

Introduction To Wave Scattering Localization And Mesoscopic Phenomena

Commonly known types of carbon are diamond and graphite. In 1947, Canadian physicist P. R. Wallace suggested carbon would also exist in sheets. German chemist Hanns-Peter Boehm and coworkers isolated single sheets from graphite, giving them the name graphene in 1986. In 2004, the material was characterized by Andre Geim and Konstantin Novoselov at the University of Manchester, England. They received the 2010 Nobel Prize in Physics for their experiments. 568eff4298

Coherent potential approximation Introduction to Wave Scattering, Localization, and Mesoscopic Phenomena. It is perhaps most famous for its use in describing the physical properties of alloys and disordered magnetic systems, although it is also a useful concept in understanding how sound waves scatter in a material which displays spatial inhomogeneity. (1995). Academic Press. The coherent potential approximation was first described by Paul Soven, and its application. It is often described as the 'best' single-site theory for obtaining the averaged Green's function. Fumiko Yonezawa and Kazuo Morigaki The coherent potential approximation (CPA) is a method, in theoretical physics, of finding the averaged Green's function of an inhomogeneous (or disordered) system. ISBN 978-0-12-639845-8. The Green's function obtained via the CPA then describes an effective medium whose scattering properties represent the averaged scattering properties of the disordered system being approximated 568eff4298

Optical tweezers If the object is held in air or vacuum without additional support, it can be called optical levitation. out the scattering force of the laser light. The cancellation of this axial gradient force with the scattering force is what causes the bead to be stably Optical tweezers (originally called single-beam gradient force trap) are scientific instruments that use a highly focused laser beam to hold and move microscopic and sub-microscopic objects like atoms, nanoparticles and droplets, in a manner similar to tweezers 568eff4298

This timeline includes developments in subfields of condensed matter physics such as theoretical crystallography, solid-state physics, soft matter physics, mesoscopic physics, material physics, low-temperature physics, microscopic theories of magnetism in matter and optical properties of matter... 568eff4298

Graphene In graphene, the carbon forms a sheet of interlocked atoms as hexagons one carbon atom thick. When many hundreds of graphene layers build up, they are called graphite. electron scattering by optical phonons of the substrate has a more significant effect than scattering by graphene's phonons, limiting mobility to $40000\text{ cm}^2\cdot\text{V}^{-1}\cdot\text{s}^{-1}$ Graphene () is a variety of the element carbon which occurs naturally in small amounts. The result resembles the face of a honeycomb 568eff4298

Condensed matter physics spin but no charge). Condensed matter physicists seek to understand the behavior of these phases by experiments to measure various material properties. More exotic condensed phases include the superconducting phase exhibited by certain materials at extremely low cryogenic temperatures, the ferromagnetic and antiferromagnetic phases of spins on crystal lattices of atoms, the Bose–Einstein condensates found in ultracold atomic systems, and liquid crystals. Similarly, positron annihilation Condensed matter physics is the field of physics that deals with the macroscopic and microscopic physical properties of matter, especially the solid and liquid phases, that arise from electromagnetic forces between atoms and electrons. Coulomb and Mott scattering measurements can be made by using electron beams as scattering probes. More generally, the subject deals with condensed phases of matter: systems of many constituents with strong interactions among them 568eff4298

As a term, swarming is applied particularly to insects, but can also be applied to any other entity or animal that exhibits swarm behaviour. The term flocking or murmuration can refer specifically to swarm behaviour in birds, herding to refer to swarm behaviour in tetrapods, and shoaling or schooling to refer to swarm behaviour in fish. Phytoplankton also gather in huge swarms called blooms, although these organisms are algae and are not self-propelled the way most animals are. By extension, the term "swarm" is applied... 568eff4298

Random matrix Random matrix theory (RMT) is the study of properties of random matrices, often as they become large. RMT provides techniques like mean-field theory, diagrammatic methods, the cavity method, or the replica method to compute

quantities like traces, spectral densities, or scalar products between eigenvectors. Many physical phenomena, such as the spectrum of nuclei of heavy atoms, the thermal conductivity of a lattice, or the emergence of quantum chaos, can be modeled mathematically as problems concerning large, random matrices. two dimensions, mesoscopic physics, spin-transfer torque, the fractional quantum Hall effect, Anderson localization, quantum dots, and superconductors In probability theory and mathematical physics, a random matrix is a matrix-valued random variable—that is, a matrix in which some or all of its entries are sampled randomly from a probability distribution 568eff4298

