**INTRODUCTION**

**Quantum mechanics**

Quantum mechanics is a fundamental theory in physics that provides a description of the physical properties of nature at the scale of atoms and subatomic particles. It is the foundation of all quantum physics including quantum chemistry, quantum field theory, quantum technology, and quantum information science.

Classical physics, the description of physics that existed before the theory of relativity and quantum mechanics, describes many aspects of nature at an ordinary (macroscopic) scale, while quantum mechanics explains the aspects of nature at small (atomic and subatomic) scales, for which classical mechanics is insufficient. Most theories in classical physics can be derived from quantum mechanics as an approximation valid at large (macroscopic) scale.

Quantum mechanics differs from classical physics in that energy, momentum, angular momentum, and other quantities of a bound system are restricted to discrete values (quantization), objects have characteristics of both particles and waves (wave-particle duality), and there are limits to how accurately the value of a physical quantity can be predicted prior to its measurement, given a complete set of initial conditions (the uncertainty principle).

Quantum mechanics arose gradually from theories to explain observations which could not be reconciled with classical physics, such as Max Planck's solution in 1900 to the black-body radiation problem, and the correspondence between energy and frequency in Albert Einstein's 1905 paper which explained the photoelectric effect. These early attempts to understand microscopic phenomena, now known as the "old quantum theory", led to the full development of quantum mechanics in the mid-1920s by Niels Bohr, Erwin Schrödinger, Werner Heisenberg, Max Born and others. The modern theory is formulated in various specially developed mathematical formalisms. In one of them, a mathematical entity called the wave function provides information, in the form of probability amplitudes, about what measurements of a particle's energy, momentum, and other physical properties may yield.

**Applications**

**Applications of quantum mechanics**

Quantum mechanics has had enormous success in explaining many of the features of our universe, with regards to small-scale and discrete quantities and interactions which cannot be explained by classical methods.

Quantum mechanics is often the only theory that can reveal the individual behaviors of the subatomic particles that make up all forms of matter (electrons, protons, neutrons, photons, and others). Solid-state physics and materials science are dependent upon quantum mechanics

In many aspects modern technology operates at a scale where quantum effects are significant.

**Important applications of quantum theory include;**

1. Quantum chemistry
2. Quantum optics
3. Quantum computing
4. Superconducting magnets
5. Light-emitting diodes
6. The optical amplifier
7. The laser
8. The transistor
9. Semiconductors such as the microprocessor, medical and research imaging such as magnetic resonance imaging and electron microscopy.
10. Fluorescence
11. Phosphorescence
12. Holography
13. Periodic table
14. X-rays
15. Quantum-Mechanical View of Atoms
16. Computer & Mobile Phone
17. **Biological Compass**
18. **Global Positioning System (GPS)**
19. Telecommunication
20. Magnetic Resonance Imaging

**Quantum chemistry:**

**Quantum chemistry**, also called **molecular quantum mechanics**, is a branch of [chemistry](https://en.wikipedia.org/wiki/Chemistry) focused on the application of [quantum mechanics](https://en.wikipedia.org/wiki/Quantum_mechanics) to chemical systems. Understanding [electronic structure](https://en.wikipedia.org/wiki/Electronic_structure) and [molecular dynamics](https://en.wikipedia.org/wiki/Molecular_dynamics) using the [Schrödinger equations](https://en.wikipedia.org/wiki/Schr%C3%B6dinger_equation) are central topics in quantum chemistry.

Chemists rely heavily on [spectroscopy](https://en.wikipedia.org/wiki/Spectroscopy) through which information regarding the [quantization](https://en.wikipedia.org/wiki/Quantization_(physics)) of energy on a molecular scale can be obtained. Common methods are [infra-red (IR) spectroscopy](https://en.wikipedia.org/wiki/Infra-red_(IR)_spectroscopy), [nuclear magnetic resonance (NMR) spectroscopy](https://en.wikipedia.org/wiki/Nuclear_magnetic_resonance_(NMR)_spectroscopy), and [scanning probe microscopy](https://en.wikipedia.org/wiki/Scanning_probe_microscopy). Quantum chemistry studies the [ground state](https://en.wikipedia.org/wiki/Ground_state) of individual atoms and molecules, and the [excited states](https://en.wikipedia.org/wiki/Excited_state), and [transition states](https://en.wikipedia.org/wiki/Transition_state) that occur during [chemical reactions](https://en.wikipedia.org/wiki/Chemical_reaction).

