Medicine is the art and science of healing. It encompasses a range of health care practices evolved to maintain and restore health by the prevention and treatment of illness.

Contemporary medicine applies health science, biomedical research, and medical technology to diagnose and treat injury and disease, typically through medication, surgery, or some other form of therapy. The word medicine is derived from the Latin "ars medicina", meaning the art of healing.

**Statue of Asclepius**

**the Greek God of medicine**

Though medical technology and clinical expertise are pivotal to contemporary medicine, successful face-to-face relief of actual suffering continues to require the application of ordinary human feeling and compassion, known in English as bedside manner.

***History of medicine***

**The ancient Sumerian god Ningishzida**

The ancient Sumerian god Ningishzida, the patron of medicine, accompanied by two gryphon Prehistoric medicine incorporated plants (herbalism), animal parts and minerals. In many cases these materials were used ritually as magical substances by priests, shamans, or medicine men. Well-known spiritual systems include animism (the notion of inanimate objects having spirits), spiritualism (an appeal to gods or communion with ancestor spirits); shamanism (the vesting of an individual with mystic powers); and divination (magically obtaining the truth).

The field of medical anthropology examines the ways in which culture and society are organized around or impacted by issues of health, health care and related issues.

**Statuette of ancient Egyptian physician Imhotep**

Early records on medicine have been discovered from ancient Egyptian medicine, Babylonian medicine, Ayurvedic medicine (in the Indian subcontinent), classical Chinese medicine (predecessor to the modern traditional Chinese Medicine), and ancient Greek medicine and Roman medicine. Earliest records of dedicated hospitals come from Mihintale in Sri Lanka where evidence of dedicated medicinal treatment facilities for patients are found.

**The Greek physician Hippocrates**

The Greek physician Hippocrates (ca. 460 BC – ca. 370 BC), generally referred to as the Father of Modern Medicine. The Greek physician Hippocrates, known as the Father of Medicine, laid the foundation for a rational approach to medicine (although some historians consider Imhotep, the noted Egyptian physician, to hold that honor.

Statuette of ancient Egyptian physician Imhotep in the Louvre. Hippocrates invented the Hippocratic Oath for physicians, which is still relevant and in use today and was the first to categorize illnesses as acute, chronic, endemic and epidemic, and use terms such as, "exacerbation, relapse, resolution, crisis, paroxysm, peak, and convalescence". The Greek physician Galen was one of the greatest surgeons of the ancient world and performed many audacious operations —including brain and eye surgeries— that were not tried again for almost two millennia. After the fall of the Western Roman Empire and the onset of the Dark Ages, the Greek tradition of medicine went into decline in Western Europe, although it continued uninterrupted in the Eastern Roman (Byzantine) Empire.

**A Latin copy of *The Canon of Medicine***

After 750, the Muslim Arab world had Hippocrates' and Galen's works translated into Arabic, and Islamic physicians engaged in some significant medical research. Notable Islamic medical pioneers include polymath Avicenna, who, along with Hippocrates, has also been called the Father of Medicine, Abulcasis, the father of surgery, Avenzoar, the father of experimental surgery[citation needed], Ibn al-Nafis, the father of circulatory physiology[citation needed], and Averroes. Rhazes, who is called the father of pediatrics[citation needed], was one of first to question the Greek theory of humorism, which nevertheless remained influential in both medieval Western and medieval Islamic medicine. However, overall mortality and morbidity levels in the medieval Middle East and medieval Europe did not significantly differ one from the other, which indicates that there was no major medical "breakthrough" to modern medicine in either region in this period. The fourteenth and fifteenth century Black Death was just as devastating to the Middle East as to Europe, and it has even been argued that Western Europe was generally more effective in recovering from the pandemic than the

Middle East. In the early modern period, important early figures in medicine and anatomy emerged in Europe, including Gabriele Falloppio and William Harvey.

**An ancient Greek patient gets medical treatment**

An ancient Greek patient gets medical treatment: this aryballos (circa 480-470 BCE, now in Paris's Louvre Museum) probably contained healing oilThe major shift in medical thinking was the gradual rejection, especially during the Black Death in the 14th and 15th centuries, of what may be called the 'traditional authority' approach to science and medicine. This was the notion that because some prominent person in the past said something must be so, then that was the way it was, and anything one observed to the contrary was an anomaly (which was paralleled by a similar shift in European society in general - see Copernicus's rejection of Ptolemy's theories on astronomy). Physicians like Ibn al-Nafis and Vesalius improved upon or disproved some of the theories from the past.

