If we write this as T,

$$T = \frac{v}{v_0} \qquad (1.6)$$

Therefore, this T can be said to be a common time that is aligned with the local time of point P, allowing for direct comparison of the times of locations at different spatial positions. Let's call this T the common time (Figure 1.2, however, the spatial scale (scale of the vertical axis) is not considered in this figure).

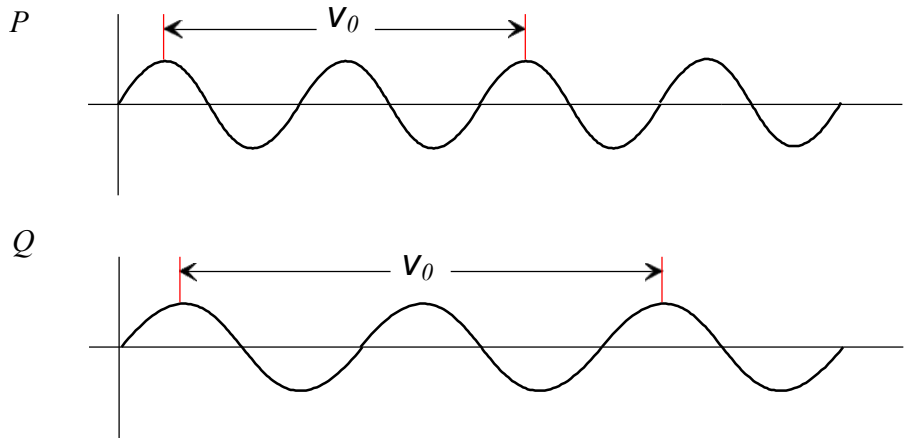


Figure 1.2 Concept of Common Time

In simpler terms, this means using a fixed periodic motion as a reference when measuring time, and using the observed frequency as a substitute for time. This is essentially the very definition of time itself.

1.5 Relationship between time and space

There is a good example that helps us intuitively imagine the concept of shared time.Airplanes flying in the distance appear to be moving slowly.Why does it appear to be flying slowly? The velocity of an object is perceived as displacement/time. An airplane flying far away appears smaller, and its apparent displacement also appears smaller, making it seem to be flying slowly.

Did they also use apparent time in this case? If this time also decreases in proportion to the displacement, then the velocity of the object would not change regardless of distance, and it would not appear to be moving slowly.

Therefore, this time is probably not using apparent time. It can be considered that the time is determined by the time at the observer's location watching the airplane. If that is the case, does apparent time not exist?

To investigate this, let's compare how a circle rotating at a constant speed appears to observer A, who is viewing it from nearby, and observer B, who is viewing it from a distance. A lamp is placed at one point on the outer circumference of the circle.

A and B determine how the rotating circle is rotating by measuring its apparent displacement.It is assumed that it can be used to observe accurately.