On the calculations, quantum chemical studies use also [semi-empirical](https://en.wikipedia.org/wiki/Semi-empirical_quantum_chemistry_method) and other methods based on quantum mechanical principles, and deal with time dependent problems. Many quantum chemical studies assume the nuclei are at rest ([Born–Oppenheimer approximation](https://en.wikipedia.org/wiki/Born%E2%80%93Oppenheimer_approximation)). Many calculations involve iterative methods that include self-consistent field methods. Major goals of quantum chemistry include increasing the accuracy of the results for small molecular systems, and increasing the size of large molecules that can be processed, which is limited by scaling considerations—the computation time increases as a power of the number of atoms.

**Quantum optics:**

Quantum optics is a branch of atomic, molecular, and optical physics dealing with how individual quanta of light, known as photons, interact with atoms and molecules. It includes the study of the particle-like properties of photons. Photons have been used to test many of the counter-intuitive predictions of quantum mechanics, such as entanglement and teleportation, and are a useful resource for quantum information processing.

**Quantum computing:**

Quantum computing is the use of quantum phenomena such as superposition and entanglement to perform computation. Computers that perform quantum computations are known as quantum computers. They are believed to be able to solve certain computational problems, such as integer factorization (which underlies RSA encryption), substantially faster than classical computers. The study of quantum computing is a subfield of quantum information science. It is likely to expand in the next few years as the field shifts toward real-world use in pharmaceutical, data security and other applications.

Quantum computing began in the early 1980s when physicist Paul Benioff proposed a quantum mechanical model of the Turing machine. Richard Feynman and Yuri Manin later suggested that a quantum computer had the potential to simulate things a classical computer could not

In 1994, Peter Shor developed a quantum algorithm for factoring integers with the potential to decrypt RSA-encrypted communications. Despite ongoing experimental progress since the late 1990s, most researchers believe that "fault-tolerant quantum computing [is] still a rather distant dream”.

In recent years, investment in quantum computing research has increased in the public and private sectors. On 23 October 2019, Google AI, in partnership with the U.S. National Aeronautics and Space Administration (NASA), claimed to have performed a quantum computation that was infeasible on any classical computer

There are several types of quantum computers (or rather, quantum computing systems), including the quantum circuit model, quantum Turing machine, adiabatic quantum computer, one-way quantum computer, and various quantum cellular automata. The most widely used model is the quantum circuit, based on the quantum bit, or "qubit", which is somewhat analogous to the bit in classical computation. A qubit can be in a 1 or 0 quantum state, or in a superposition of the 1 and 0 states. When it is measured, however, it is always 0 or 1; the probability of either outcomes depends on the qubit's quantum state immediately prior to measurement.

Efforts towards building a physical quantum computer focus on technologies such as transmons, ion traps and topological quantum computers, which aim to create high-quality qubits.

These qubits may be designed differently, depending on the full quantum computer's computing model, whether quantum logic gates, quantum annealing, or adiabatic quantum computation. There is currently a number of significant obstacles to constructing useful quantum computers. It is particularly difficult to maintain qubits' quantum states, as they suffer from quantum decoherence and state fidelity. Quantum computers therefore require error correction.

Any computational problem that can be solved by a classical computer can also be solved by a quantum computer.[13] Conversely, any problem that can be solved by a quantum computer can also be solved by a classical computer, at least in principle given enough time. In other words, quantum computers obey the Church–Turing thesis. While this means that quantum computers provide no additional advantages over classical computers in terms of computability, quantum algorithms for certain problems have significantly lower time complexities than corresponding known classical algorithms. Notably, quantum computers are believed to be able to quickly solve certain problems that no classical computer could solve in any feasible amount of time—a feat known as "quantum supremacy." The study of the computational complexity of problems with respect to quantum computers is known as quantum complexity theory.

**Superconducting magnet:**

A superconducting magnet is an electromagnet made from coils of superconducting wire. They must be cooled to cryogenic temperatures during operation. In its superconducting state the wire has no electrical resistance and therefore can conduct much larger electric currents than ordinary wire, creating intense magnetic fields. Superconducting magnets can produce greater magnetic fields than all but the strongest non-superconducting electromagnets and can be cheaper to operate because no energy is dissipated as heat in the windings. They are used in MRI machines in hospitals, and in scientific equipment such as NMR spectrometers, mass spectrometers, fusion reactors and particle accelerators. They are also used for levitation, guidance and propulsion in a magnetic levitation (maglev) railway system being constructed in Japan.