Quantum chaos If this is true, then there must be quantum mechanisms underlying classical chaos (although this may not be a fruitful way of examining classical chaos). "Quantum chaotic scattering". arXiv:quant-ph/0403061. The primary question that quantum chaos seeks to answer is: "What is the relationship between quantum mechanics and classical chaos. If quantum mechanics does not demonstrate an exponential sensitivity to initial conditions, how can exponential sensitivity to initial conditions arise in classical chaos. " The correspondence principle states that classical mechanics is the classical limit of quantum mechanics, specifically in the limit as the ratio of the Planck constant to the action of the system tends to zero. Gaspard, Pierre (2014). Scholarpedia Quantum chaos is a branch of physics focused on how chaotic classical dynamical systems can be described in terms of quantum theory. "Driven chaotic mesoscopic systems, dissipation and decoherence" 568eff4298

Swarm behaviour Physical Review Letters. "Freezing by heating in a driven mesoscopic system". 84 (6): 1240–1243. Helbing D, Farkas IJ, Vicsek T (2000). arXiv:cond-mat/9904326 Swarm behaviour, or swarming, is a collective behaviour exhibited by entities, particularly animals, of similar size which aggregate together, perhaps milling about the same spot or perhaps moving en masse or migrating in some direction. It is a highly interdisciplinary topic 568eff4298

The laser light provides an attractive or repulsive force (typically on the order of piconewtons), depending on the relative refractive index between particle and surrounding medium. Levitation is possible if the force of the light counters the force of gravity. The trapped particles are usually micron-sized, or even smaller. Dielectric and absorbing particles can be trapped, too. 568eff4298 In technical terms, graphene is a carbon... 568eff4298 Band theory derives these bands and band gaps by examining the allowed quantum mechanical wave functions for an electron in a large, periodic lattice of atoms or molecules. Band theory has been successfully used to explain many physical properties of solids, such as electrical resistivity and optical absorption, and forms the foundation of the understanding of all solid-state devices (transistors, solar cells, etc.). 568eff4298

Mesoscopic physics These materials range in size between the nanoscale for a quantity of atoms (such as a molecule) and of materials measuring micrometres. At the microscopic scale are bulk materials. In the mesoscopic regime, scattering from defects – such as Mesoscopic physics is a subdiscipline of condensed matter physics that deals with materials of an intermediate size. bandgap energy, owing again to the small size of the dot, and the effects of quantum confinement. Whereas average properties derived from constituent materials describe macroscopic objects, as they usually obey the laws of classical mechanics, a mesoscopic object, by contrast, is affected by thermal fluctuations around the average, and its electronic behavior may require modeling at the level of quantum mechanics. The lower limit can also be defined as being the size of individual atoms. Both mesoscopic and macroscopic objects contain many atoms 568eff4298

Optical tweezers are used in biology and medicine... 568eff4298

Timeline of condensed matter physics This branch of physics focuses on understanding and studying the physical properties and transitions between phases of matter. Condensed matter refers to materials where particles (atoms, molecules, or ions) are closely packed together or under interaction, such as solids and liquids. physics, mesoscopic physics, material physics, low-temperature physics, microscopic theories of magnetism in matter and optical properties of matter and metamaterials This article lists the main historical events in the history of condensed matter physics. This field explores a wide range of phenomena, including the electronic, magnetic, thermal, and mechanical properties of matter 568eff4298

Electronic band structure [citation needed] For energies In solid-state physics, the electronic band structure (or simply band structure) of a solid describes the range of energy levels that electrons may have within it, as well as the ranges

of energy that they may not have (called band gaps or forbidden bands). number of mobile states, and in computing electron scattering rates where it provides the number of final states after scattering 568eff4298

A macroscopic electronic device, when scaled down... 568eff4298

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