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MEDICINE

From mummies to MRI scans, plagues to prosthetics

A MAGNIFICENTLY ILLUSTRATED HISTORY

BIG PICTURE PRESS

ANCIENT BELIEFS

Humans have always looked for ways to cure illnesses and treat injuries, but ideas and beliefs have changed over time. Today, if we feel ill or have an injury we often turn to medical treatments, but there are lots of other traditions which have historically made people feel better.

FAITH AND HOPE

In many past cultures, how you were feeling was believed to depend on the gods, the stars or luck. Linking body parts and diseases with the position of the stars, moon and planets is a practice used all over the world. In fact, the word influenza, which we often shorten to 'flu', comes from the Italian word for 'influence' of the planets. In medieval Europe, doctors linked each part of the body to an astrological sign (such as Pisces for the feet) and treatment was only carried out when the stars were in the correct position.

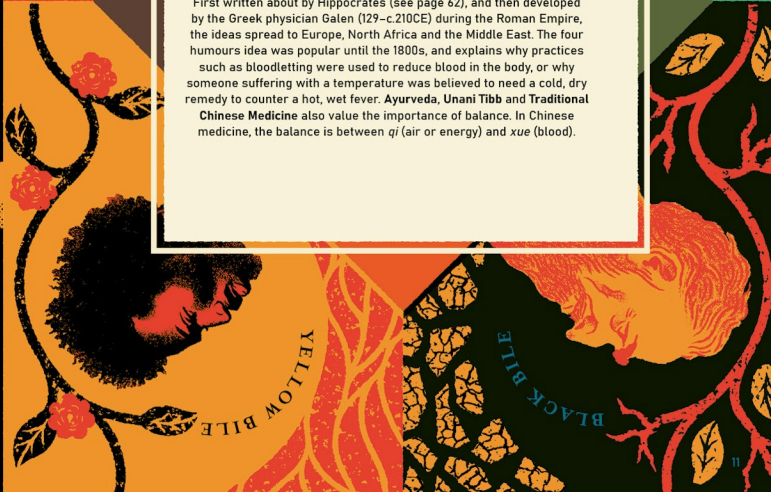
THE POWER OF TRUST

Kings and queens were once believed to have a God-given power to cure the disease **scrofula**. From the 11th–17th centuries, people queued to be touched by a monarch, or wore a coin around their neck which had been touched by royalty. Patients taking a **placebo** can often feel better, and scientists are still trying to understand the importance of trusting someone or something to provide a cure.

A BALANCING ACT

The ancient Greeks believed that the key to a healthy body was to achieve balance. This balance was established between four bodily humours: blood, **phlegm**, black **bile** and yellow bile. Each humour was linked to four conditions: wet, cold, hot and dry; and also to personalities, diseases, organs and seasons of the year. For example, someone with an excess of blood in their body was considered to be cheerful and optimistic, and their characteristics were linked to springtime and to children. Their qualities represented warmth and moisture, which were associated with the liver, and therefore its diseases.

First written about by Hippocrates (see page 62), and then developed by the Greek physician Galen (129–c.210CE) during the Roman Empire, the ideas spread to Europe, North Africa and the Middle East. The four humours idea was popular until the 1800s, and explains why practices such as bloodletting were used to reduce blood in the body, or why someone suffering with a temperature was believed to need a cold, dry remedy to counter a hot, wet fever. **Ayurveda**, **Unani Tibb** and **Traditional Chinese Medicine** also value the importance of balance. In Chinese medicine, the balance is between *qi* (air or energy) and *xue* (blood).



OPENING UP THE BODY

Finding out how the human body works is very difficult unless you can look inside it. The science of 'anatomy' (a term that derives from the ancient Greek for 'to cut up') was vital to a growing understanding of the body's structure. Although the practice is strictly controlled now, people have been dissecting dead bodies for thousands of years.

UNDER THE SKIN

Galen, a Greek doctor working in the Roman Empire (see page 11), was revered for his **anatomical** knowledge. He examined human bodies by treating wounded Roman gladiators, but he only carried out dissections on animals which meant that not all of his observations were accurate for humans. For centuries, Galen's work was central to doctors' understanding of anatomy in Islamic countries and in Europe. The first known book from the Islamic world to include anatomical illustrations of the whole body is *Mansur's Anatomy*, written in around 1400. Many people became fascinated by anatomy in the 1500s and Andreas Vesalius (1514–64), professor of anatomy at Padua University in Italy, was especially keen to update Galen's ideas. He published his findings in *De humani corpis fabrica* (On the Fabric of the Human Body) in 1543. This seven-book volume corrected the 300 errors Vesalius had found in Galen's original works.

As medical training developed, there was increasing demand to learn about anatomy from bodies rather than books. By the 1700s, some European universities offered public human anatomy lectures using the corpses of executed criminals. But this limited supply of bodies led to a boom in grave-robbings by unscrupulous types keen to make money. The most infamous 'body snatchers' were William Burke and William Hare in Edinburgh. Although the two never actually robbed a grave, they murdered at least 16 people in 1827 and 1828. Something clearly had to be done. In 1832, the British government passed the Anatomy Act to allow medical schools to use bodies that were unclaimed by their families. Anatomy is still vitally important for medical training today and most doctors carry out human dissection as part of their course. Laws such as the Human Tissue Act in Britain control their ethical use.

MEASURING THE BODY

If doctors are unable to see inside a patient's body, they need other ways to find out what is going on. Since ancient times, doctors have monitored a patient's pulse, observed their temperature and examined their urine to assess their health. Today, they might also take more specific measurements such as checking cardiac enzyme levels for the heart. Many tests have only become widespread and practical with recent developments in both technology and equipment.

