

1001 Inventions Highlights

The *1001 Inventions* global touring exhibition features dozens of interactive exhibits, electronic games, touch-screen experiences for the visitor and recreations of famous innovations. More than 1 million people have already viewed the exhibition and from the positive feedback received, we have compiled a useful overview of the top ten highlights from 1001 Inventions plus an award-winning educational film that introduces the exhibition.

1. **Maps of the World**
2. **The Elephant Clock**
3. **Flying Machines**
4. **Engines**
5. **Perfume and Petroleum**
6. **Hospitals and Medical Treatment**
7. **Chinese Navy**
8. **Music**
9. **Personal Grooming**
10. **Coffee**
11. **The Library of Secrets**

1. Maps of the World

Did you know that Christopher Columbus studied Arabic maps? The great European explorers of the 15th and 16th centuries would probably not have embarked on their expedition were it not for the geographers and map makers of Muslim civilization.

The *1001 Inventions* exhibition highlights two important maps. The first is a replica of the 500-year old work by Ottoman cartographer Piri Re'is, which is the second oldest surviving map of the Americas. The original is currently in the Topkapi Palace, Istanbul. Piri Re'is was an accomplished sailor who made his name on the high seas. However, the rediscovery of his cartography has brought him modern fame. His famous map of the world was produced using information from more than a dozen sources and even features the Andean mountains of South America.

The exhibition also highlights the work of famed cartographer Al-Idrisi, whose World Atlas of 1514 demonstrates that, unlike in modern times, maps in medieval times often showed South at the top and North at the bottom. To modern eyes these maps look "upside-down".

2. The Elephant Clock

Also known as *The Clock of Civilizations*, the **Elephant Clock** was a 13th century time-telling machine invented by engineering genius Al-Jazari, in what is now Southern Turkey. Its inventor was responsible for more than 50 beautiful, yet fully-functional, automatons which he recorded in his celebrated *Book of Knowledge of Ingenious Mechanical Devices*.

Al-Jazari's **Elephant Clock** was a masterpiece celebrating the diversity of humankind. Its moving parts were automated using a water-powered timer inspired by an Indian mechanism known as ghatika. Combined

with this were an Egyptian phoenix, Greek hydraulic technology, Chinese dragons, an Indian elephant and mechanical figurines in Arabian dress. The clock cleverly reflected cultural and technological influences from across Muslim civilization, from Spain to China.

3. Flying Machines

More than 1000 years before the Wright Brothers took to the sky, and six centuries before Leonardo Da Vinci's inspirational designs, an eccentric genius of African descent, living in Muslim Spain, jumped off a cliff in an elaborate Flying machine and wowed the crowds below.

Abbas ibn Firnas' achievements had already brought him respect and admiration. He had already invented spectacles – which he dubbed “reading stones” – water clocks and weather simulators. However, his crowning accomplishment was his ingenious Flying Machine, similar to modern gliders, which he constructed from wood, silk and eagle feathers. In the 850s, 70-year old Abbas ibn Firnas launched himself from a hill near the Spanish city of Cordoba and amazed the crowd below as he glided for more than ten minutes before a bumpy landing, which he later realised was due to the lack of a tail in his contraption.

Ibn Firnas is just one of the aviation pioneers highlighted in 1001 Inventions. One of the most audacious attempts at flight was made in 1633, when the world's first manned Rocket-powered flight took place in Turkey. Lagari Hasan Celebi used three hundred pounds of gunpowder in a metal rocket to launch himself over the waters of the Bosphorus as part of a celebration for the Sultan's daughter being born. Celebi glided safely back to Earth on a set of “wings” he had incorporated into the machine's design.

4. Engines

Another of Al-Jazari's ingenious inventions was the crank mechanism that converted rotational motion into linear motion. It's a system that exists in every conventional plane, train and automobile in the world, and is present in millions of machines worldwide, from grinding grain to driving an engine. The industrial revolution simply would not have been possible without such a device.

A few centuries after Al-Jazari, another engineering pioneer from the Ottoman world produced a six-cylinder engine for pumping water. His innovative creation was a fore-runner of the gasoline-driven engines we see powering our modern transport needs.

5. Perfume and Petroleum

The chemical processes developed by an 8th century chemist called Jabir ibn Hayyan form the basis of the both the modern perfume and petro-chemical industries. His use of chemical instruments, such as the alembic still, to manipulate matter led to dramatic leaps forward in processes such as distillation, filtration and purification.

The later work of 9th century chemist Al-Kindi, culminating in his seminal compendium *The Book of the Chemistry of Perfumes and Distillations*, is widely regarded as the basis of the perfume industry that developed in Southern France several centuries later. Al Kindi's work included recipes for more than 100 perfumes as well as detailed descriptions of perfume-making equipment.

The same process used to create perfumes – distillation –has also had an underappreciated impact upon the way we live our lives today. Who would have thought that the black sludge, known in Arabic as *naft*, would have over four thousand uses? Without the process of distillation, and in this case of crude oil, we would have no gasoline, kerosene, asphalts or plastics.

6. Hospitals and Medical Treatment

The medical advances made by Muslim civilization are so significant that a large section of the 1001 Inventions exhibition, dubbed the “Hospital Zone”, is dedicated to healing and healthcare.

The first modern hospital was completed in 874 by Ahmad ibn Tulun in Cairo which provided free medical treatment for all patients. It was the prototype for numerous state and charitably-funded medical facilities that flourished soon afterwards. However, this was just the start of the incredible advances in healthcare and medicine made within Muslim civilization. Ophthalmologists were performing eye-surgery as early as the 10th century, and invented treatments for cataracts, glaucoma and numerous diseases of the eye and eye-lids. Uzbek physician ibn Sina developed treatments for cancerous tumours as early as the 11th Century.