Modern scientific biomedical research (where results are testable and reproducible) began to replace early Western traditions based on herbalism, the Greek "four humours" and other such pre-modern notions. The modern era really began with Edward Jenner's discovery of the smallpox vaccine at the end of the 18th century (inspired by the method of inoculation earlier practiced in Asia), Robert Koch's discoveries around 1880 of the transmission of disease by bacteria, and then the discovery of antibiotics around 1900. The post-18th century modernity period brought more groundbreaking researchers from Europe. From Germany and Austrian doctors such as Rudolf Virchow, Wilhelm

Conrad Röntgen, Karl Landsteiner, and Otto Loewi) made contributions.

In the United Kingdom Alexander Fleming, Joseph Lister, Francis Crick, and Florence Nightingale are considered important. From New Zealand and Australia came Maurice Wilkins, Howard Florey, and Frank Macfarlane Burnet). In the United States William Williams Keen, Harvey Cushing, William Coley, James D. Watson, Italy (Salvador Luria), Switzerland (Alexandre Yersin), Japan (Kitasato Shibasaburo), and France (Jean-Martin Charcot, Claude Bernard, Paul Broca and others did significant work. Russian (Nikolai Korotkov also did significant work, as did Sir William Osler and Harvey Cushing.

As science and technology developed, medicine became more reliant upon medications. Throughout history and in Europe right until the late 18th century not only animal and plant products were used as medicine, but also human body parts and fluids. Pharmacology developed from herbalism and many drugs are still derived from plants (atropine, ephedrine, warfarin, aspirin, digoxin, vinca alkaloids, taxol, hyoscine, etc). The first of these was arsphenamine / Salvarsan discovered by Paul Ehrlich in 1908 after he observed that bacteria took up toxic dyes that human cells did not. Vaccines were discovered by Edward Jenner and Louis Pasteur. The first major class of antibiotics was the sulfa drugs, derived by French chemists originally from azo dyes. This has become increasingly sophisticated; modern biotechnology allows drugs targeted towards specific physiological processes to be developed, sometimes designed for compatibility with the body to reduce side-effects.

Genomics and knowledge of human genetics is having some influence on medicine, as the causative genes of most monogenic genetic disorders have now been identified, and the development of techniques in molecular biology and genetics are influencing medical technology, practice and decision-making.

Evidence-based medicine is a contemporary movement to establish the most effective algorithms of practice (ways of doing things) through the use of systematic reviews and meta-analysis. The movement is facilitated by modern global information science, which allows as much of the available evidence as possible to be collected and analyzed according to standard protocols which are then disseminated to healthcare providers. One problem with this 'best practice' approach is that it could be seen to stifle novel approaches to treatment[citation needed]. The Cochrane Collaboration leads this movement. A 2001 review of 160 Cochrane systematic reviews revealed that, according to two readers, 21.3% of the reviews concluded insufficient evidence, 20% concluded evidence of no effect, and 22.5% concluded positive effect.

All human societies have medical beliefs that provide explanations for birth, death, and disease. Throughout history, illness has been attributed to witchcraft, demons, adverse astral influence, or the will of the gods. These ideas still retain some power, with faith healing and shrines still used in some places, although the rise of scientific medicine over the past millennium has altered or replaced many of the old beliefs.

###### General overview of the history of medicine

Prehistoric medicine

Although there is no record to establish when plants were first used for medicinal purposes (herbalism), the use of plants as healing agents is an ancient practice. Over time through emulation of the behavior of fauna a medicinal knowledge base developed and was passed between generations.

As tribal culture specialized specific castes, Shamans and apothecaries performed the 'niche occupation' of healing.

Egyptian medicine

Ancient Egypt developed a large, varied and fruitful medical tradition. Herodotus described the Egyptians as "the healthiest of all men, next to the Libyans", due to the dry climate and the notable public health system that they possessed. According to him, "the practice of medicine is so pecialized among them that each physician is a healer of one disease and no more." In the Odyssey, Homer describes Egypt as a land where "the earth, the giver of grain, bears greatest store of drugs" and where "every man is a physician." Although Egyptian medicine, to a good extent, dealt with the supernatural, it eventually developed a practical use in the fields of anatomy, public health, and clinical diagnostics.

