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# Principle of Relativity


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The principle of relativity means that every movement in absolutely empty space is relative, or it is impossible to find out whether an observer is at rest or moving at constant speed. Einstein accepted the principle, but he claimed that moving clocks run slower than clocks that do not move. Since it is impossible to determine whether an object is moving in empty space or not, this assertion contradicts the principle of relativity. To get around this problem, it was necessary to make a new assumption: Every clock "sees" other clocks running slower when they "move" relative to it. Following this assumption, each clock must run faster and slower than any other clock at the same time. The problem is known as the twin paradox. If one clock runs slower than another clock, then it is not possible that the other clock runs slower than this clock. After Einstein was made aware of the contradiction, he kept finding new excuses and finally succeeded in establishing his theory as the most ingenious theory ever. But the theory is full of contradictions and silly suppositions, which cannot be justified by logical argumentation.

Einstein's first postulate: *"The laws by which the states of physical systems undergo change are not affected, whether these changes of state be referred to the one or the other of two systems of co-ordinates in uniform translational motion."*

It is not clear what exactly is meant here, because the wording is very imprecise. Essentially, one can say that the postulate can be equated with the classical principle of relativity. What the postulate does mean? If we consider an object moving in a coordinate system $S_1$ with velocity $v$ along the $x$-axis in positive direction we will measure $w - v$ in a coordinate system $S_2$ moving with w along the same $x$-axis in the same positive direction. If an object moves in $S_2$ with velocity $v$, it will move in $S_1$ with velocity $w + v$, because $S_1$ moves in $S_2$ in negative direction. The speed of the same object can by no means be the same in two coordinate systems that move relative to each other, no matter how high a single velocity is.

It can easily be shown that Einstein's "first" postulate is incomplete when applied to the propagation of waves, for example water waves. If we observe the waves from different coordinate systems, we will see that there is a single reference frame in which the speed of the waves is the same in all directions relative to the observer's frame of reference. Only coordinate systems, in which all physical properties of the "system" are equal, can be considered as equivalent. The velocity of water waves can only be constant in a coordinate system where the water is stationary. A coordinate system alone has no physical properties. This rule must apply to all other waves, because all waves are described by the same wave equation and all waves must have a carrier. Especially the equation for electromagnetic waves assumes a stationary ether [1]. If waves or other moving objects are considered from other reference frames, the Galilean transformation must be applied. There can be no doubt that an observer moving relative to the preferred reference frame will see $\vec{c} - \vec{v}$ relative to his own reference frame (coordinate system), and that Einstein's "second" postulate has no sense.

Einstein's "second" postulate: "*Every light beam moves in the "stationary" coordinate system with the definite velocity V, regardless of whether this light beam is emitted by a stationary or moving body. Here*

$$velocity = \frac{Path\ of\ light}{Interval\ of\ time}$$

*where "interval of time," is to be understood as defined in § 1."*

Thus Einstein gets a constant c by manipulation of time to get a constant c, i.e. the "interval of time" is already defined in § 1 as "path of light" divided by c.

When an observer measures constant speed of sound in air in all directions, we can conclude that the air is stationary with respect to the observer. That is always the case if the air enclosed in a room. Outside the room, the air is generally not stationary, and the speed of sound in the surrounding air does not remain constant relative to the observer. If two closed containers move uniformly relative to each other, the speed of sound in each container will be constant inside the container, but not constant relative to another container. When sound signals are exchanged between two containers, the speed of sound changes twice, but remains constant everywhere relative to the local medium.

The same consideration can be applied to electromagnetic waves in the ether. If the ether is stationary relative to a body, the speed of light is constant relative to that body. Many experiments have shown that the speed of light is constant relative to the earth-cantered, non-rotating coordinate system. The special property of that system is the stationary gravitational field. The gravitational field is so strong that it is able of carrying along local ether, so the space around the earth can be regarded as a container filled with ether. The same must be true for other planets and probably for the moon, since the properties of all these systems are very similar. If the moving object is too small, it cannot gravitationally attract the ether, and the object moves through the ether without resistance. This is the case, for example, when the Sagnac device rotates in the ether (the relative circulation of the luminiferous ether in the closed circuit) or when water flows through the ether (Fresnel's drag coefficient: Water electrons move through the luminiferous ether).

