

Desert Robotics - Lunar Rover Design

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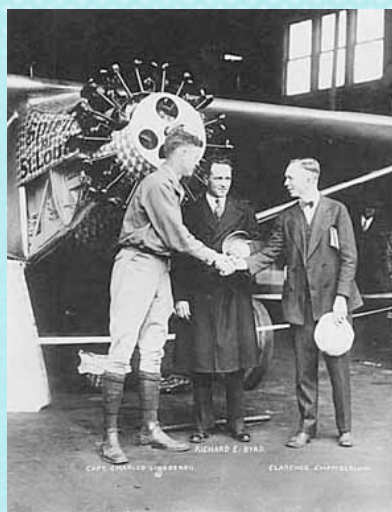
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ENGINEERING PRIZES IN HISTORY

The idea of offering a cash prize for a scientific achievement is not new. Today we have the X Prize Foundation with many competitions, but they were not the first. Throughout history there have been many such contests and many of them proved to be very important to the development of modern technology and scientific advances, and, more importantly, how the world viewed different inventions. After Lindbergh was awarded the Orteig Prize in 1927, the aviation industry took off. The number of airline passengers went from 5782 to 173,405 in just three years (1926-1929). Pilot licenses increased by 300% and licensed aircraft by 400%. More than 1/4 of all Americans saw the Spirit of St. Louis (Lindbergh's plane) in the year after the historic flight. The aviation industry is now valued at over \$300 billion. [1]



Lindbergh stands in front of his plane, the Spirit of St. Louis. [3]



Lindbergh receives the \$25,000 check from Orteig on June 16, 1927, [3]



In 1919 **The Orteig Prize**, offered by wealthy hotel owner Raymond Orteig, challenged the aviation field to fly non-stop from New York to Paris. Charles Lindbergh, an unknown airmail pilot at the time, took home the \$25,000 in 1927 by successfully landing his plane, the Spirit of St. Louis, in Paris after crossing the Atlantic ocean alone. By this one act Lindbergh won the hearts of the whole nation and changed the world forever creating a \$300 billion aviation industry. The \$20 million Ansari X Prize was modeled after the Orteig. The X Prize Foundation hopes these new competitions will also change the world and create a new future. [2] [3]

The Ortiz prize certainly had an affect on our modern world. Let's take a look at some other engineering prizes in history that shaped the world as we know it today.

The Longitude Act of 1714 issued by the British Parliament offered a cash prize, £20,000, for developing a precise method for using time to navigate the oceans. Many famous scientists, including Galileo, attempted to win the prize. John Harrison solved the problem with his marine timekeeper H4 called "The Watch." [4]



John Harrison 1694-1776



John Harrison's H1. [6]



John Harrison's fourth marine timekeeper, H4. [5]

John Harrison was a successful clock maker. He decided to try to win the Longitude Prize by making his clocks seaworthy. The problem with clocks in the 18th century was that they had a pendulum which wouldn't work on a rolling ship. Harrison also had to control temperature changes and friction. He worked for over 40 years perfecting his design before being awarded the Longitude Act prize. He died at the age of 83 on March 24, 1776. [4]

The most successful design that Harrison made was the final H4 watch developed in 1755. It proved to be one of the most important time pieces ever created. [5] It lost only five seconds in a transatlantic crossing in 1762. The H4 was also tested during a voyage to the West Indies and beat the Longitude Act requirements by 3 times. [4]

The Problem with Longitude was considered impossible to solve in the 18th century. Latitude is measured from the equator (0° latitude) in parallel lines running just like the equator. It can be easily determined by the height of the sun at noon or by the stars at night. But Longitude is measured from the North to South Poles and cannot be so easily determined. The local time on the ship and a time for a known longitude (like at the home port) are needed to figure out longitude. Each hour difference between the home port and the ship is 15° of longitude east or west. (the earth rotates a full 360° in 24 hours, so 1 hour is 15 or 360/24).

INNOVATIVE OR CRAZY?

REAL IDEAS SUBMITTED TO THE LONGITUDE ACT OF 1714 [2] [13]

“Solar/Lunar Eclipse”

Solar and lunar eclipses could be very accurately predicted. An astronomer proposed that accurate time could be determined by a key list of eclipses. When a sea captain saw an eclipse the list could tell the exact time, but the long interval between each event made the method impractical. [4]

“Wounded Dog”

An alchemist in France claimed to have invented a magic healing powder that could cause a dog to howl from a distance when the powder was applied to a cloth that had been in contact with an open wound on the dog. The dog was wounded and a cloth applied to the wound. The cloth stayed in Greenwich, England and the dog went to sea on a ship. Each day at exactly 12 noon, the magic powder was applied to the cloth in Greenwich. The dog on the ship howled, the wound healed, and the captain knew it was 12 noon. Each day the dog had to be wounded again so the whole process could start over. Needless to say, this entry didn't win. [4]