Medical information in the Edwin Smith Papyrus may date to a time as early as 3000 BC. The earliest known surgery in Egypt was performed in Egypt around 2750 BC. Imhotep in the 3rd dynasty is sometimes credited with being the founder of ancient Egyptian medicine and with being the original author of the Edwin Smith Papyrus, detailing cures, ailments and anatomical observations. The Edwin Smith Papyrus is regarded as a copy of several earlier

works and was written circa 1600 BC. It is an ancient textbook on surgery almost completely devoid of magical thinking and describes in exquisite detail the examination, diagnosis, treatment, and prognosis of numerous ailments.

Conversely, the Ebers papyrus (c. 1550 BC) is full of incantations and foul applications meant to turn away disease- causing demons, and other superstition.

The Ebers papyrus also provides our earliest possible documentation of ancient awareness of tumors, but ancient medical terminology being badly understood, cases Ebers 546 and 547[vague] for instance may refer to simple swellings.

The Kahun Gynaecological Papyrus treats women's complaints, including problems with conception. Thirty four cases detailing diagnosis and treatment survive, some of them fragmentarily. Dating to 1800 BC, it is the oldest surviving medical text of any kind.

Medical institutions, referred to as Houses of Life are known to have been established in ancient Egypt as early as the 1st Dynasty. By the time of the 19th Dynasty some workers enjoyed such benefits as medical insurance, pensions and sick leave.

The earliest known physician is also credited to ancient Egypt: Hesy-Ra, “Chief of Dentists and Physicians” for King Djoser in the 27th century BC. Also, the earliest known woman physician, Peseshet, practiced in Ancient Egypt at the time of the 4th dynasty. Her title was “Lady Overseer of the Lady Physicians.” In addition to her supervisory role, Peseshet graduated midwives at an ancient Egyptian medical school in Sais.

Babylonian medicine

The oldest Babylonian texts on medicine date back to the Old Babylonian period in the first half of the 2nd millennium BC. The most extensive Babylonian medical text, however, is the Diagnostic Handbook written by the physician Esagil-kin-apli of Borsippa, during the reign of the Babylonian king Adad-apla- iddina (1069-1046 BC).

Along with contemporary ancient Egyptian medicine, the Babylonians introduced the concepts of diagnosis, prognosis, physical examination, and medical prescriptions. In addition, the Diagnostic Handbook introduced the methods of therapy and etiology and the use of empiricism, logic and rationality in diagnosis, prognosis and therapy. The text contains a list of medical symptoms and often detailed empirical observations along with logical rules used in combining observed symptoms on the body of a patient with its diagnosis and prognosis.

The Diagnostic Handbook was based on a logical set of axioms and assumptions, including the modern view that through the examination and inspection of the symptoms of a patient, it is possible to determine the patient's disease, its aetiology and future development, and the chances of the patient's recovery. The symptoms and diseases of a patient were treated through therapeutic means such as bandages, creams and pills.

Indian medicine

Archaeologists in Mehrgarh in Balochistan province in the present day Pakistan discovered that the people of Indus Valley Civilization from the early Harappan periods (c. 3300 BC) had knowledge of medicine and dentistry. The physical anthropologist who carried out the examinations, Professor Andrea Cucina from the University of Missouri-Columbia, made the discovery when he

was cleaning the teeth from one of the men. Later research in the same area found evidence of teeth having been drilled, dating back 9,000 years.

The Atharvaveda, a sacred text of Hinduism dating from the 10th to the 12th centuries B.C.E., is the first Indic text dealing with medicine. The Atharvans sought to kill the causes of disease with a variety of incantations or plant based drugs in order to counter the disease. This approach to disease is quite different compared to the trihumoral theory of Ayurveda.

Chinese medicine

China also developed a large body of traditional medicine. Much of the philosophy of traditional Chinese medicine derived from empirical observations of disease and illness by Taoist physicians and reflects the classical Chinese belief that individual human experiences express causative principles effective in the environment at all scales. These causative principles, whether material, essential, or mystical, correlate as the expression of the natural order of the universe.