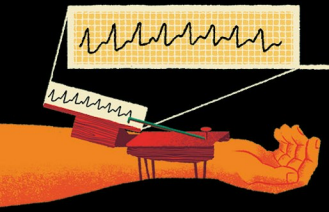
READING VITAL SIGNS

For centuries, doctors have examined the appearance and even the taste of a patient's urine as an indication of their health. Ancient physicians such as Hippocrates and Galen linked bodily fluids to the balance of a person's humours (see page 11), and Ibn Sina recorded that some patients' urine evaporated to leave a sweet residue like honey, something we now know to be a symptom of diabetes (see page 73). Today, urine analysis is still used to detect conditions such as diabetes and for pregnancy tests.

HEART AND BLOOD

Although monitoring a patient's heart by taking their pulse has been practised for centuries in many civilisations, counting the pulse accurately is not as easy as it might sound.

Italian physician Sanctorius (1561–1636) introduced a pendulum to help him determine pulse rates, and British doctor Sir John Floyer (1649–1734) added a second hand to a watch to make counting easier.



Recording the pulse rate automatically and accurately on a machine was a significant breakthrough. By the 19th century, German physiologist Karl Vierordt (1818–84) had invented the sphygmograph to trace a patient's pulse onto a graph.

THE CIRCULATION EXPERIMENT

For centuries, medical thinkers puzzled over how the body makes and circulates blood. Based on his own human dissections, Arabic doctor Ibn al-Nafis (1213–1288) rejected Galen's theory that the body has two blood systems, and instead wrote about one system. In Europe three centuries later, royal physician and anatomy lecturer William Harvey (1578–1657) proved this idea by demonstrating that the heart acts like a pump and recirculates blood around the body. He shared his findings through public lectures and a book published in 1628, but his new ideas were controversial and were not fully accepted during his lifetime.

VISUALISING RHYTHM

In the 20th century, the electrocardiogram (ECG) was invented to record visually a heart's electrical activity. Early machines were enormous, took five people to make them work and needed the patient to put their limbs in buckets of salt water. Today's ECGs are computerised with signals taken from the patient via electrodes attached to their skin.

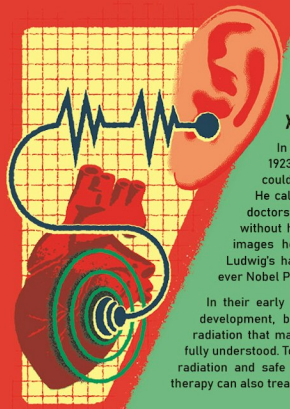
FROM THE INSIDE OUT

For centuries, doctors and scientists rarely got the opportunity to see inside the human body. To be able to work out why a person felt sick, whether they had a more serious disease or how to heal a complicated broken bone was very difficult until scientists developed the equipment we have today.

STETHOSCOPE

In 1816, French doctor René Laennec (1781–1826) invented the stethoscope. Doctors knew that listening to a person's heart, their breathing or the sounds that their digestive system made helped reveal what was going on inside. Laennec's invention meant that they could hear more clearly, and without awkwardly putting their ear on a patient's chest.

The first stethoscopes were simply tubes, before the 'two-eared' type we recognise today was invented in the 1850s. Simple trumpet-shaped tubes are still often used to hear a baby growing in a mother's womb.



X-RAYS

In 1895, German scientist Wilhelm Röntgen (1845–1923) discovered that the rays he was investigating could produce an image of the bones in his hand. He called his discovery X-rays. For the first time, doctors could see inside a living human being without having to cut them open. One of the first images he took was of his wife Anna Bertha Ludwig's hand. In 1901 he was awarded the first ever Nobel Prize in physics for his work.

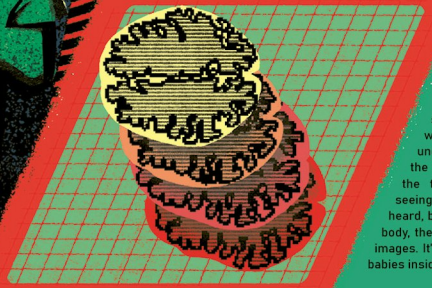
In their early days, X-rays were a very exciting development, but the dangerous effects of the radiation that make the images possible was not fully understood. Today, we know much more about radiation and safe levels of exposure. Radiation therapy can also treat diseases like cancer.

MRI SCANS

Magnetic Resonance Imaging, or MRI, uses magnetic fields and radio waves to create 3D images of the inside of a person's body. X-rays can only help to see bones, but MRI scans can make images of organs and blood vessels. At least three scientists were working on this idea independently in the 1970s – Raymond Damadian (b.1936), Paul Lauterbur (1929–2007) and Peter Mansfield (1933–2017). In 1974, it took more than 20 minutes for Mansfield to get an image of a student's finger. By 1978, both Damadian and Mansfield had built whole body scanners. Mansfield climbed in himself to get the first 50-minute scan.

CT SCANS

CT or CAT stands for 'Computed (Axial) Tomography'. The scanner takes several X-ray images like slices through a patient's body. These can be put back together using a computer so that doctors can see a highly detailed 3D image that can be checked for bone damage, tumours or internal bleeding. CT scanning was invented by British engineer Godfrey Hounsfield (1919–2004) and South African scientist Allan Cormack (1924–98) in 1972. They won the Nobel Prize in medicine for their invention in 1979.



ULTRASOUND

The first scientists to experiment with high-frequency sound waves, or ultrasound, were trying to measure distances underwater in the early 1800s. By the 1950s, researchers realised that the technique could be helpful for seeing inside people. The sound can't be heard, but the waves can be sent into the body, the echoes detected and turned into images. It's a very safe way to see growing babies inside a pregnant woman.