Whenever you have visited a doctor or seen someone undergo a surgery, you must have often wondered, how can a small pill cure a disease or a surgery fix a broken bone. Whenever such queries cropped up, you found the answers in school science books or on the Internet.

The word ‘science’ literally means knowledge or the state of knowing. When this knowledge is put to practical use, it creates technology. Today, we have most, if not all, science recorded for posterity in print and other media. But if the history of science is traced back to its origin, it probably starts from an unmarked era of ancient times. Science of Medicine and Surgery has advanced by leaps and bounds today but many techniques practiced today we known to the ancient scholars of India. Let’s see how that happened...

What is Ayurveda?

Ayurveda as a science of medicine owes its origins in ancient India. Ayurveda consists of two Sanskrit words - ‘ayur’ meaning age or life, and ‘veda’ which means knowledge. Thus, the literal meaning of Ayurveda is the science of life or longevity. Ayurveda constitutes ideas about ailments and diseases, their symptoms, diagnosis and cure, and relies heavily on herbal medicines, including extracts of several plants of medicinal values. This reliance on herbs differentiates Ayurveda from systems like Allopathy and Homeopathy. Ayurveda has also always disassociated itself with witch doctors and voodoo.

Ancient scholars of India like Atreya, and Agnivesa have dealt with principles of Ayurveda as long back as 800 BC. Their works and other developments were compiled by a scholar called Charaka and is called “Charaka-Samahita”. It contains the “Principles of Ayurveda” and it remained like a standard textbook almost for 2000 years. It was also translated into many languages, including Arabic and Latin.
‘Charaka-Samahita’ deals with a variety of matters covering body functions (physiology), etiology and embryology, concepts of digestion (what happens to food after it enters the body), metabolism, and immunity (protection from diseases).

**Sushruta and Surgery**

Can you imagine plastic surgery and dental surgery 2000 years ago when most of western world was still living in caves? Sushruta, a medical scholar and practitioner, lived 2000 years before, in the ancient Indian city of Kasi, now called Varanasi. His work is compiled in a collection called ‘Sushruta-Samahita’ in which he describes over 120 surgical instruments, 300 surgical procedures and classifies human surgery in 8 categories. Because of his numerous contributions to the science and art of surgery he is known by the title “Father of Surgery.”

Sushruta is also the father of plastic surgery and cosmetic surgery since his technique of forehead flap rhinoplasty (repairing the disfigured nose with a flap of skin from the forehead) that he used to reconstruct noses that were amputated as a punishment for crimes, is practiced almost unchanged in technique to this day. Sushruta was also the first surgeon to advocate the practice of operations on inanimate objects such as watermelons, clay plots and reeds; thus predating the modern practice of the surgical workshop by hundreds of years. Inoculation was practiced in China, India, and Turkey, and was a precursor to vaccination for smallpox.

Above is an artist’s impression of an operation being performed in ancient India.
India’s Contribution to the
Civil Engineering and Architecture

Since thousands of years, the magical and sacred land of India has been the site for a multitude of significant historical and philosophical developments along with several facets of scientific and technological activities. India’s contribution to the world in the field of science and technology ranges from the discovery of zero and decimal point system in Mathematics, Ayurveda and Surgery to significant contributions in the fields of Shipbuilding and Navigation as well as Civil Engineering. In this article, we shall focus on the technological innovations, discoveries and contributions made by India that paved the path for the progress and prosperity of the entire human civilization in the centuries to follow.

Civil Engineering and Architecture

Geological evidence in the form of prominent pre-historic sites such as Lothal (Gujarat), Harappa and Mohenjodero (currently located in Pakistan) has suggested that the concepts of town planning, hydraulic engineering, air cooling architecture, planned and interlinked underground drainage systems and the technique of using burnt bricks to build building structures existed in India more than 5000 years ago. Urban planned townships like the Indus Valley civilization had started to flourish in India at a time when most of Europe and the world were still relatively primitive in terms of town planning and building structures. The grassroots knowledge of building structures and technical developments in civil engineering led the way to the creation of many magnificent structures in the form of palaces, temples and forts.