Greek and Roman medicine

The first known Greek medical school opened in Cnidus in 700 BC. Alcmaeon, author of the first anatomical work, worked at this school, and it was here that the practice of observing patients was established.

As was the case elsewhere, the ancient Greeks developed a humoral medicine system where treatment sought to restore the balance of humours within the body.

**View of the *Askleipion* of Kos, the best preserved instance of an Asklepieion**

Asclepeia provided carefully controlled spaces conducive to healing and fulfilled several of the requirements of institutions created for healing. In the Asclepieion of Epidaurus, three large marble boards dated to 350 BC preserve the names, case histories, complaints, and cures of about 70 patients who came to the temple with a problem and shed it there. Some of the surgical cures listed, such as the opening of an abdominal abscess or the removal of traumatic foreign material, are realistic enough to have taken place, but with the patient in a state of enkoimesis induced with the help of soporific substances such as opium.

**The *Plinthios Brokhos* as described by Greek physician Heraklas**

A towering figure in the history of medicine was the physician Hippocrates of Kos (ca. 460 BC – ca. 370 BC), considered the "father of modern medicine." The Hippocratic Corpus is a collection of around seventy early medical works from ancient Greece strongly associated with Hippocrates and his students. Most famously, Hippocrates invented the Hippocratic Oath for physicians, which is still relevant and in use today.

Hebrew medicine

Most of our knowledge of ancient Hebrew medicine during the 1st millennium BCE comes from the Torah, i.e. the Five Books of Moses, which contain various health related laws and rituals, such as isolating infected people, washing after handling a dead body and burying excrement away from camp.

While the observance of these statutes would have and do lead to several health benefits, Jewish belief commands that these rituals and prohibitions be kept purely to fulfill the will of God with no ulterior motive.

Arabic and Persian medicine

**An Arabic manuscript**

Persia's position at the crossroads of the East and the West frequently placed it in the midst of developments in both ancient Greek and Indian medicine. The first generation of Persian physicians was trained at the Academy of Jundishapur, where the teaching hospital has sometimes been claimed to have been invented. These evolved into the medieval Islamic Bimaristan hospitals, which are regarded as the earliest public hospitals in the modern sense. Such advances resulted in the medieval Islamic Caliphate having a higher life expectancy than other pre-modern agricultural societies.

The Islamic civilization rose to primacy in medical science as Muslim physicians contributed significantly to the field of medicine, including anatomy, ophthalmology, pharmacology, pharmacy, physiology, surgery, and the pharmaceutical sciences. The Arabs further developed Greek, Roman and Indian medical practices. Galen, Hippocrates, Sushruta and Charaka were pre- eminent authorities.

The translation of 129 works of ancient Greek physician Galen into Arabic by Hunayn ibn Ishaq and his assistants, and in particular Galen's insistence on a rational systematic approach to medicine, set the template for Islamic medicine, which rapidly spread throughout the Arab Empire.

Muslim physicians set up some of the earliest dedicated hospitals, which later spread to Europe during the Crusades, inspired by the hospitals in the Middle East. Muhammad ibn Zakariya al-Razi became the first physician to systematically use alcohol in his practice as a physician.

Al-Kindi wrote De Gradibus, in which he demonstrated the application of mathematics to medicine, particularly in the field of

pharmacology. This includes the development of a mathematical scale to quantify the strength of drugs, and a system that would allow a doctor to determine in advance the most critical days of a patient's illness.

Razi (Rhazes) (865-925) recorded clinical cases of his own experience and provided very useful recordings of various diseases. His Comprehensive Book of Medicine, which introduced measles and smallpox, was very influential in Europe. In his Doubts about Galen, Razi was also the first to prove the theory of humorism false using an experimental method.

In 1021, Ibn al-Haytham (Alhacen) made important advances in eye surgery, as he studied and correctly explained the process of sight and visual perception for the first time.

Avicenna, considered the father of modern medicine and one of the greatest thinkers and medical scholars in history.

