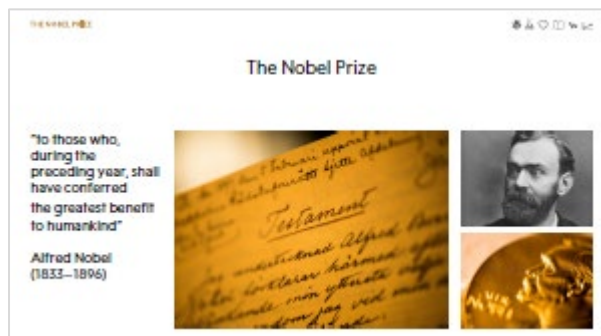


THE NOBEL PRIZE

Speaker's manuscript – All Nobel Prizes 2024

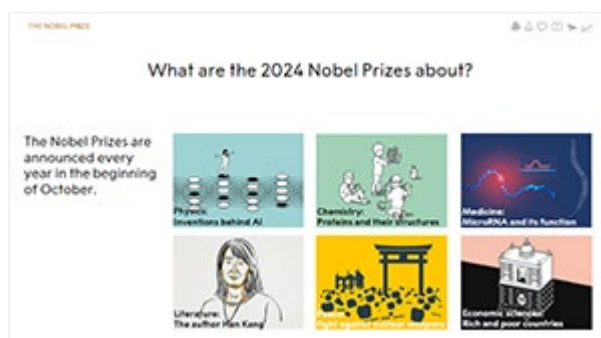
The Nobel Prize

- The Swedish inventor Alfred Nobel died on 10 December 1896. He invented dynamite and became very rich. In his last will he wrote that the majority of his fortune was to be used for five prizes given to “those who, during the preceding year, have conferred the greatest benefit to humankind.”
- According to the will, the prize is to be awarded in five categories: physics, chemistry, physiology or medicine, literature and peace.
- The Nobel Prizes were first awarded in 1901.
- In the late 1960s, Sveriges Riksbank (Sweden's central bank) established the Prize in Economic Sciences Prize in Memory of Alfred Nobel.
- The prize in economic sciences is awarded at the same time as the Nobel Prize, as part of the same ceremony on 10 December every year.



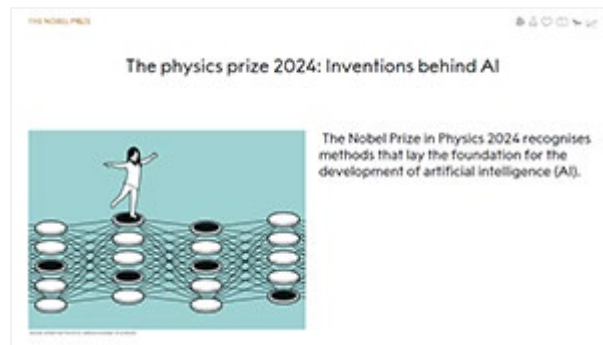
What are the 2024 Nobel Prizes about?

- The 2024 Nobel Prizes are about everything from the inventions behind artificial intelligence (AI), the three-dimensional structure of proteins, and microRNA to Han Kang's writing, the fight against nuclear weapons, and research that explains why some countries are rich and others poor.



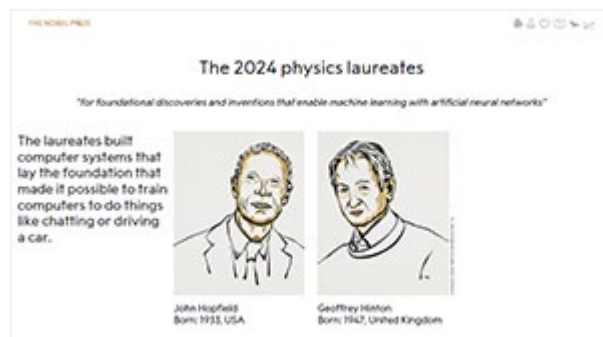
The 2024 physics prize: The inventions behind AI

- The 2024 physics laureates made inventions that underly the development of artificial intelligence (AI) – a topic of frequent discussion in society today.



