Some people are in the habit of calling this field of study 'thermodynamics' without realizing that it isn't actually thermodynamics. This is because thermodynamics, which is concerned with heat engines and heat transfer, was discovered by an Irish scientist named Luke Howard in 1854. On the other hand, statistical physics studies both physical systems at equilibrium and nonequilibrium systems. For example, it studies how gases act under pressure changes or after an explosion. It also covers topics like transport phenomena and self-organization in chaotic systems! This field of study is seeing a rise in popularity because researchers are able to calculate properties like response times or distribution profiles with greater accuracy than what was possible before. Another reason why this field is gaining momentum in the scientific community is because there are so many applications of statistical physics in modern technological systems. For example, one can calculate properties like viscosity, conductivity, or thermal conductivity in heat transfer engineering. Similar to heat engines, these engineering systems are used to collect energy from external sources and convert it into work. Basically statistical physics studies all sorts of physical systems that exist on or between scales like length scales (or molecular scale), temperature scales (or macroscopic temperature), and timescales (or nanoseconds). These physical systems can be either 'equilibrium' or 'nonequilibrium' systems. Examples of equilibrium systems include a system at rest or a system that is in a state that has no energy being being added or being taken away. Examples of nonequilibrium systems include a system at a high temperature, a system under pressure, or a system within an explosion. One whole branch of statistical physics is the statistical mechanics which studies the properties of equilibrium statistical systems. This branch includes both thermodynamics and statistical mechanics. The thermodynamics branch studies the behavior of nonequilibrium systems by calculating properties like pressure and temperature changes as well as heat transfer from one region to another. On the other hand, statistical mechanics studies a closed system which is isolated from its environment. It uses equations from probability theory to calculate the system's microscopic state as a function of time. One of the most important discoveries in statistical physics occurred in 1873 when a German physicist named Rudolf Clausius used mathematics to accurately predict that gases would behave as they do. This discovery led to the invention of the first mathematical model that actually described some aspects of gas behavior! In honor of his discovery, some scientists named this model 'the Clausius-Clapeyron equation'. The reason that this equation is so important is because it explains the density of a gas as a function of temperature! Before Clausius discovered his model, scientists were unable to explain why gases behaved differently at different temperatures. However, after his discovery, they were able to understand why gases had more volume at higher temperatures and less volume at lower temperatures! Clausius also found some equations that describe how the internal energy of an ideal gas changes with time. These are collectively called the 'Clausius-Clapeyron equations'. Another important concept that Clausius discovered was the idea of entropy.

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