Avicenna's contributions include the introduction of systematic experimentation and quantification into the study of physiology, the discovery of the contagious nature of infectious diseases, the introduction of quarantine to limit the spread of contagious diseases, the introduction of experimental medicine and clinical trials, the first descriptions on bacteria and viral organisms, the distinction of mediastinitis from pleurisy, the contagious nature of phthisis and tuberculosis, the distribution of diseases by water and soil, and the first careful descriptions of skin troubles, sexually transmitted diseases, and nervous ailments, as well the use of ice to treat fevers, and the separation of medicine from pharmacology, which was important to the development of the pharmaceutical sciences.

In 1242, Ibn al-Nafis was the first to describe pulmonary circulation and coronary circulation, which form the basis of the circulatory system, for which he is considered the father of the theory of circulation. He also described the earliest concept of

metabolism, and developed new systems of physiology and psychology to replace the Avicennian and Galenic systems, while discrediting many of their erroneous theories on the four humours, pulsation, bones, muscles, intestines, sensory organs, bilious canals, esophagus, stomach, etc.

Ibn al-Lubudi (1210-1267) rejected the theory of four humours, discovered that the body and its preservation depend exclusively upon blood, rejected Galen's idea that women can produce sperm, and discovered that the movement of arteries are not dependent upon the movement of the heart, that the heart is the first organ to form in a fetus' body (rather than the brain as claimed by Hippocrates), and that the bones forming the skull can grow into tumors.

Maimonides, although a Jew himself, made various contributions to Islamic medicine in the 13th century. The Anatomy of the body of Mansur ibn Ilyas (c. 1390) contained comprehensive diagrams of the body's structural, nervous and circulatory systems. During the Black Death, or bubonic plague in 14th century al-Andalus, Ibn Khatima and Ibn al-Khatib discovered that infecious diseases are caused by microorganisms which enter the human body.

Other medical innovations first introduced by Muslim physicians include the discovery of the immune system, the introduction of microbiology, the use of animal testing, and the combination of medicine with other sciences (including agriculture, botany, chemistry, and pharmacology), as well as the invention of the injection syringe by Ammar ibn Ali al-Mawsili in 9th century Iraq, the first drugstores in Baghdad (754), the distinction between medicine and pharmacy by the 12th century, and the discovery of at least 2,000 medicinal and chemical substances.

**Physician setting a dislocated arm**

**Anatomy Lesson of Dr. Nicolaes Tulp**

Organised professional medicine re-emerged, with the foundation of the medical college ( Schola Medica Salernitana ) of Salerno in Italy in the 11th century, which in co-operation with the monastery of Monte Cassino, translated many Byzantine and Arabic works. In the twelfth century universities were founded in Italy and elsewhere, which soon developed schools of medicine. Gradually the reliance on the masters of the ancient world was augmented by the results of individual observation and experience. Surgical practice improved greatly during the medieval period. Rogerius Salernitanus composed his Chirurgia, which became the foundation for modern Western surgical manuals up to the modern time. With the Renaissance came an increase in experimental investigation, principally in dissection and examining bodies. The work of individuals like Andreas Vesalius and William Harvey challenged accepted folklore with scientific evidence.

The development of modern neurology began in the 16th century with Vesalius, who described the anatomy of the brain and much else; he had little notion of function, thinking that it lay mainly in the ventricles. Understanding and diagnosis improved but with little direct benefit to health. Few effective drugs existed, beyond opium and quinine. Folklore cures and potentially poisonous metal-based compounds were popular treatments.

Modern medicine

Medicine was revolutionized in the 19th century and beyond by advances in chemistry and laboratory techniques and equipment, old ideas of infectious disease epidemiology were replaced with bacteriology and virology.

Bacteria and microorganisms were first observed with a microscope by Antonie van Leeuwenhoek in 1676, initiating the scientific field microbiology.

Ignaz Semmelweis (1818-1865) in 1847 dramatically reduced the death rate of new mothers from childbed fever by the simple expedient of requiring physicians to clean their hands before attending to women in childbirth. His discovery pre-dated the germ theory of disease. However, his discoveries were not appreciated by his contemporaries and came into general use only with discoveries of British surgeon Joseph Lister, who in 1865 proved the principles of antisepsis in the treatment of wounds; However, medical conservatism on new breakthroughs in pre- existing science prevented them from being generally well received during the 19th century.