**Light-emitting diode (LED):**

A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. The color of the light (corresponding to the energy of the photons) is determined by the energy required for electrons to cross the band gap of the semiconductor. White light is obtained by using multiple semiconductors or a layer of light-emitting phosphor on the semiconductor device

Appearing as practical electronic components in 1962, the earliest LEDs emitted low-intensity infrared (IR) light. Infrared LEDs are used in remote-control circuits, such as those used with a wide variety of consumer electronics. The first visible-light LEDs were of low intensity and limited to red. Modern LEDs are available across the visible, ultraviolet (UV), and infrared wavelengths, with high light output.

Early LEDs were often used as indicator lamps, replacing small incandescent bulbs, and in seven-segment displays. Recent developments have produced high-output white light LEDs suitable for room and outdoor area lighting. LEDs have led to new displays and sensors, while their high switching rates are useful in advanced communications technology.

LEDs have many advantages over incandescent light sources, including lower energy consumption, longer lifetime, improved physical robustness, smaller size, and faster switching. LEDs are used in applications as diverse as aviation lighting, fairy lights, automotive headlamps, advertising, general lighting, traffic signals, camera flashes, lighted wallpaper, horticultural grow lights, and medical devices.

Unlike a laser, the light emitted from an LED is neither spectrally coherent nor even highly monochromatic. However, its spectrum is sufficiently narrow that it appears to the human eye as a pure (saturated) color. Also unlike most lasers, its radiation is not spatially coherent, so it cannot approach the very high brightness’s characteristic of lasers.

**Optical amplifier:**

An optical amplifier is a device that amplifies an optical signal directly, without the need to first convert it to an electrical signal. An optical amplifier may be thought of as a laser without an optical cavity, or one in which feedback from the cavity is suppressed. Optical amplifiers are important in optical communication and laser physics. They are used as optical repeaters in the long distance fiberoptic cables which carry much of the world's telecommunication links.

There are several different physical mechanisms that can be used to amplify a light signal, which correspond to the major types of optical amplifiers. In doped fiber amplifiers and bulk lasers, stimulated emission in the amplifier's gain medium causes amplification of incoming light. In semiconductor optical amplifiers (SOAs), electron-hole recombination occurs. In Raman amplifiers, Raman scattering of incoming light with phonons in the lattice of the gain medium produces photons coherent with the incoming photons. Parametric amplifiers use parametric amplification.

**Laser:**

A laser is a device that emits light through a process of optical amplification based on the stimulated emission of electromagnetic radiation. The term "laser" originated as an acronym for "light amplification by stimulated emission of radiation”. The first laser was built in 1960 by Theodore H. Maiman at Hughes Research Laboratories, based on theoretical work by Charles Hard Townes and Arthur Leonard Schawlow.

A laser differs from other sources of light in that it emits light which is coherent. Spatial coherence allows a laser to be focused to a tight spot, enabling applications such as laser cutting and lithography. Spatial coherence also allows a laser beam to stay narrow over great distances (collimation), enabling applications such as laser pointers and lidar. Lasers can also have high temporal coherence, which allows them to emit light with a very narrow spectrum, i.e., they can emit a single color of light. Alternatively, temporal coherence can be used to produce pulses of light with a broad spectrum but durations as short as a femtosecond ("ultrashort pulses").

Lasers are used in optical disk drives, laser printers, barcode scanners, DNA sequencing instruments, fiber-optic, semiconducting chip manufacturing (photolithography), and free-space optical communication, laser surgery and skin treatments, cutting and welding materials, military and law enforcement devices for marking targets and measuring range and speed, and in laser lighting displays for entertainment. They have been used for car headlamps on luxury cars, by using a blue laser and a phosphor to produce highly directional white light.

**Transistor:**

A transistor is a semiconductor device used to amplify or switch electronic signals and electrical power. Transistors are one of the basic building blocks of modern electronics. It is composed of semiconductor material usually with at least three terminals for connection to an external circuit. A voltage or current applied to one pair of the transistor's terminals controls the current through another pair of terminals. Because the controlled (output) power can be higher than the controlling (input) power, a transistor can amplify a signal. Today, some transistors are packaged individually, but many more are found embedded in integrated circuits.