“Anchored Ships”

This idea anchored ships out at sea 7 miles apart. The 1st ship fired canons at 12 noon. Then each ship that heard fired its canons letting everyone know that it was 12 o'clock. The cost of this operation along with the danger of having so many ships out to sea all the time was the downfall of this idea. [4]

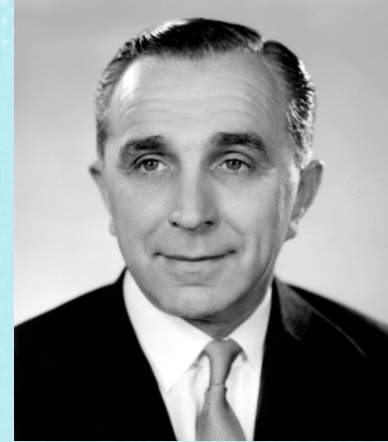
“Moons of Jupiter”

Galileo came up with an accurate way of telling time on land and proposed it could be used at sea. The eclipses of Jupiter's moons happened several times every day. Galileo could predict them accurately providing a way to tell the exact time by looking through a telescope to view the eclipse. This idea was in the top running for the contest. It worked on land, but the movement of ships at sea made it hard to keep a telescope steady enough to view the moons of Jupiter. It also took too long to do the calculations, around 4 hours. [4]

ENGINEERING PRIZES IN MODERN TIMES

The Kremer Prizes

Henry Kremer was British industrialist who thought that man should be able to fly using only the power of his own muscles. This was just like one of Leonardo da Vinci ideas. Kremer was unable to come up with a successful invention so in 1959 he set up the Kremer Prize. The sum of £5,000 (which later grew to £50,000) was offered to the first human powered flight.



Henry Kremer, Industrialist

No one won the prize until 1977 when MacCready's Gossamer Condor, a human powered Mylar-skinned plane, flew a figure eight over a half-mile course. After that success, Kremer put up £100,000 for anyone who could cross the English Channel by human powered flight. The Gossamer Albatross, also built by MacCready, won that prize in 1979. Today MacCready designs electric cars for General Motors using the lightweight construction techniques he developed for the Gossamer planes. [7]



Richard P. Feynman, Physicist

Prizes Offered by Richard Feynman

Dr. Richard P. Feynman was a Nobel Laureate physicist at the California Institute of Technology. In 1959 he gave a speech about molecular-scale engineering entitled "There's Plenty of Room at the Bottom." To get interest in this new field he offered \$1000 prizes. This was funded by his own personal money. One prize would be given to the first person who could construct a working electric motor that was built at a 1/64 inch scale or less. Another prize would be for writing very small text, 1/25,000 scale. That would be small enough to write the entire Encyclopedia Britannica on the head of a pin.

A small motor was created in 1960 by an engineer winning the prize, but it didn't really use break through technology. Feynman did make the requirements small enough. But he did pay the prize anyways. In 1985 Thomas Newman a graduate student from Stanford University, won printing prize. He printed the first page of Charles Dicken's novel, A Tale of Two Cities so small using electron beam lithography. It measured only 1/160 of a millimeter. and was 20 times smaller than can be seen by the human eye. This project was a technological advance just like Dr. Feynman wanted. [8]

Foresight Institute Offers \$250,000 Feynman Grand Prize For Major Advances In Molecular Nanotechnology

The Foresight Institute is a not-for-profit organization, located in Palo Alto, California, that deals with nanotechnology. They continue the idea of Feynman by offering cash prizes in the field of molecular nanotechnology. They will give \$250,000 for specific advancements in this field.

The Contest:

1. Design and construct a functional nanometer-scale robotic arm. It must perform specific tasks.
2. Design and construct a nanometer computing device which can add two 8-bit binary numbers.

What is Nanotechnology?

Nanotechnology is a new field where precise structures are built from individual molecules and atoms. If this can be done, supercomputers could be built that would be the size of a sugar cube. Robots could be molecular-scaled making it possible to repair damage in human cells. A single drop of blood could hold more than one billion of these small robots. Molecular machines could manufacture products without making pollution.

The founder of the Foresight Institute is K. Eric Drexler, Ph.D. He has written many books on molecular nanotechnology. He said they offer the prizes to get people interested: "Foresight Institute expects this large prize to attract the interest of talented people working in the many sciences and technologies bearing upon molecular nanotechnology."

Drexler also said, "The Feynman Prize will recognize one of the most significant technological breakthroughs in human history However, the rewards awaiting those who achieve significant nanotechnology breakthroughs will be far greater than the prize itself." [9]

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