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ASHTAG

Applied Science and Humanities Department

VISION

The Department of Applied Science and Humanities is committed to dynamically integrate the components of Science, Humanities and Engineering to groom students to transform them as globally acknowledged professionals.

MISSION

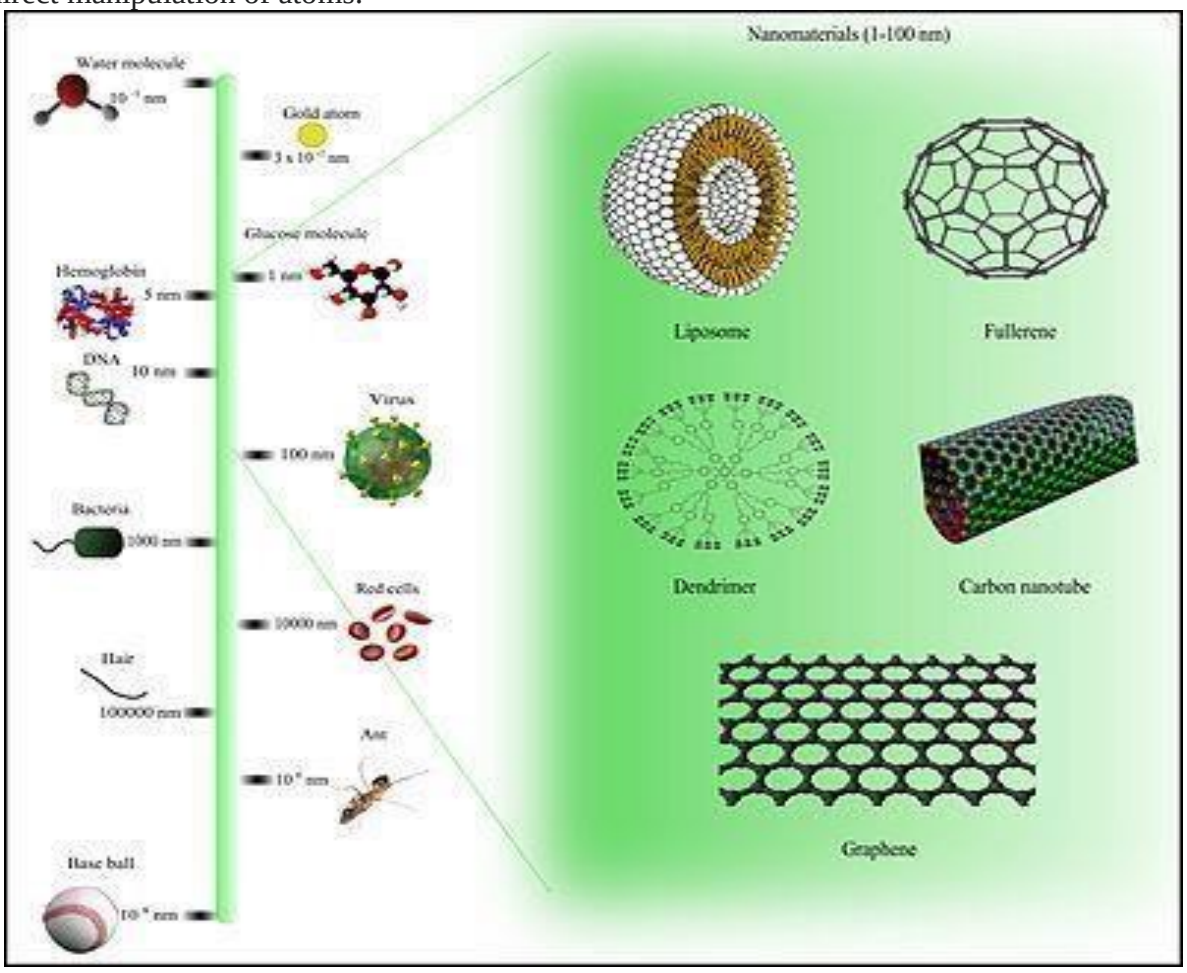
The department is carrying a mission to create and disseminate the knowledge and techniques in intellectual areas of Engineering and other core areas of Applied Science and Humanities for betterment of Eco system.

To inculcate the importance of Applied Science and develop a natural flair for Engineering and Technology which in turn shall mold students into a competent professional.

To be recognized for practicing the best teaching-learning processes to create highly competent, resourceful, and self-motivated young Engineers for the benefit of the society.