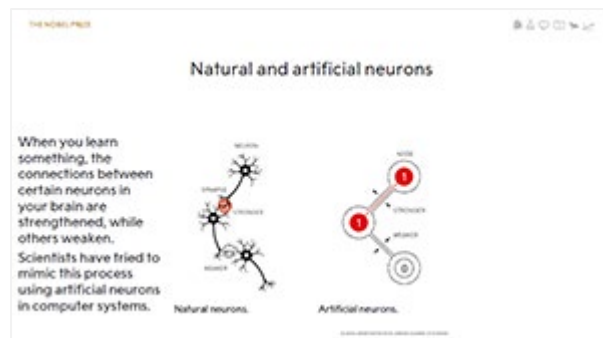
The 2024 physics laureates

- The 2024 Physics Prize laureates built computer systems that allow us to train computers to do things like chatting, driving a car or interpreting pictures of faces. Although computers can't think, they can be taught to mimic functions like remembering and learning.



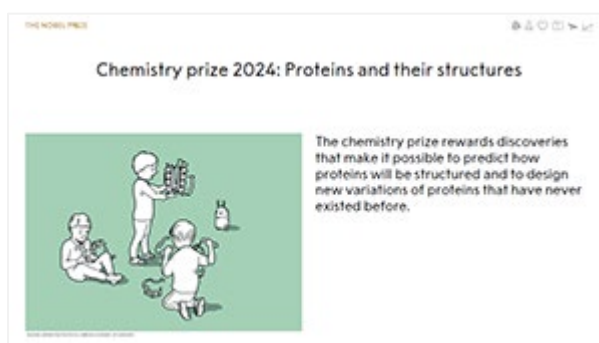
Natural and artificial neurons

- Right at this very moment, while you're thinking and learning something new, the neurons (nerve cells) in your brain are sending signals to one another through so-called synapses.
- The brain's neurons are interconnected by these synapses to form a network, and when you learn something, the connections between some neurons get stronger, while the connections between others get weaker.
- In order to mimic the brain's nerve cells, computer systems have been devised in which neurons are represented by nodes that are linked together to form a network that allows signals to be sent back and forth in various ways. The connection between any two nodes can be made stronger or weaker.
- Scientists can use such systems to train computers to translate from one language to another, interpret pictures or carry on a conversation.
- Today these systems are used by scientists in many different fields, such as climate scientists or astronomers looking for planets in other solar systems.



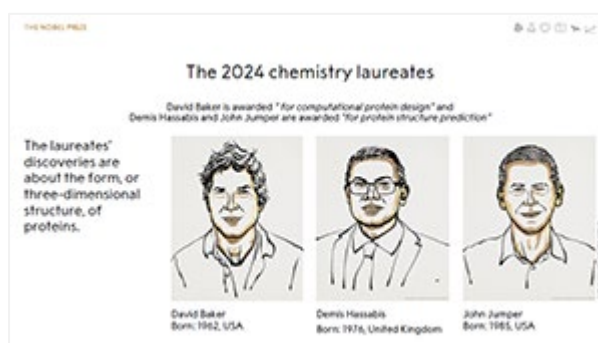
The 2024 chemistry prize: Proteins and their structures

- The Chemistry Prize 2024 recognises two discoveries that both deal with proteins, and particularly the three-dimensional structure of proteins.
- All living things contain proteins. Proteins are essential to the various functions of an organism, so they can be seen as life's chemical multitool.



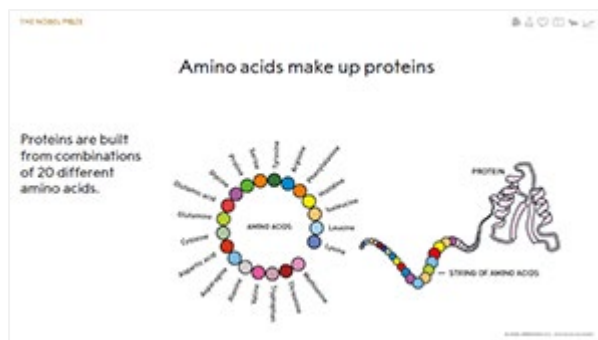
The 2024 chemistry laureates

- David Baker developed a computer programme called Rosetta that can design new proteins.
- Demis Hassabis and John Jumper developed an AI model that predicts the form of a protein based on the sequence of amino acids that make it up.