In 1854 W. Thomson wrote [2]: *"That there must be a medium forming a continuous material communication throughout space to the remotest visible body is a fundamental assumption in the undulatory Theory of Light. Whether or not this medium is … a continuation of our own atmosphere, its existence is a fact that cannot be questioned, when the overwhelming evidence in favour of the undulatory theory is considered ... "*

Einstein claimed that the ether is not necessary for his theory. In 1909 he said [3]: *"Today, however, we must consider the ether hypothesis as an overcome point of view. It is even undeniable that there is an extended group of radiation-related facts which show that the light has certain fundamental properties which can be understood far more from the point of view of Newton's theory of emission of light than from the point of view of undulation theory. Therefore, it is my opinion that the next phase of the development of theoretical physics will bring us a theory of light which can be understood as a kind of fusion of undulation and emission theory of light."*

Later, Einstein changed his mind and claimed that physics is unthinkable without ether.

According to the principle of relativity, the speed of the same object cannot be equal in two reference frames at the same time. Two frames of reference are only equivalent when all physical properties of the frames correspond to each other. If we regard sound in air, the air must be at rest with respect to all coordinate systems to make these systems equivalent. In case of light, the ether must be at rest relative to all coordinate systems in which the speed of light is constant. Only in this case, the physical laws are independent of the state of motion of a coordinate system, but that means at the same time that Galilean transformation has to be applied in order to correctly transform between coordinate systems. The principle of relativity was fully explained in Galileo's famous work "Dialogue" [4]. Later attempts to explain relativity principle in a new way (Poincaré, Einstein) can be considered as failed. Poincaré assumed that motion relative to ether is not detectable and called this principle of relativity.

Galileo [4]: *"Shut yourself up with some friend in the main cabin below decks on some large ship, and have with you there some flies, butterflies, and other small flying animals. Have a large bowl of water with some fish in it; hang up a bottle that empties drop by drop into a wide vessel beneath it. With the ship standing still, observe carefully how the little animals fly with equal speed to all sides of the cabin. The fish swim indifferently in all directions; the drops fall into the vessel beneath; and, in throwing something to your friend, you need throw it no more strongly in one direction than another, the distances being equal; jumping with your feet together, you pass equal spaces in every direction. When you have observed all these things carefully (though there is no doubt that when the ship is standing still everything must happen in this way), have the ship proceed with any speed you like, so long as the motion is uniform and not fluctuating this way and that. You will discover not the least change in all the effects named, nor could you tell from any of them whether the ship was moving or standing still. [...] The cause of all these correspondences of effects is the fact that the ship's motion is common to all the things contained in it, and to the air also. That is why I said you should be below decks; for if this took place above in the open air, which would not follow the course of the ship, more or less noticeable differences would be seen in some of the effects noted."*

**References**


1. J. C. Maxwell: "A dynamical theory of the electromagnetic field" Philosophical Transactions of the Royal Society of London. 155: 459–512 (1856).
2. W. Thomson: "Note on the Possible Density of the Luminiferous Medium, and on the Mechanical Value of a Cubic Mile of Sunlight" read 1st May, 1854, *Transactions of the Royal Society of Edinburgh* p.57-61. (1857).
3. A. Einstein: "Über die Entwicklung unserer Anschauungen über das Wesen und die Konstitution der Strahlung" [On the Development of Our Views Concerning the Nature and Constitution of Radiation]. Physikalische Zeitschrift. 10: 817–825 (1909).
4. G. Galilei: "Dialogue Concerning the Two Chief World Systems", (English translation 1967).