Nanotechnology

Nanotechnology were first discussed in 1959 by renowned physicist Richard Feynman in his talk There's plenty of room at bottom , in which he described the possibility of synthesis via direct manipulation of atoms.



Comparison of Nanomaterials Sizes

The term "nano-technology" was first used by Norio Taniguchi in 1974, though it was not widely known. Inspired by Feynman's concepts, K. Eric Drexler used the term "nanotechnology" in his 1986 book Engines of Creation : The coming of era of Nanotechnology, which proposed the idea of a nanoscale "assembler" which would be able to build a copy of itself and of other items of arbitrary complexity with atomic control in 1986, Drexler co-founded The Foresight Institute (with which he is no longer affiliated) to help increase public awareness and understanding of nanotechnology concepts and implications.

The emergence of nanotechnology as a field in the 1980s occurred through convergence of Drexler's theoretical and public work, which developed and popularized a conceptual framework for nanotechnology, and high-visibility experimental advances that drew additional wide-scale attention to the prospects of atomic control of matter. In the 1980s, two major breakthroughs sparked the growth of nanotechnology in the modern era. First, the invention of

the scanning tunneling microscope in 1981 which provided unprecedented visualization of individual atoms and bonds, and was successfully used to manipulate individual atoms in 1989. The microscope's developers Gerd Binnig and Heinrich Rohrer at IBM Zurich Research Laboratory received a Nobel Prize in Physics in 1986. Binnig, Quate and Gerber also invented the analogous atomic force microscope that year.

Second, fullerenes were discovered in 1985 by Harry Kroto, Richard Smalley, and Robert Curl, who together won the 1996 Nobel Prize in Chemistry. C_{60} was not initially described as nanotechnology; the term was used regarding subsequent work with related carbon nanotubes (sometimes called graphene tubes or Bucky tubes) which suggested potential applications for nanoscale electronics and devices. The discovery of carbon nanotubes is largely attributed to Sumio Iijima of NEC in 1991 for which Iijima won the inaugural 2008 Kavli Prize in Nanoscience.

A nanolayer-base metal–semiconductor junction (M–S junction) transistor was initially proposed by A. Rose in 1960, and fabricated by L. Geppert, Mohamed

Atalla and Dawon Kahng in 1962 Decades later, advances in multi-gate technology enabled the scaling of metal–oxide–semiconductor field-effect transistor (MOSFET) devices down to nano-scale levels smaller than gate length, starting with the FinFET (fin field-effect transistor), a three-dimensional, non-planar, double-gate MOSFET. At UC Berkeley, a team of researchers including Digh Hisamoto, Chenming Hu, Tsu-Jae King Liu, Jeffrey Bokor and others fabricated FinFET devices down to a process in 1998, then in 2001, and then 10 nm in 2002

In the early 2000s, the field garnered increased scientific, political, and commercial attention that led to both controversy and progress. Controversies emerged regarding the definitions and potential implications of nanotechnologies, exemplified by the Royal Society's report on nanotechnology. Challenges were raised regarding the feasibility of applications envisioned by advocates of molecular nanotechnology, which culminated in a public debate between Drexler and Smalley in 2001 and 2003.

Meanwhile, commercialization of products based on advancements in nanoscale technologies began emerging. These products are limited to bulk applications of nanomaterials and do not involve atomic control of matter. Some examples include the Silver Nano platform for using silver nanoparticles as an antibacterial agent, nanoparticle-based transparent sunscreens, carbon fiber strengthening using silica nanoparticles, and carbon nanotubes for stain-resistant textiles.

Governments moved to promote and fund research into nanotechnology, such as in the U.S. with the National Nanotechnology Initiative, which formalized a size-based definition of nanotechnology and established funding for research on the nanoscale, and in Europe via the European Framework Programmes for Research and Technological Development.

By the mid-2000s new and serious scientific attention began to flourish. Projects emerged to produce nanotechnology roadmaps which center on atomically precise manipulation of matter and discuss existing and projected capabilities, goals, and applications.

In 2006, a team of Korean researchers from the Korea Advanced Institute of Science and Technology (KAIST) and the National Nano Fab Center developed a 3 nm MOSFET, the world's smallest Nano electronic device. It was based on gate-allaround (GAA) FinFET technology.

Contributed by : Rishi Vekaria , Jimit Mehta

Source : https://en.m.wikipedia.org/wiki/Nanotechnology

Submarine

A submarine (or sub) is a watercraft capable of independent operation underwater. It differs from a submersible, which has more limited underwater capability. The term is also sometimes used historically or colloquially to refer to remotely operated vehicles and robots, as well as medium-sized or smaller vessels, such as the midget submarine and the wet sub. Submarines are referred to as "boats" rather than "ships" irrespective of their size.