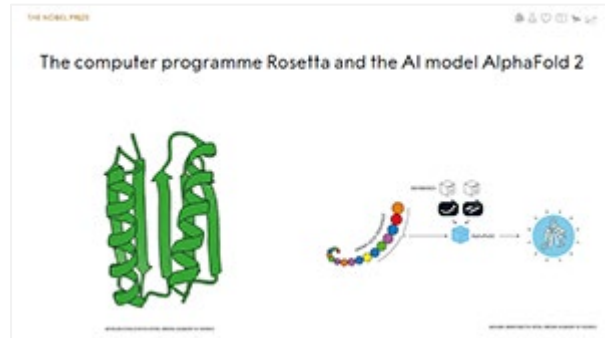
Amino acids make up proteins

- Proteins are made up of twenty different kinds of amino acids that can be linked together like a string of pearls in an infinite number of different combinations.
- What makes proteins so amazing is that these strings of pearls twist and fold themselves into specific three-dimensional structures.
- For over 50 years, researchers dreamed of being able to predict the three-dimensional structure of a protein – what it looks like – knowing only the sequence of amino acids.
- But why is it so important to know the three-dimensional structure of a protein? Because it's the protein's form that determines what function it will have, such as producing a particular chemical reaction.
- Knowing a protein's three-dimensional structure makes it possible for researchers to understand various sequences of events in living organisms. It increases our understanding of diseases and will make it possible to develop new medications in the future.



The computer programme Rosetta and the AI model AlphaFold 2

- Thanks to a computer programme called Rosetta, which was developed by one of this year's chemistry laureates, researchers can create entirely new proteins, which was once thought impossible. In the future, these new proteins might function as targeted pharmaceuticals, vaccines or microsensors.
- Thanks to an AI model called AlphaFold 2, which the other two laureates developed, researchers can predict the structure of a certain protein based on the sequence of amino acids that make it up. Since AlphaFold 2 was introduced in 2020, researchers have been able to predict the 3D-structure of almost every one of the 200 million known proteins found in nature. Researchers can now create images of proteins that could break down plastic, for example.



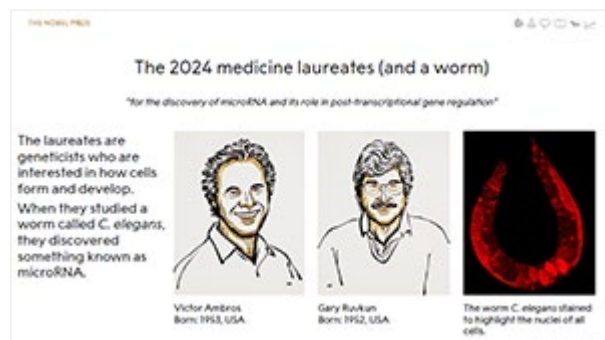
The 2024 medicine prize: MicroRNA and its function

- The 2024 medicine prize is about the discovery of a little molecule – microRNA – that is involved in the process that determines which proteins are produced in a cell and how much of each is produced.



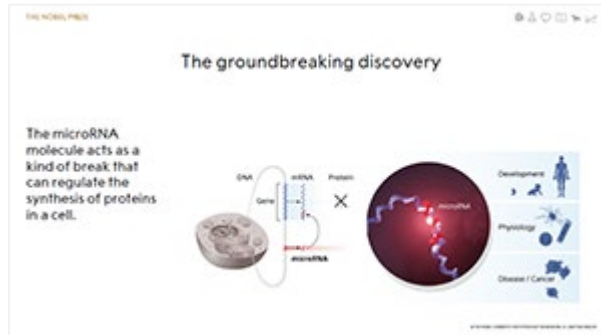
The 2024 medicine laureates (and a worm)

- Both laureates are geneticists who are interested in how cells form and develop. They found worms that had mutated and looked a little different, and they decided to figure out why.
- The worm they studied is called *C. elegans*, and although it is small it has many of the cell types found in much more advanced organisms, including humans.
- In 1993, they discovered microRNA in the worm, and several years later they understood that microRNA is also found in humans and other more complex animals.