Austro-Hungarian physicist Julius Edgar Lilienfeld proposed the concept of a field-effect transistor in 1926, but it was not possible to actually construct a working device at that time. The first working device to be built was a point-contact transistor invented in 1947 by American physicists John Bardeen and Walter Brattain while working under William Shockley at Bell Labs. The three shared the 1956 Nobel Prize in Physics for their achievement. The most widely used type of transistor is the metal–oxide–semiconductor field-effect transistor (MOSFET), which was invented by Mohamed Atalla and Dawon Kahng at Bell Labs in 1959. Transistors revolutionized the field of electronics, and paved the way for smaller and cheaper radios, calculators, and computers, among other things.

Most transistors are made from very pure silicon, and some from germanium, but certain other semiconductor materials are sometimes used. A transistor may have only one kind of charge carrier, in a field-effect transistor, or may have two kinds of charge carriers in bipolar junction transistor devices. Compared with the vacuum tube, transistors are generally smaller and require less power to operate. Certain vacuum tubes have advantages over transistors at very high operating frequencies or high operating voltages. Many types of transistors are made to standardized specifications by multiple manufacturers.

**Semiconductor:**

A semiconductor material has an electrical conductivity value falling between that of a conductor, such as metallic copper, and an insulator, such as glass. Its resistivity falls as its temperature rises; metals behave in the opposite way. Its conducting properties may be altered in useful ways by introducing impurities ("doping") into the crystal structure. When two differently-doped regions exist in the same crystal, a semiconductor junction is created. The behavior of charge carriers, which include electrons, ions and electron holes, at these junctions is the basis of diodes, transistors and most modern electronics. Some examples of semiconductors are silicon, germanium, gallium arsenide, and elements near the so-called "metalloid staircase" on the periodic table. After silicon, gallium arsenide is the second most common semiconductor and is used in laser diodes, solar cells, microwave-frequency integrated circuits, and others. Silicon is a critical element for fabricating most electronic circuits.

Semiconductor devices can display a range of useful properties, such as passing current more easily in one direction than the other, showing variable resistance, and sensitivity to light or heat. Because the electrical properties of a semiconductor material can be modified by doping, or by the application of electrical fields or light, devices made from semiconductors can be used for amplification, switching, and energy conversion.

The conductivity of silicon is increased by adding a small amount (of the order of 1 in 108) of pentavalent (antimony, phosphorus, or arsenic) or trivalent (boron, gallium, indium) atoms. This process is known as doping and the resulting semiconductors are known as doped or extrinsic semiconductors. Apart from doping, the conductivity of a semiconductor can be improved by increasing its temperature. This is contrary to the behavior of a metal in which conductivity decreases with an increase in temperature.

The modern understanding of the properties of a semiconductor relies on quantum physics to explain the movement of charge carriers in a crystal lattice. Doping greatly increases the number of charge carriers within the crystal. When a doped semiconductor contains free holes it is called "p-type", and when it contains free electrons it is known as "n-type". The semiconductor materials used in electronic devices are doped under precise conditions to control the concentration and regions of p- and n-type dopants. A single semiconductor device crystal can have many p- and n-type regions; the p–n junctions between these regions are responsible for the useful electronic behavior. Using a hot-point probe, one can determine quickly whether a semiconductor sample is p- or n-type.

Some of the properties of semiconductor materials were observed throughout the mid 19th and first decades of the 20th century. The first practical application of semiconductors in electronics was the 1904 development of the cat's-whisker detector, a primitive semiconductor diode used in early radio receivers. Developments in quantum physics led in turn to the invention of the transistor in 1947, the integrated circuit in 1958, and the MOSFET (metal–oxide–semiconductor field-effect transistor) in 1959.

**Fluorescence:**

Fluorescence is the emission of light by a substance that has absorbed light or other electromagnetic radiation. It is a form of photoluminescence. In most cases, the emitted light has a longer wavelength, and therefore lower energy, than the absorbed radiation. However, when the absorbed electromagnetic radiation is intense, it is possible for one electron to absorb two photons; this two-photon absorption can lead to emission of radiation having a shorter wavelength than the absorbed radiation. The emitted radiation may also be of the same wavelength as the absorbed radiation, termed “resonance fluorescence”.

Fluorescence occurs when an orbital electron of a molecule or atom relaxes to its ground state by emitting a photon of light after being excited to a higher quantum state by some type of energy. The most striking examples of fluorescence occur when the absorbed radiation is in the ultraviolet region of the spectrum, and thus invisible to the human eye, and the emitted light is in the visible region.