After Charles Darwin's 1859 publication of The Origin of Species, Gregor Mendel (1822-1884) published in 1865 his books on pea plants, which would be later known as Mendel's laws. Re- discovered at the turn of the century, they would form the basis of classical genetics. The 1953 discovery of the structure of DNA by Watson and Crick would open the door to molecular biology and modern genetics.

During the late 19th century and the first part of the 20th century, several physicians, such as Nobel prize winner Alexis Carrel, supported eugenics, a theory first formulated in 1865 by Francis Galton. Eugenics was discredited as a science after the Nazis' experiments in World War II became known; however, compulsory sterilization programs continued to be used in modern countries (including the US, Sweden and Peru) until much later.

Semmelweis's work was supported by the discoveries made by Louis Pasteur. Linking microorganisms with disease, Pasteur brought about a revolution in medicine. He also invented with

Claude Bernard (1813-1878) the process of pasteurization still in use today. His experiments confirmed the germ theory.

Claude Bernard aimed at establishing scientific method in medicine; he published An Introduction to the Study of Experimental Medicine in 1865. Beside this, Pasteur, along with Robert Koch (who was awarded the Nobel Prize in 1905), founded bacteriology. Koch was also famous for the discovery of the tubercle bacillus (1882) and the cholera bacillus (1883) and for his development of Koch's postulates.

The participation of women in medical care (beyond serving as midwives, sitters and cleaning women) was brought about by the likes of Florence Nightingale. These women showed a previously male dominated profession the elemental role of nursing in order to lessen the aggravation of patient mortality which resulted from lack of hygiene and nutrition.

Nightingale set up the St Thomas hospital, post-Crimea, in 1852. Elizabeth Blackwell (1821-1910) became the first woman to formally study, and subsequently practice, medicine in the United States. It was in this era that actual cures were developed for certain endemic infectious diseases.

However the decline in many of the most lethal diseases was more due to improvements in public health and nutrition than to medicine. It was not until the 20th century that the application of the scientific method to medical research began to produce multiple important developments in medicine, with great advances in pharmacology and surgery.

During the 1910s, medicine was closely related to church in most of Europe including the United Kingdom. Most doctors took permission of the church before prescribing any medicine to patients. Before surgeries, permission of the church was

mandatory. During the First World War, Alexis Carrel and Henry Dakin developed the Carrel-Dakin method of treating wounds with an irrigation, Dakin's solution, a germicide which helped prevent gangrene.

The Great War spurred the usage of Roentgen's X-ray, and the electrocardiograph, for the monitoring of internal bodily functions. This was followed in the inter-war period by the development of the first anti-bacterial agents such as the sulpha antibiotics. The Second World War saw the introduction of widespread and effective antimicrobial therapy with the development and mass production of penicillin antibiotics, made possible by the pressures of the war and the collaboration of British scientists with the American pharmaceutical industry.

Lunatic asylums began to appear in the Industrial Era. Emil Kraepelin (1856-1926) introduced new medical categories of mental illness, which eventually came into psychiatric usage despite their basis in behavior rather than pathology or etiology. In the 1920s surrealist opposition to psychiatry was expressed in a number of surrealist publications.

In the 1930s several controversial medical practices were introduced including inducing seizures (by electroshock, insulin or other drugs) or cutting parts of the brain apart (leucotomy or lobotomy). Both came into widespread use by psychiatry, but there were grave concerns and much opposition on grounds of basic morality, harmful effects, or misuse. In the 1950s new psychiatric drugs, notably the antipsychotic chlorpromazine, were designed in laboratories and slowly came into preferred use. Although often accepted as an advance in some ways, there was some opposition, due to serious adverse effects such as tardive dyskinesia. Patients often opposed psychiatry and refused or stopped taking the drugs when not subject to psychiatric control. There was also increasing opposition to the use of psychiatric hospitals, and attempts to

move people back into the community on a collaborative user- led group approach ("therapeutic communities") not controlled by psychiatry. Campaigns against masturbation were done in the Victorian era and elsewhere. Lobotomy was used until the 1970s to treat schizophrenia. This was denounced by the anti-psychiatric movement in the 1960s and later.

The 20th century witnessed a shift from a master-apprentice paradigm of teaching of clinical medicine to a more "democratic" system of medical schools. With the advent of the evidence-based medicine and great advances of information technology the process of change is likely to evolve further, with greater development of international projects such as the Human genome project.