Speaker’s manuscript, slide show

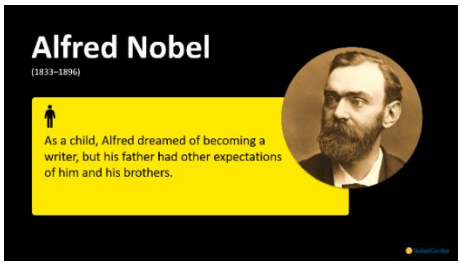
The 2017 Nobel Prize in Physics

Title slide

Now the world has found out who will receive the 2017 Nobel Prize in Physics.

Today you will learn more about the background of the Nobel Prize and about this year’s Prize.

Alfred Nobel

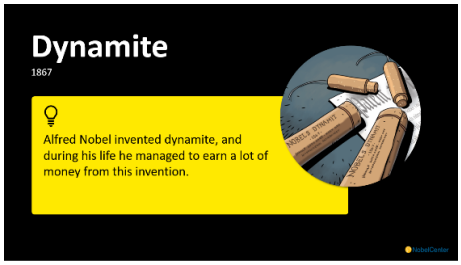


Alfred Nobel was born in Stockholm, Sweden on October 23, 1833.

As a nine-year-old, he moved together with his older brothers and his mother to Saint Petersburg, the capital of Russia at that time. There his father Immanuel had started a factory.

In St. Petersburg, Alfred received a good education and dreamed of becoming a writer. Alfred’s father made him study natural sciences and technology instead, since he and his brothers were expected to take over the family’s factory.

Dynamite



Alfred Nobel, his father and his brother Emil tried to invent an explosive that was safer than pure nitroglycerine. It was very dangerous to use nitroglycerine as an explosive – so dangerous that Alfred’s brother Emil died in an explosives accident in 1864.

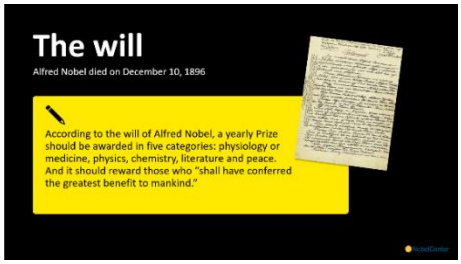
But Alfred finally succeeded in developing a method for producing nitroglycerine and a way to use it as an explosive.

He named his invention “Dynamite” in 1867. Dynamite was a comparatively safe explosive. It was in huge demand during the period of industrialisation, since there was so much construction work. By taking out patents on many of his ideas, Alfred earned a lot of money and started many factories around the world.

The will

Alfred Nobel died of a stroke on December 10, 1896. He had no children, so in his will he wrote that a large part of his fortune should be placed in a fund. The yearly interest on this fund would pay for a prize given to “those who, during the preceding year, shall have conferred the greatest benefit to mankind.”

The interest would be divided into five equal parts, with one part awarded to those who “shall have made the most important discovery or invention within the field of physics”. The first Nobel Prize was awarded in 1901. Since then, more than 900 Prizes have been awarded to different people and organisations.



The Nobel Prize Award Ceremony

On December 10 each year, the Nobel Prize is presented. This year the Prize in each category consists of a medal, a diploma and nine million Swedish kronor – or over a million US dollars.

The Prize Award Ceremony is held at Stockholm Concert Hall for all categories except the Peace Prize, which is awarded in Oslo, Norway. After the actual Award Ceremony, there is an elegant Banquet in each city to honour the new Nobel Laureates.

The Nobel Prize in Physics

“… the person who shall have made the most important discovery or invention within the field of physics.”

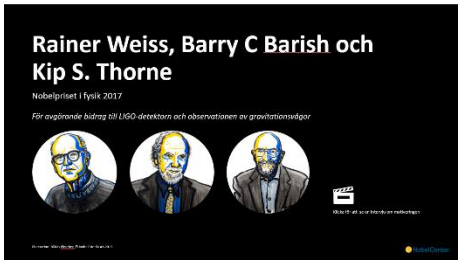
The Nobel Prize in Physics is thus awarded to people who have either made inventions or discoveries in this field.