**Phosphorescence:**

Phosphorescence is a specific type of photoluminescence related to fluorescence. Unlike fluorescence, a phosphorescent material does not immediately re-emit the radiation it absorbs. Excitation of electrons to a higher state is accompanied with the change of a spin state. Once in a different spin state, electrons cannot relax into the ground state quickly because the re-emission involves quantum mechanically forbidden energy state transitions. As these transitions occur very slowly in certain materials, absorbed radiation may be re-emitted at a lower intensity for up to several hours after the original excitation.

**Holography:**

Holography is an optical technique which enables three-dimensional images to be made.

Holography is a technique which enables three-dimensional images to be made. It involves the use of a laser, interference, and diffraction, light intensity recording and suitable illumination of the recording. The image changes as the position and orientation of the viewing system changes in exactly the same way as if the object were still present, thus making the image appear three-dimensional.

Laser: Holograms are recorded using a flash of light that illuminates a scene and then imprints on a recording medium, much in the way a photograph is recorded. In addition, however, part of the light beam must be shone directly onto the recording medium – this second light beam is known as the reference beam (]). A hologram requires a laser as the sole light source. Laser is required as a light source to produce an interference pattern on the recording plate. To prevent external light from interfering, holograms are usually taken in darkness, or in low level light of a different color from the laser light used in making the hologram. Holography requires a specific exposure time, which can be controlled using a shutter, or by electronically timing the laser

Recording a hologram: Holograms are recorded using a flash of light that illuminates a scene and then imprints on a recording medium, much in the way a photograph is recorded. In addition, however, part of the light beam must be shone directly onto the recording medium – this second light beam is known as the reference beam.

Apparatus: A hologram can be made by shining part of the light beam directly onto the recording medium, and the other part onto the object in such a way that some of the scattered light falls onto the recording medium. A more flexible arrangement for recording a hologram requires the laser beam to be aimed through a series of elements that change it in different ways. The first element is a beam splitter that divides the beam into two identical beams, each aimed in different directions:

One beam (known as the illumination or object beam) is spread using lenses and directed onto the scene using mirrors. Some of the light scattered (reflected) from the scene then falls onto the recording medium.

The second beam (known as the reference beam) is also spread through the use of lenses, but is directed so that it doesn’t come in contact with the scene, and instead travels directly onto the recording medium.

**Periodic Table of Elements:**

The periodic table is a tabular display of the chemical elements. The elements are organized based on their atomic numbers, electron configurations, and recurring chemical properties.

In the periodic table, elements are presented in order of increasing atomic number (the number of protons). The rows of the table are called periods; the columns of the s- (columns 1-2 and He), d- (columns 3-12), and p-blocks (columns 13-18, except He) are called groups. (The terminology of s-, p-, and d- blocks originate from the valence atomic orbitals the element’s electrons occupy. ) Some groups have specific names, such as the halogens or the noble gases. Since, by definition, a periodic table incorporates recurring trends, any such table can be used to derive relationships between the properties of the elements and predict the properties of new, yet-to-be-discovered, or synthesized elements. As a result, the periodic table provides a useful framework for analyzing chemical behavior, and such tables are widely used in chemistry and other sciences.

**X-rays:**

X-radiation (composed of x-rays) is a form of electromagnetic radiation. X-rays have wavelengths in the range of 0.01 to 10 nanometers, which corresponds to frequencies in the range of 30 petahertz to 30 exahertz (3·1016 Hz to 3·1019 Hz) and energies in the of range 100 eV to 100 keV.

X-rays can be generated by an x-ray tube, a vacuum tube that uses high voltage to accelerate the electrons released by a hot cathode to a high velocity. The high-velocity electrons collide with a metal target, the anode, creating the x-rays. The maximum energy of the produced x-ray photon is limited by the energy of the incident electron, which is equal to the voltage on the tube times the electron charge, so an 80-kV tube cannot create x-rays with an energy greater than 80 keV. When the electrons hit the target, x-rays are created through two different atomic processes:

X-ray fluorescence, if the electron has enough energy that it can knock an orbital electron out of the inner electron shell of a metal atom. As a result, electrons from higher energy levels fill up the vacancy, and x-ray photons are emitted. This process produces an emission spectrum of x-rays at a few discrete frequencies, sometimes referred to as the spectral lines. The spectral lines generated depend on the target (anode) element used and therefore are called characteristic lines. Usually these are transitions from upper shells into the K shell (called K lines), or the L shell (called L lines), and so on.

Bremsstrahlung, literally meaning braking radiation. Bremsstrahlung is radiation given off by the electrons as they are scattered by the strong electric field near the high-Z (proton number) nuclei. These x-rays have a continuous spectrum. The intensity of the x-rays increases linearly with decreasing frequency, from zero at the energy of the incident electrons, the voltage on the x-ray tube.

