symbolizes movement and life. From a negative perspective, time represents a moment from a past that is no more and a future that is not yet, whereas the present is a moving boundary line between past and future.

Becoming aware that time is moving one toward death, a person becomes anxious about the transitory nature of human existence. In response to such a threat, a person affirms the present and the threat of nonbeing through an innate, ontological courage that is based in God. Therefore, time is central to human finitude, and the anxiety associated with death reveals the ontological character of time. Moreover, human courage affirms temporality, whereas one would surrender to the annihilating character of time without courage.

Time moves ahead toward something new, unique, and novel, and the creative nature of time is evident with historical time, which appears as time running toward fulfillment, because it is united with the dimension of spirit. The fulfillment of historical time (*kairos*) is for Tillich the event of God's action in Jesus as the Christ, which is repetitively experienced. The fulfillment and aim of the end of history is answered, according to Tillich, by eternal life in the kingdom of God, which is the final meaning of history, because individuals are fulfilled in all areas of their lives.

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See also Christianity; Existentialism; God and Time; Ontology

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Time, Absolute

The concept of absolute time is a hypothetical model from the laws of classical physics postulated by Isaac Newton in the *Principia* in 1687. Although the Newtonian model of absolute time has since been opposed and rejected in light of more recent scholarship, it still provides a way to study science with reference to time and understand the phenomena of time within the scientific tradition.

According to this model, it is assumed that time runs at the same rate for all the observers in the universe, or in other words, the rate of time of each observer can be scaled to the absolute time by multiplying the rate by a constant. This concept of absolute time suggests absolute simultaneity by the coincidence of two or more events at different points in space for all observers in the universe. So, absolute time has been discussed in two senses of absoluteness. In first sense, absoluteness means independent of events, while in second sense, it means independent of observer or frame of reference.

Newton's theory was a dominant paradigm throughout the 18th and 19th centuries. Newton regarded time as something absolute, true, and mathematical, of itself and by its own nature, that flows uniformly without relation to anything external, and by another name it is called duration. He explained that the motion of a particle has to be described relative to an inertial frame in which the particle will move at a constant velocity in a straight line unless some external force is applied to it; time among different frames differs by a constant, and all times can be described relative to an absolute time.

This theory encountered strong opposition from many philosophers and some religious thinkers who considered time an illusion. Leibniz, a contemporary of Newton, criticized that Newton's concepts of time and space are identical by their definitions and also opposed him using religious reasoning: that if there were no way to distinguish one time from another, God was faced with an impossible choice to decide rationally on the moment of creation. Many critics do not accept this logic and considered it nonscientific; they would see time created at the instant of Creation.

The concept of absolute time became outdated in early 20th-century scientific dialogue, when electrical and magnetic phenomena were studied theoretically, and Albert Einstein challenged the existence of time and space as separate absolute concepts by introducing a model of spacetime in his special relativity theory. According to this theory, there may always be observers for whom simultaneity is always relative, while there is no such thing as absolute simultaneity and hence no existence of absolute time.

Muhammad Aurang Zeb Mughal

See also Einstein, Albert; Einstein and Newton; God, Sensorium of; Newton, Isaac; Space, Absolute; Space and Time; Spacetime, Curvature of; Spacetime Continuum

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Time, Arrow of

Nothing in common experience would seem to be more assured than the one-way flow of time from past to future. Many everyday events seem to be irreversible. Air rushes out of a punctured tire, never back into the tire to reinflate it. Heat flows from higher-temperature bodies to those of lower temperature, never from lower to higher, cooling a room for free. Heat engines use up energy, never producing useful energy for free. People age and die, never rising from the dead and growing younger.

The empirical fact that many physical events occur in only one time direction is codified in physics as the *second law of thermodynamics*, which requires that the *entropy* of a system, a measure of disorder, must always increase or, at best, remain constant when that system is isolated from the rest its environment.

However, the second law does not represent an infallible universal principle. Consider a closed room full of people. The air in the room is composed of individual molecules that move around pretty much randomly. Suppose someone opens a window at just that instant when all the air molecules just happen, by chance, to be moving in the direction of the window. The air then rushes out of the room and everyone inside explodes and dies.

No known principle of the mechanics of particle motion forbids this tragic event from happening. Although possible, it is very unlikely. The probability that all the molecules are moving in the direction of the window when it is opened is minuscule, and therefore not likely to occur even once on earth during the planet's entire existence.

If we were watching a film showing all the air in a room escaping through a window, leaving behind a vacuum, we could reasonably surmise that the film is being run backward through the projector. But suppose we have a room with just three molecules, as illustrated in Figure 1. The chance that the molecules randomly fly out the window is not at all small. Watching a film showing this event, we cannot judge for sure that the film is playing in reverse.

So, in one case we can determine the direction of time. In the second case we have no basis for even assuming that there is a direction of time. Irreversibility seems to hold true when there are many particles, while it is absent when there are only a few.

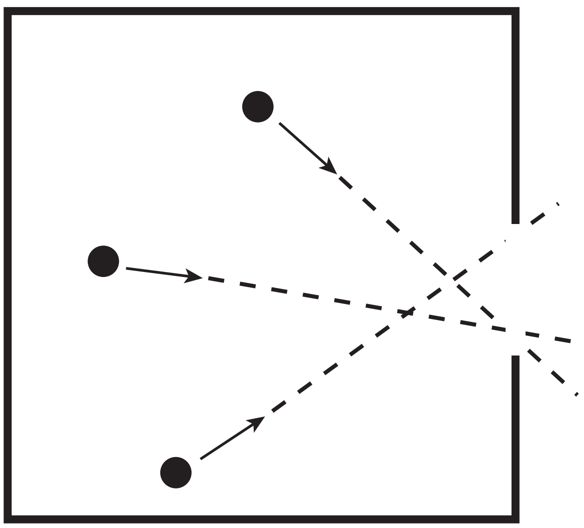

Figure 1 A chamber with three molecules

Notes: The probability of all three molecules escaping through an opening, leaving behind a vacuum, is not small. No direction of time can be defined with this observation.