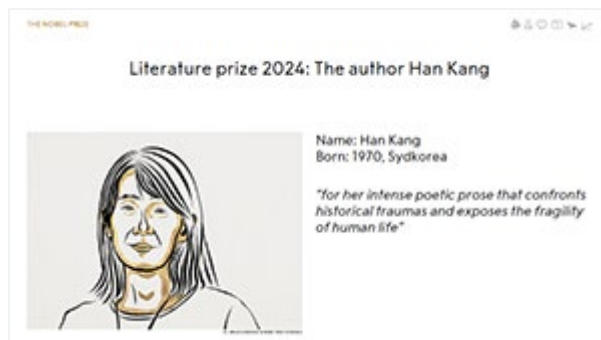
The groundbreaking discovery

- Almost everything that happens in our bodies relies on proteins. It is therefore important that we thoroughly understand how proteins work.
- The genes in our cells act like recipes for how all these proteins are synthesised. Humans are made up of many billions of cells that all contain exactly the same genes, or protein recipes. The chemistry laureates' research has revealed how cells regulate their genes – that is, how they control which proteins are made and how much of each is made. And this depends on what kind of cell it is – a muscle cell, for example, or an intestinal cell or a nerve cell.
- MicroRNA attaches to a messenger RNA (mRNA) molecule, acting like a kind of break that can stop the production of proteins in the cell.
- The discovery of microRNA has helped us understand how different kinds of cells can form in the body even though they all have the same genes. Genetic research has also shown that mature cells and tissues cannot develop normally without microRNA.



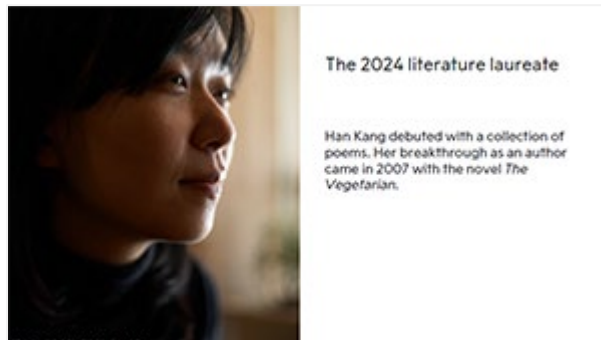
The 2024 literature prize: The author Han Kang

- South Korean author Han Kang writes in Korean, and her works have been translated into over twenty different languages.
- In addition to writing, she has devoted herself to making art and music, which can be seen in both the form and the content of her writing.



The 2024 literature laureate

- Several of Kang's books deal with the grieving process in conjunction with different kinds of loss – losing close relatives in a massacre, losing the ability to speak, or to see, or losing a sibling the narrator never got to meet.
- In her book *We Do Not Part*, she describes how two women friends attempt to transform the pain and trauma of a massacre in the late 1940s on Jeju Island into a joint art project of the same name as the title of the book.
- She also confronts different norms, or unstated rules, as in the novel *The Vegetarian*.



Excerpt from *The Vegetarian*

- Han Kang had her great international breakthrough in 2007 with the novel *The Vegetarian*, in which a woman's choice to stop eating meat has violent consequences.
- Here is a short excerpt from the novel in which the woman's husband describes a family dinner:



"Eat it! Listen to what your father's telling you and eat. Everything I say is for your own good. So why act like this if it makes you ill?"

The fatherly affection that was almost choking the old man made a powerful impression on me, and I was moved to tears in spite of myself. Probably everyone gathered there felt the same. With one hand my wife pushed away his chopsticks, which were shaking silently in empty space.

"Father, I don't eat meat."

In an instant, his flat palm cleaved the empty space.

The Vegetarian (2007)

Hogarth, 2015, translated by Deborah Smith

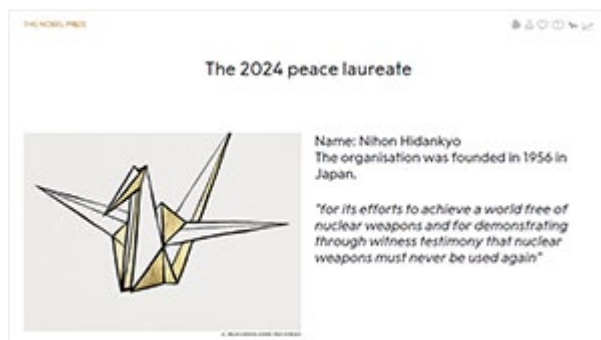
The 2024 peace prize: The fight against nuclear weapons

- In 1945, near the end of the Second World War, the United States dropped two atomic bombs on the Japanese cities of Hiroshima and Nagasaki.
- Some of the survivors of the bombings founded a grassroots movement called Nihon Hidankyo in 1956. Nihon Hidankyo has been awarded the 2024 peace prize for its efforts to rid the world of nuclear weapons.