Both of these x-ray production processes are inefficient, with a production efficiency of only about one percent. Therefore, to produce a usable flux of x-rays, most of the electric power consumed by the tube is released as heat waste. The x-ray tube must be designed to dissipate this excess heat.

A specialized source of x-rays that is becoming widely used in research is synchrotron radiation, which is generated by particle accelerators. Its unique features are x-ray outputs many orders of magnitude greater than those of x-ray tubes, wide x-ray spectra, excellent collimation, and linear polarization.

**Quantum-Mechanical View of Atoms:**

The atom is a basic unit of matter that consists of a nucleus surrounded by negatively charged electrons. The atomic nucleus contains a mix of positively charged protons and electrically neutral neutrons. The electrons of an atom are bound to the nucleus by the electromagnetic (Coulomb) force. Atoms are minuscule objects with diameters of a few tenths of a nanometer and tiny masses proportional to the volume implied by these dimensions. Atoms in solid states (or, to be precise, their electron clouds) can be observed individually using special instruments such as the scanning tunneling microscope.

Hydrogen-1 (one proton + one electron) is the simplest form of atoms, and not surprisingly, our quantum mechanical understanding of atoms evolved with the understanding of this species. In 1913, physicist Niels Bohr suggested that the electrons were confined into clearly defined, quantized orbits, and could jump between these, but could not freely spiral inward or outward in intermediate states. An electron must absorb or emit specific amounts of energy to transition between these fixed orbits. Bohr’s model successfully explained spectroscopic data of hydrogen very well, but it adopted a semi classical approach where electron was still considered a (classical) particle.

Adopting Louis de Broglie’s proposal of wave-particle duality, Erwin Schrödinger, in 1926, developed a mathematical model of the atom that described the electrons as three-dimensional waveforms rather than point particles. A consequence of using waveforms to describe particles is that it is mathematically impossible to obtain precise values for both the position and momentum of a particle at the same time; this became known as the uncertainty principle, formulated by Werner Heisenberg in 1926. Thereafter, the planetary model of the atom was discarded in favor of one that described atomic orbital zones around the nucleus where a given electron is most likely to be observed.

**Computer & Mobile Phone:**

The whole computer world is based on the principle of Quantum Physics. Quantum Physics talks about the wave nature of electrons, and, so, this forms the basis of the band structure of solid objects on which semiconductor-based electronics are built. Not to forget that we are able to manipulate the electrical properties of silicon only because we can study the wave nature of electrons. Once the band structure is changed, the conductivity alters as well. How can the band structure be changed? Of course, Quantum Physics knows the answer!

**Biological Compass:**

If you think that only the humankind has been lucky enough to make use of Quantum Physics, you are totally wrong! According to theories by scientists, birds like European Robin make use of Quantum Physics to migrate. A light-sensitive protein called cryptochrome contains electrons. Photons, after entering the eyes of the bird, hit cryptochrome, and radicals are released. These radicals enable the bird to “see” a magnetic map. Another theory suggests that the beaks of the birds contain magnetic minerals. Crustaceans, lizards, insects, and even some mammals make use of such type of magnetic compass. You might be surprised to know the type of cryptochrome which is used for navigation by flies has also been found in the human eye! However, its use is unclear.

**Global Positioning System (GPS):**

Navigating to unknown locations has never been easier as it has been with the aid of Quantum Physics. While using a mobile phone for navigation, the GPS receiver in the phone is responsible for picking up the signal from multiple clocks. The distance and time between your current location and the destination are calculated by calculating different arrival times from different satellites. Moreover, even the distance from your current location from each satellite is also calculated. Each satellite is equipped with an atomic clock, which relies on Quantum Physics only.

**Telecommunication:**

Communication has been made extremely easy because of the important role of Quantum Physics. Fibre optic telecommunication has made possible two-way and quick communication. The fibre optic telecommunication is possible only because of lasers, which are devices of Quantum Physics.

**Magnetic Resonance Imaging:**

Magnetic Resonance Imaging, also known as Nuclear Magnetic Resonance, involves the reversal of the spins of the electrons in hydrogen nuclei. So, basically, we are talking of shift in energies; which is nothing but one of the applications of Quantum Physics. The study of soft tissues can easily be carried out with the use of MRI. Thanks to Quantum Physics that the diagnosis and treatment of some life-threatening ailments have been possible.