US *Virginia*-class submarine underway in Groton

For general submersion or surfacing, submarines use the main ballast tanks (MBTs), which are ambient pressure tanks, filled with water to submerge, or with air to surface.

For more precise

control of depth, submarines use smaller depth control tanks (DCTs)—also called hard tanks

Russian *Akula*-class submarine of the Northern Fleet

Although experimental submarines had been built earlier, submarine design took off during the 19th century, and they were adopted by several navies. They were first widely used during World War I (1914–1918), and are now used in many navies, large and small. Military uses include attacking enemy surface ships (merchant and military) or other submarines, and for aircraft carrier protection, blockade running, nuclear deterrence, reconnaissance, conventional land attack (for example, using a cruise missile), and covert insertion of special forces. Civilian uses include marine science, salvage, exploration, and facility inspection and maintenance. Submarines can also be modified for specialized functions such as search-and-rescue missions and undersea cable repair. They are also used in tourism and undersea archaeology. Modern deep-diving submarines derive from the bathyscaphe, which evolved from the diving bell. Most large submarines consist of a cylindrical body with hemispherical (or conical) ends and a vertical structure, usually located amidships, that houses communications and sensing devices as well as periscopes. In modern submarines, this structure is the "sail" in American usage and "fin" in European usage. A "conning tower" was a feature of earlier designs: a separate pressure

hull above the main body of the boat that allowed the use of shorter periscopes. There is propeller (or pump jet) at the rear, and various hydrodynamic control fins. Smaller, deepdiving, and specialty submarines may deviate significantly from this traditional design. Submarines dive and resurface by means of diving planes and changing the amount of water and air in ballast tanks to affect their buoyancy.

Submarines encompass a wide range of types and capabilities. They include small autonomous examples using A-Navigation and one- or two-person subs that operate for a few hours, to vessels that can remain submerged for six months—such as the Russian Typhoon class, the biggest submarines ever built. Submarines can work at greater depths than are survivable or practical for human divers.

Before and during World War II, the primary role of the submarine was anti-surface ship warfare. Submarines would attack either on the surface using deck guns, or submerged using torpedoes. They were particularly effective in sinking Allied transatlantic shipping in both World Wars, and in disrupting Japanese supply routes and naval operations in the Pacific in World War II.

Mine-laying submarines were developed in the early part of the 20th century. The facility was used in both World Wars. Submarines were also used for inserting and removing covert agents and military forces in special operations, for intelligence gathering, and to rescue aircrew during air attacks on islands, where the airmen would be told of safe places to crash-land so the submarines could rescue them. Submarines could carry cargo through hostile waters or act as supply vessels for other submarines.

Submarines could usually locate and attack other submarines only on the surface, although HMS *Venturer* managed to sink *U-864* with a four torpedo spread while both were submerged. The British developed a specialized anti-submarine submarine in WWI, the R class. After WWII, with the development of the homing torpedo, better sonar systems, and nuclear propulsion, submarines also became able to hunt each other effectively.

The development of submarine-launched ballistic missile and submarinelaunched cruise missiles gave submarines a substantial and long-ranged ability to attack both land and sea targets with a variety of weapons ranging from cluster bombs to nuclear weapons.

The primary defence of a submarine lies in its ability to remain concealed in the depths of the ocean. Early submarines could be detected by the sound they made. Water is an excellent conductor of sound (much better than air), and submarines can detect and track comparatively noisy surface ships from long distances. Modern submarines are built with an emphasis on stealth. Advanced propeller designs, extensive sound-reducing insulation, and special machinery help a submarine remain as quiet as ambient ocean noise, making them difficult to detect. It takes specialized technology to find and attack modern submarines.

Active sonar uses the reflection of sound emitted from the search equipment to detect submarines. It has been used since WWII by surface ships, submarines and aircraft (via dropped buoys and helicopter "dipping" arrays), but it reveals the emitter's position, and is susceptible to counter-measures.