Turkish scientists were vaccinating children against the Smallpox virus more than 300 years ago by injecting them with the less dangerous Cowpox virus. When these Turkish vaccinations were introduced to England in the 1700s they faced fierce opposition from church and state. Almost a century later, Englishman Dr. Edward Jenner was (erroneously) credited with the discovery of the Smallpox vaccine.

One of the most important figures in the history of medicine, and almost unheard of outside the Muslim world, was the 10th century Andalusian physician Al-Zahrawi, who invented more than 200 sophisticated surgical tools – such as surgical needles, scalpels, forceps and bone saws – many of which are still used in modern operating theatres. Al-Zahrawi also pioneered the use of catgut for internal stitching, an advance that has saved millions of lives. Unlike other stitching, Catgut stitching dissolves naturally within the body which means a second operation to remove internal stitching could be avoided. This had a particularly significant positive impact on survival rates following caesarean operations.

7. Chinese Navy

Zheng He, a fourteenth century Muslim Admiral of the Chinese Navy, was responsible for building the largest wooden ships ever constructed. At more than 400 feet long, these seafaring vessels dwarfed all contemporary ships. (As a comparison, the largest ship used by Columbus to first reach the Americas was a mere 70 feet long.)

Zheng He’s fleet of “floating cities” took almost 30,000 men, in more than 300 ships, voyaging 30,000+ miles and visiting thirty-seven countries. Some of the lands the great fleet visiting included Java, Sumatra, Ceylon, Siam, the East Indies, Bengal, the Maldives, Mecca, the Persian Sultanate of Ormuz, Borneo, Brunei, Mogadishu, Mombasa and other East African ports.

These journeys fostered scientific discovery and the search for gems, minerals, plants, animals and medicines. They also improved navigational and cartographical knowledge of the world; developed international relations; and traded large quantities of cargo, including silk and cotton goods, porcelain, gold and silverware, copper utensils and iron implements.

Zheng He's ships were described by European explorers as "Swimming Dragons" because they were dotted with dragon eyes to help them "see". They were approximately five times the size of the largest ships typically found in European ports.

8. Music

The modern musical notation system comes from the Arabic alphabet, and both the guitar and violin can trace their roots back to Muslim Spain, where the world's first Conservatory was established more than 1000 years ago. At around the same time, in Baghdad, accomplished scientist Al-Kindi was the first to explore "music therapy" as a tool for healing.

Many instruments used in traditional music, rock bands and orchestras today can trace their names and origins from Muslim civilization. Instruments like the lute came from the *al-'ud*, the rebec from the *rababah*, the guitar from the *qitara* and the naker from the *naqqara*, a goatskin-covered wooden drum.

The Ottoman state was the first Euro-Asian nation to have a permanent military musical band. Founded in 1299, the famous Mehterhane military band would arrive in the middle of battles to rouse the spirits of the soldiers while also terrifying the enemy. European military bands, from the 17th century onwards, were inspired by the Ottoman military bands.

9. Personal Grooming

Much of our modern personal grooming habits can trace their roots back to the Muslim civilization of the Middle Ages. Perfumes, soaps, toothbrushes and cosmetics all came to the western world from Muslim lands.

Soap - Although substances for cleansing the skin have been in use since ancient times, soap as we know it today was invented by Muslims in the 7th century using vegetable oils. The formula for creating soap has remained the same ever since.

Toothbrushes - In the 6th century, the prophet Muhammad scrubbed his teeth with a twig of Miswak tree before each of the five daily prayers. Recent research by Swiss pharmacists has confirmed that Miswak contains antibacterial substances which protect against gum disease and tooth decay.

Cosmetics - Teeth bleaching, hair conditioning, moisturisers and mouthwashes were a common feature of Muslim life as early as the 9th century. The spread of Islam also brought Henna dye – used on hair and skin – to different parts of the world, which modern scientists have discovered contains anti-bacterial and anti-fungal agents.

10. Coffee Shops

Billions of cups of coffee are drunk worldwide every day – enough to fill nearly three hundred Olympic-sized swimming pools. Coffee is a global industry and is the second-largest commodity-based product in the world (after oil).

Its story begins in the 9th century, when a shepherd named Khalid observed the stimulating effect of coffee when his herd were grazing on the Ethiopian slopes. This discovery gave rise to *al-qahwa* which became one of the most popular beverages in the Muslim world. The traditional coffee house came to Europe in the 17th century via Egypt, and cafés are now a common feature in every European and American town.

The consumption of coffee in Europe was originally based on the traditional Muslim preparation of the drink. This entailed boiling the mixture of coffee powder, sugar and water together. In the 17th century, Viennese monks in Austria, who found Turkish coffee too strong for their taste, mixed it with cream and honey. This made the color of the coffee turn brown, resembling the color of the robes worn by the Capuchin monastic order. Which gave rise to the “cappuccino” name so famous today.

11. The Library of Secrets

An internationally acclaimed award-winning educational short film, starring Academy Award®-winner Sir Ben Kingsley, which introduces the exhibition to museum visitors. Three school children visit a dusty library to research the story of 'The Dark Ages'. What they find changes their world view dramatically as ingenious inventors and pioneers of science and technology are vividly brought to life.

This astounding movie provides an eye-opening introduction to the 1001 Inventions initiative and is one of the highlights of our global touring exhibition. It has won more than 20 international awards including “Best Film” recognition in London, Hamburg, Los Angeles and Cannes as well as at the New York Festival.