The 2024 peace laureate

- By talking about their experiences and giving witness testimony, they have shown why nuclear weapons must never ever be used again, raising awareness of how catastrophic the consequences of using such weapons are.

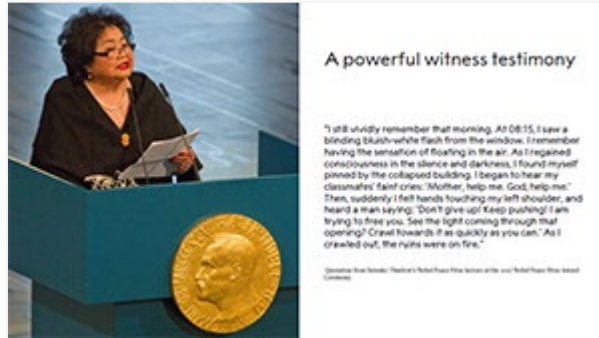


THE NOBEL PRIZE

- About 120,000 people were killed immediately by the two atomic bombs that were dropped on Hiroshima and Nagasaki, and about the same number died from burn injuries and radiation sickness in the months and years that followed.

A powerful witness testimony

- Setsuko Thurlow's is one of many powerful witness testimonies about the atomic bombs dropped on Japan. She was thirteen years old when the atomic bomb was dropped on Hiroshima. Setsuko Thurlow is a member of Nihon Hidankyo and has also been involved in the International Campaign to Abolish Nuclear Weapons (ICAN), which was awarded the peace prize in 2017.



- At the award ceremony, she gave a speech in which she gave an account of her experiences:

"I still vividly remember that morning. At 08:15, I saw a blinding bluish-white flash from the window. I remember having the sensation of floating in the air. As I regained consciousness in the silence and darkness, I found myself pinned by the collapsed building. I began to hear my classmates' faint cries: 'Mother, help me. God, help me.' Then, suddenly I felt hands touching my left shoulder, and heard a man saying: 'Don't give up! Keep pushing! I am trying to free you. See the light coming through that opening? Crawl towards it as quickly as you can.' As I crawled out, the ruins were on fire."

(Quotation from Setsuko Thurlow's Nobel Peace Prize lecture at the 2017 Nobel Peace Prize Award Ceremony.)

The 2024 Economic sciences prize: Rich and poor countries

- Have you ever wondered why some countries are rich and others are poor?
- The 2024 economics prize is about research that demonstrates that the disparity is largely due to what form of governance each country has, and what laws, and how those have been established.



The 2024 economic sciences laureates

- The laureates have studied the prosperity of different places that were colonised by Europeans. Colonisation is when a country takes over another area outside of its own borders. It was during the era of European voyages of discovery in the fifteenth and sixteenth centuries that those countries started colonising areas around the world.
- The laureates' research demonstrates that the places that were rich when they were colonised are now among the poor, while those places that were poor when they were colonised have become more prosperous.
- This development is largely the result of the form of governance and laws brought in by the colonisers.



More democratic systems are the solution

- Today the richest 20 per cent of the world's countries are about 30 times richer than the poorest 20 per cent.
- The income gap between the poorest and the richest countries does not appear to change over time. Even when the poorest countries become more prosperous, they cannot catch up to the richest ones.
- But we can change that. Research shows that it is possible to increase economic prosperity in the poor countries if they transition to more democratic systems.



The Nobel Prize Award Ceremony

- The Nobel Prizes are awarded every year on 10 December. Alfred Nobel died on 10 December 1896.
- Each prize includes a medal, a diploma, and a large sum of money. In 2023, the prize amount is 11 million Swedish kronor, or about one million dollars.
- The award ceremony is held in Sweden at the Stockholm Concert Hall for all Nobel prizes except the peace prize, which is awarded at City Hall in Oslo, Norway.
- The awarding of the prizes is followed by a festive banquet to celebrate the year's Nobel Prize laureates.

