

Elementary Statistical Mechanics

Statistical mechanics

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In physics, statistical mechanics is a mathematical framework that applies statistical methods and probability theory to large assemblies of microscopic entities. Sometimes called statistical physics or statistical thermodynamics, its applications include many problems in a wide variety of fields such as biology, neuroscience, computer science, information theory and sociology. Its main purpose is to clarify the properties of matter in aggregate, in terms of physical laws governing atomic motion.

Statistical mechanics arose out of the development of classical thermodynamics, a field for which it was successful in explaining macroscopic physical properties—such as temperature, pressure, and heat capacity—in terms of microscopic parameters that fluctuate about average values and are characterized...

Elementary Principles in Statistical Mechanics

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Elementary Principles in Statistical Mechanics, published in March 1902, is a scientific treatise by Josiah Willard Gibbs which is considered to be the foundation of modern statistical mechanics. Its full title was Elementary Principles in Statistical Mechanics, developed with especial reference to the rational foundation of thermodynamics.

List of textbooks in thermodynamics and statistical mechanics

A list of notable textbooks in thermodynamics and statistical mechanics, arranged by category and date. Fermi, Enrico (1956). Thermodynamics (New ed.)

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Ensemble (mathematical physics)

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In physics, specifically statistical mechanics, an ensemble (also statistical ensemble) is an idealization consisting of a large number of virtual copies (sometimes infinitely many) of a system, considered all at once, each of which represents a possible state that the real system might be in. In other words, a statistical ensemble is a set of systems of particles used in statistical mechanics to describe a single

system. The concept of an ensemble was introduced by J. Willard Gibbs in 1902.

A thermodynamic ensemble is a specific variety

of statistical ensemble that, among other properties, is in statistical equilibrium (defined below), and is used to derive the properties of thermodynamic systems from the laws of classical or quantum mechanics.

List of textbooks on classical mechanics and quantum mechanics

This is a list of notable textbooks on classical mechanics and quantum mechanics arranged according to level and surnames of the authors in alphabetical

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Quantum statistical mechanics

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Quantum statistical mechanics is statistical mechanics applied to quantum mechanical systems. It relies on constructing density matrices that describe quantum systems in thermal equilibrium. Its applications include the study of collections of identical particles, which provides a theory that explains phenomena including superconductivity and superfluidity.

Glossary of elementary quantum mechanics

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This is a glossary for the terminology often encountered in undergraduate quantum mechanics courses.

Cautions:

Different authors may have different definitions for the same term.

The discussions are restricted to Schrödinger picture and non-relativistic quantum mechanics.

Notation:

$|$

x

$\rangle$

$\{\displaystyle |x\rangle\}$

- position eigenstate

$|$

α

$\rangle$

,

$|$

β

$\rangle$

,

$|$

γ

)

.

.

.

$\{\displaystyle |\alpha \rangle , |\beta \rangle , |\gamma \rangle \dots\}$

- wave function of the state of the system

$\Psi \dots$

Introduction to quantum mechanics

Quantum mechanics is the study of matter and matter's interactions with energy on the scale of atomic and subatomic particles. By contrast, classical

Quantum mechanics is the study of matter and matter's interactions with energy on the scale of atomic and subatomic particles. By contrast, classical physics explains matter and energy only on a scale familiar to human experience, including the behavior of astronomical bodies such as the Moon. Classical physics is still used in much of modern science and technology. However, towards the end of the 19th century, scientists discovered phenomena in both the large (macro) and the small (micro) worlds that classical physics could not explain. The desire to resolve inconsistencies between observed phenomena and classical theory led to a revolution in physics, a shift in the original scientific paradigm: the development of quantum mechanics.

Many aspects of quantum mechanics yield unexpected results...

Mathematical formulation of quantum mechanics

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The mathematical formulations of quantum mechanics are those mathematical formalisms that permit a rigorous description of quantum mechanics. This mathematical formalism uses mainly a part of functional analysis, especially Hilbert spaces, which are a kind of linear space. Such are distinguished from mathematical formalisms for physics theories developed prior to the early 1900s by the use of abstract mathematical structures, such as infinite-dimensional Hilbert spaces (L2 space mainly), and operators on these spaces. In brief, values of physical observables such as energy and momentum were no longer considered as values of functions on phase space, but as eigenvalues; more precisely as spectral values of linear operators in Hilbert space.

These formulations of quantum mechanics continue to...

Quantum mechanics

Quantum mechanics is the fundamental physical theory that describes the behavior of matter and of light; its unusual characteristics typically occur at

Quantum mechanics is the fundamental physical theory that describes the behavior of matter and of light; its unusual characteristics typically occur at and below the scale of atoms. It is the foundation of all quantum physics, which includes quantum chemistry, quantum biology, quantum field theory, quantum technology, and

quantum information science.

Quantum mechanics can describe many systems that classical physics cannot. Classical physics can describe many aspects of nature at an ordinary (macroscopic and (optical) microscopic) scale, but is not sufficient for describing them at very small submicroscopic (atomic and subatomic) scales. Classical mechanics can be derived from quantum mechanics as an approximation that is valid at ordinary scales.

Quantum systems have bound states that are...

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