A concealed military submarine is a real threat, and because of its stealth, can force an enemy navy to waste resources searching large areas of ocean and protecting ships against attack. This advantage was vividly demonstrated in the 1982 Falklands War when the British nuclearpowered submarine HMS *Conqueror* sank the Argentine cruiser *General Belgians*. After the sinking the Argentine Navy recognized that they had no effective defence against

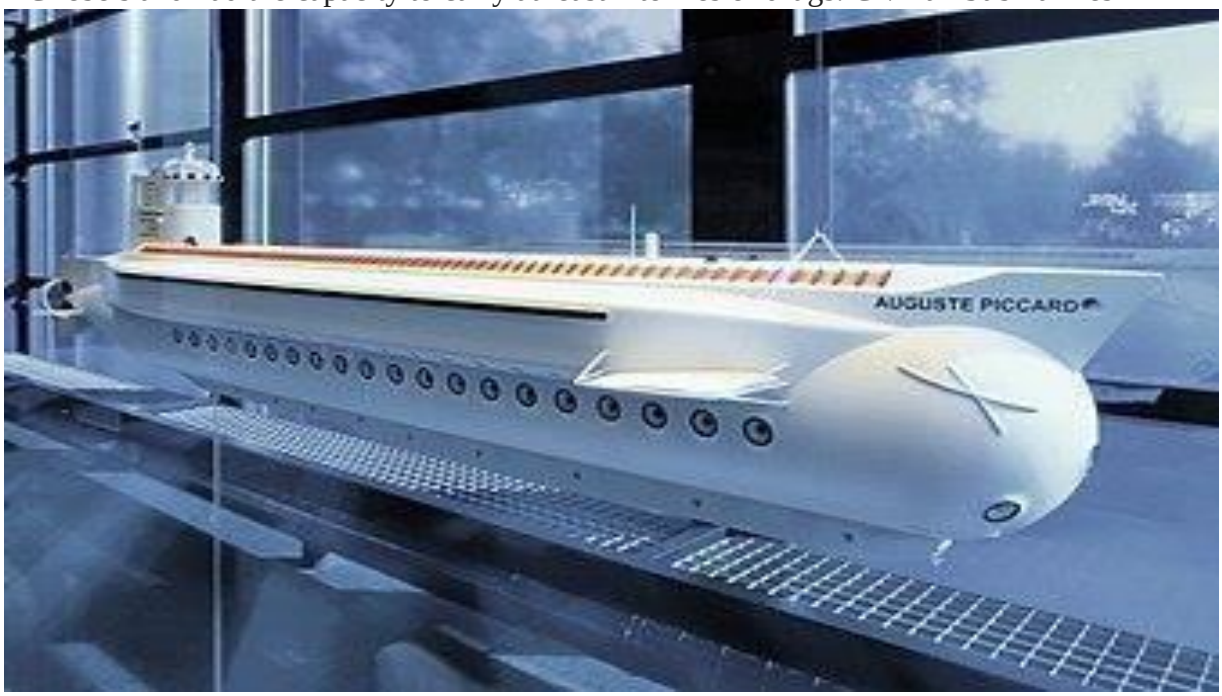
submarine attack, and the Argentine surface fleet withdrew to port for the remainder of the war, though an Argentine submarine remained at sea. Civilian

Although the majority of the world's submarines are military, there are some civilian submarines, which are used for tourism, exploration, oil and gas platform inspections, and pipeline surveys. Some are also used in illegal activities.

The Submarine Voyage ride opened at Disneyland in 1959, but although it ran under water it was not a true submarine, as it ran on tracks and was open to the atmosphere The first tourist submarine was *Auguste Piccard*, which went into service in 1964 at Expo64 By 1997 there were 45 tourist submarines operating around the world Submarines with a crush depth in the range of 400–500 feet (120–150 m) are operated in several areas worldwide, typically with bottom depths around 100 to 120 feet (30 to 37 m), with a carrying capacity of 50 to 100 passengers.

In a typical operation a surface vessel carries passengers to an offshore operating area and loads them into the submarine. The submarine then visits underwater points of interest such as natural or artificial reef structures. To surface safely without danger of collision the location of the submarine is marked with an air release and movement to the surface is coordinated by an observer in a support craft.

A recent development is the deployment of so-called macro-submarines by South American drug smugglers to evade law enforcement detection. Although they occasionally deploy true submarines, most are self-propelled semi-submersibles, where a portion of the craft remains above water at all times. In September 2011, Colombian authorities seized a 16-meter-long submersible that could hold a crew of 5, costing about $2 million. The vessel belonged to FARC rebels and had the capacity to carry at least 7 tonnes of drugs. Civilian Submarines

- 

Interior of the tourist submarine atlantis whilst submerged

Contributed by : Yash Gupta , Rishi Vekaria , Jimit Mehta

Source : https://en.m.wikipedia.org/wiki/Submarine

QUIZ

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