Shining examples of India’s famous architectural wonders, which are well known around the world, are:

- The structures constructed in the caves of Ajanta and Ellora in Maharashtra near Aurangabad. These structures consist of Hindu, Jain and Buddhist temples and monasteries inside caves and are believed to be constructed in the period between the 5th and 7th century BC.
- The Khajuraho temples in Madhya Pradesh, built between 950-1050
- The Mahabalipuram Temples situated in Tamil Nadu, near Chennai consist of temples carved out of rock and are excellent examples of Pallava art, the ruling
The Mahabodhi temple at Bodh Gaya built by Emperor Ashoka around 250 BC. Bodh Gaya is the place where Lord Buddha is believed to have attained enlightenment and there is a Vajrasana (diamond throne) in the temple at the exact spot where Lord Buddha gained Universal knowledge or Brahmagyana.

The Brihadisvara Shiva Temple in Thanjavur, Tamil Nadu built by the great Chola ruler King Rajaraja Chola I in 10th century CE (common era). This temple ranks as one of the grandest temples in India with breathtaking architecture and exquisite carvings found throughout the temple structure. It is the tallest temple structure in the world with a height of 70 m (approx. 230 feet) and the Shivalinga inside the temple is the largest in the world and is also considered to be the grandest. The temple Shikhar is very large and weighs 81.25 tonnes and is a fine example of the advanced engineering knowledge possessed by the Indian craftsmen at that time. This heavy Shikhar is carved of two huge stones and is believed to have been carried by elephants walking an estimated distance of 11 km on an inclined sand plane to reach the to the height of 70 m, the top of the temple!

The Konark Sun Temple in Orissa built in black granite rock around the 13th century period by King Narasimhadeva of the Ganga dynasty.

Such innovative ideas and pioneering architectural style had far reaching influence and led to the spread of Indian style of architecture and engineering to other regions like Baluchistan, Afghanistan, Sri Lanka, Indonesia, Malaysia, Vietnam, Laos, Cambodia, Thailand, Burma, China, Korea and Japan. Some of the famous examples of the architectural marvels built by Indian kings outside India or influenced by the Indian style of architecture include the Angkor Vat in Cambodia, the Buddhist temples of East Asia and the Buddhas of Bamiyan in Afghanistan.

Apart from the temples many magnificent structures (forts) and cities were built in the past three or four hundred years by Rajput and Maratha Kings.

Thus, the unique and grand style of architecture, town planning and building construction that started to develop in ancient India contributed many wonderful architectural marvels to the world. India, in many ways was a pioneer in the field of civil engineering and has had a pivotal role to play in the construction and civil engineering techniques that have developed in the modern world.
India’s Contribution to the Ship Building and Navigation

India has had a maritime history dating back to around 4,500 years, since the Indus Valley Civilization. There are many references of the maritime trade activities of India in ancient Sanskrit and Pali scriptures. India had trade with several nations like Cambodia, Java, Sumatra, Borneo, China, South American countries and Mesopotamia (Greece). Excavations undertaken in Mohenjodero (an Ancient archaeological site, now in Pakistan) refer to sailing ships and references to sea ships are also found in the paintings at the world famous caves in Ajanta.

Some of the prime examples of Indian contribution to the science of Navigation and the technique of ship building include:

♦ The word Navigation is derived from the Sanskrit word Navgath. Navigation, as a science originated during the Indus valley civilization some 5000 years ago.

♦ The world’s first tidal dock was built in Lothal around 2500 BC during the Harappan civilisation at Lothal near the present day Mangrol harbour on the Gujarat coast.

♦ Emperor Chandragupta Maurya (4th century BC) had an entire state department for sailing activities and appointed a Navadhyaksha (Sailing Superintendental) for the same.

♦ Images of ships are observed to be carved on the Sanchi stupa at Bodhgaya suggests the use of huge ships for overseas trade during those times.

♦ Ancient Indians were also probably the first to use maritime instruments like Sextants (used to measure angles of elevation above the horizon) and the Mariner’s compass (known as the Maccha Yantra in Sanskrit).

All these evidences clearly point to the fact that the science of Navigation and Ship Building progressed in India thousands of years ago and made maritime trade possible. Indians pioneered the science of Navigation that has helped develop modern trade and transport activities by sea. The trade which India carried on since ancient times with different countries around the world through ocean routes also helped to introduce items like cotton, pepper and other spices to the world.