Nöether’s theorem describes the connection between symmetries and conservation laws, stating that every differentiable symmetry of a physical system’s action has a corresponding conservation law. It was devised by Emmy Nöether, a German mathematician known for her work in abstract algebra and theoretical physics.

A few examples of the implications of this theorem are the conservation of momentum due to translational symmetry, the conservation of angular momentum due to rotational symmetry, the conservation of the center of mass due to boost symmetry, and the conservation of energy (with exceptions on large scales) due to time symmetry.

Time symmetry is broken on large scales because our universe evolved from a singularity, invalidating real symmetry of time. Additionally, a constant vacuum energy causes the universe’s energy to increase as space expands.

Charge, parity, and time inversion symmetry are another type of symmetry that will be elaborated on further in the CPT section.