Examples of previous Laureates

Guglielmo Marconi and Karl Ferdinand Braun received the Physics Prize in 1909 for the development of radio (“wireless telegraphy”).

Subramanyan Chandrasekhar received the 1983 Prize for studying processes of importance to the structure and evolution of the stars.

The 2017 Laureates



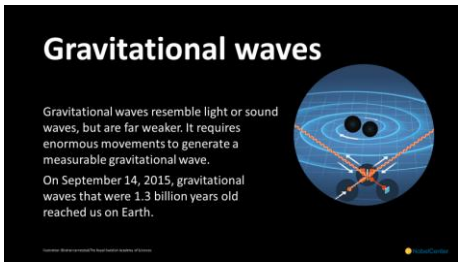
The 2017 Nobel Prize in Physics was awarded to Rainer Weiss, Barry C. Barish and Kip S. Thorne *"for decisive contributions to the LIGO detector and the observation of gravitational waves"*

We have known about gravitational waves ever since Albert Einstein noted in his relativity theory that the length, breadth and depth of space is interrelated with time and that these four dimensions are affected by different masses. For many years, scientists have wanted to measure these gravitational waves. This year's Nobel Prize in Physics rewards the scientists who were able to achieve this.

The people

Since the 1970s, physics professors Weiss and Thorne have been working to develop instruments that can measure gravitational waves. At first they worked in different places, but since the mid-1980s they have both been part of the LIGO project, a large American research project in which many scientists are collaborating. Professor Barish was the one who expanded this project from about 40 researchers to more than 1,000. More recently, the LIGO scientists have collaborated with the very similar VIRGO project in Europe.

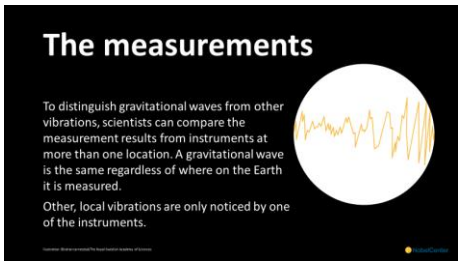
Gravitational waves



Early in the 20th century, Einstein calculated that gravitational waves must exist. Everything that has mass and changes its speed generates these waves. Gravitational waves move through space in a way similar to light or sound moving through the air, but gravitational waves are far weaker. It requires enormously large objects to generate a measurable gravitational wave.

The gravitational waves that were measured at LIGO/VIRGO arose 1.3 billion years ago, after two black holes rotated around each other faster and faster until they collided and formed a single black hole. On September 14, 2015 these waves arrived here on Earth.

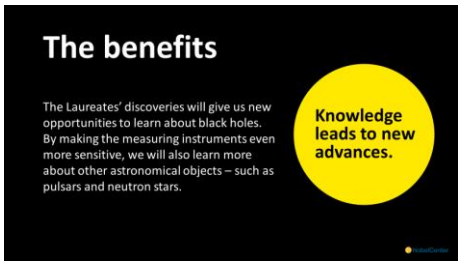
The measurements



The measurements took place at two different measuring stations at different locations in the United States that are part of the LIGO research project. Scientists were later able to measure similar waves in the European project known as VIRGO.

The actual instruments consist of two four-kilometre-long tunnels that form an L on the ground. By shining a laser into the tunnels and then allowing the laser light to bounce off a mirror at each end, scientists can measure incredibly small changes in length between the two tunnels: the legs of the L. Changes in length that are not due to gravitational waves can be eliminated by comparing the results from the different measuring stations.

The benefits



These measurements have enabled scientists to understand that Einstein was right about his descriptions of time and space. Gravitational waves had already been confirmed through observations of pulsars, but this was the first time that we were able to measure them directly.

Now we also have new opportunities to learn about black holes. These are very difficult to study, since they do not emit any measurable light. But they emit gravitational waves that tell us something about how black holes work. By making the LIGO/VIRGO instruments even more sensitive, we can also learn more about other astronomical objects such as pulsars and neutron stars.

The knowledge provided by this discovery is beneficial in itself. Knowledge leads to advances in our society. This knowledge creates opportunities and is essential to new inventions, for example.