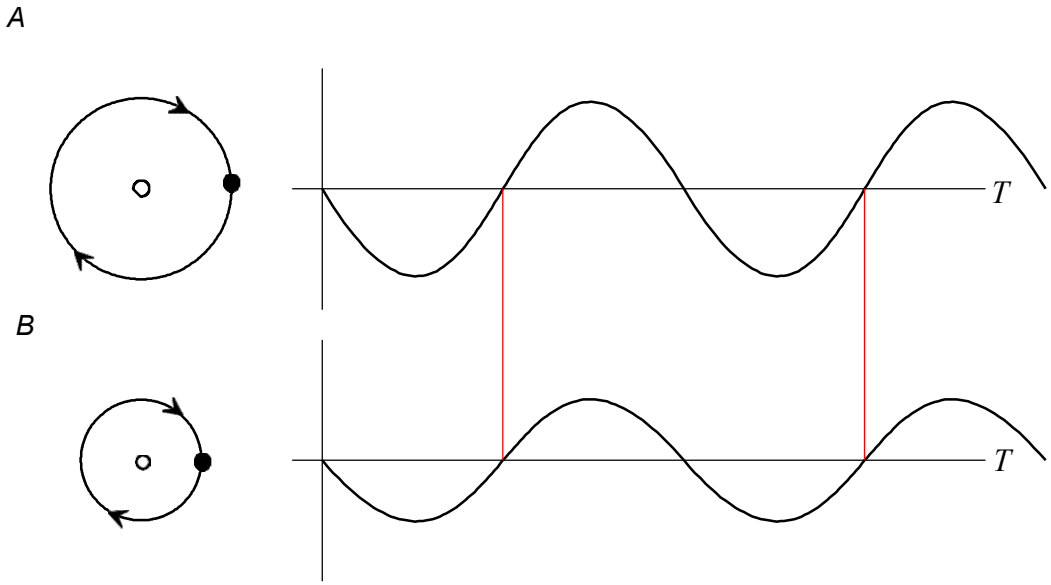


Figure 1.3 Apparent Time

Now, A and B will measure time using a rotating circle at their respective observation points. We will adopt method 1.2(2). That is, we will measure time by assuming that the distance moved along the circumference of the rotating circle is proportional to the duration of the movement. If we measure time in this way, the displacement observed at A will be longer than the displacement observed at B, so

A will observe that more time has passed than B. This is natural because B is farther away from A, and the rotating circle appears smaller to B than to A. If we measure time in this way, Apparently, a more compressed space means that time passes more slowly.

Next, let's measure time using the angle at which the position of a lamp on a rotating circle is relative to the center of the circle. For example, to clarify the position of the lamp on the circle, let's place a narrow slit between the circle and the observer, so that the lamp appears to blink at intervals corresponding to the duration of each rotation when the circle returns to its original position, and then examine whether there is a difference between A and B. In this case, it will be observed that the intervals between blinks are exactly the same for both A and B.

These two experiments suggest that the former represents time that depends on the apparent local spatial scale, while the latter represents time that does not depend on the apparent local spatial scale. Let's call these types of time apparent locally dependent time and non-locally dependent time. If space were to actually shrink, we can imagine that time would also change depending on the local space.

If the spatial scale is the same, then locally dependent time and non-locally dependent time flow at the same interval. However, if the spatial scale is not the same, we can imagine that these two types of time do not flow at the same interval.

Astronomical time is measured using the apparent angles of planets and other celestial bodies, and is therefore considered a non -locally dependent time. If local time is considered a locally dependent time, then there is no contradiction even if the scales of time for the two do not coincide. Furthermore, even between locations with different local times, a common time can be obtained by using a common non-locally dependent time.

1.6 On the contradictions of Special Theory of Relativity theory

The concept of common time can negate several fundamental assumptions of special relativity. Special relativity assumes that the common time between two spatially separated points cannot be defined without assuming a constant speed of light and measuring it using light. However, previous discussions have shown this

assumption to be incorrect. All that is needed is the use of common time.

Furthermore, it is generally believed that simultaneity cannot be maintained when observing the same event from within a moving inertial coordinate system compared to observing it from another coordinate system that is moving relative to that system. However, by using a common time, it can be concluded that simultaneity is a concept that holds true even without specifying an inertial coordinate system. In other words, observations can be made using a common time in both systems, and it is impossible for the observed times to differ in both systems because a common time is being used. This also indicates that the speed of light is not constant, and it is expected that some kind of velocity combination will be necessary.

For those who believe in special relativity, the existence of common time is unacceptable, but for those who believe in the fundamental principles of physics, the denial of common time is unacceptable. It is pointless to ponder and try to deny the existence of common time. If there is no such thing as common time, and everything is local time, then if someone at the edge of the universe starts running or stops, causing the local time at that location to change, then we must accept that this would change the Earth's orbital period. Such thinking is occult, not physics.

Furthermore, while special relativity relies on assumptions such as the principle of the constancy of the speed of light and the special principle of relativity, the concept of common time is merely given the condition that the scale of local time flow does not change during measurement. The assumptions of the principle of the constancy of the speed of light and the special principle of relativity in special relativity are themselves incorrect, but we will discuss this in Chapter 4.

The concept of common time alone refutes special relativity. The conclusion here is that special relativity and various other theories, including general relativity which developed from it, are all wrong.