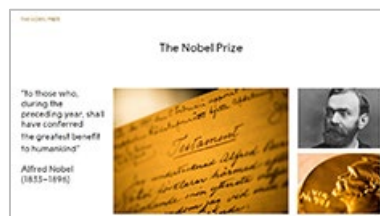


Speaker's manuscript – All Nobel Prizes 2022

The Nobel Prize

- Before Alfred Nobel died on 10 December 1896, he wrote in his will that the bulk of his fortune should be used for prizes to "those who, during the preceding year, shall have conferred the greatest benefit to humankind".
- According to the will the bulk of his fortune should be divided into five parts and to be used for prizes in physics, chemistry, physiology or medicine, literature and peace.
- The first Nobel Prizes were 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.



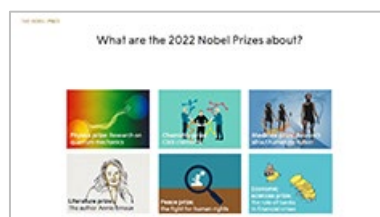
The 2022 Nobel Prize laureates

- In 2022, twelve women and men and two organizations were awarded within the various Nobel Prize categories.
- Let's take a closer look at the achievements of the 2022 Nobel Laureates and how they have benefitted humankind.



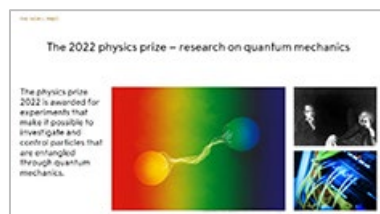
The Nobel Prizes 2022

- The Nobel Prizes are announced at the beginning of October every year.
- The 2022 prizes range from research on quantum mechanics and research on human evolution to documenting war crimes and the role of banks in financial crises.



The 2022 physics prize – research on quantum mechanics

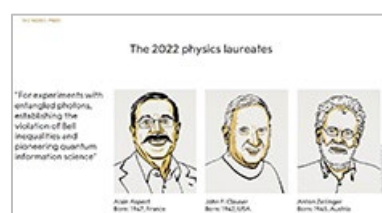
- The 2022 Nobel Prize laureates in physics have developed experiments with particles of light, or photons, that are entangled.
- These experiments have confirmed the theory of quantum mechanics is correct and paved the way for a new quantum technology.
- It's about particles that are far apart and yet still connected, or entangled, with each other. That effect is a little "spooky," according to Albert Einstein.



- Quantum mechanics was developed about a hundred years ago. Quantum mechanics is relevant when it comes to things that are very small, such as molecules, atoms and even smaller particles. It brought about a revolution in how we view the underlying forces that make up our world. For example, chance plays a decisive role in the description of the small particles and packets of light that are the basic building blocks of the world. Conventional physics' description of the world as essentially completely predictable just doesn't hold true on this fundamental level.
- Is the world fundamentally governed by chance? Physicists came to different conclusions about what this means. For example, Niels Bohr and Albert Einstein, who were awarded the Nobel Prize in Physics in 1922 and 1921 respectively, disagreed on this matter. Bohr was more convinced of quantum mechanics' validity than Einstein, who objected to the fundamental role assigned to chance in the theory of quantum mechanics.

The 2022 physics laureates

- **Alain Aspect, John F. Clauser and Anton Zeilinger** have not worked together, but rather as part of different research teams.
- Are there any practical uses for quantum mechanical entanglement? We are entering a new era of possibilities for storing, transferring and manipulating information. Some applications:
 - Secure storage and transfer of information through quantum encryption.
 - Transfer of quantum information across great distances through optical fibre cables.
 - Fast and efficient quantum computers.



The 2022 chemistry prize – click chemistry

- Nature is good at building complex molecules. Chemists are good at it too, but the methods they use are often difficult, time consuming and expensive.
- The 2022 chemistry prize is about click chemistry and bioorthogonal reactions. They are different methods for building molecules. Thanks to the work by the 2022 chemistry laureates, researchers today can construct molecules in an extremely flexible and efficient way. What was once difficult has now become much simpler.
- There are many different applications for the methods developed by the 2022 chemistry laureates. Here are a few examples:
 - Efficient production of pharmaceuticals;
 - Targeting pharmaceuticals that can track down cancer tumours;
 - Increased understanding of the progression of a disease, which may eventually make it possible to develop targeted treatments;
 - Production of materials with specific properties that allow them to conduct electricity, capture sunlight or protect from UV radiation.
- Svante Pääbo, who was awarded the 2022 Nobel Prize in Physiology or Medicine, even used click reactions to analyse DNA remains from Neanderthals.



The 2022 chemistry laureates

- Working independently of each other and on different continents, **Barry Sharpless** and **Morten Meldal** developed a method for constructing complex molecules in an efficient way.
- The researchers already knew that azides and alkynes, which are two kinds of molecules, “snap” together. They click together just like a seatbelt. Click! The laureates’ studies also showed that if we add copper ions to the reaction, they click together faster and more easily, and no unwanted by-products are formed. The result is cleaner.
- The two chemists discovered that we can attach the two important click molecules azide and alkyne to practically any other molecules we want to join together.
- This is the second time Sharpless has been awarded the Nobel Prize in Chemistry.
- Because copper is toxic, many thought it would not be possible to use the click method in living organisms. But the third laureate, **Carolyn Bertozzi**, discovered a way to do click reactions without copper ions so they could be used in living organisms too.
- Carolyn Bertozzi called these click reactions bioorthogonal reactions.



The 2022 medicine prize – research about human evolution

- Our closest extinct relatives were the Neanderthals.
- Through his pioneering research, **Svante Pääbo** accomplished something no one thought possible: mapping the genome of Neanderthals, an extinct relative of present-day humans, or *Homo sapiens*.
- In addition, he discovered another human relative in 2008, and it was given the name Denisova. The discovery was made when Pääbo studied a bone from the little finger of a human found in the Denisova Cave in Siberia. DNA from the finger bone showed its genetic sequence to be distinct from that of Neanderthals and *Homo sapiens*. Pääbo realised that this was a previously unknown hominin.
- Through his pioneering research, Pääbo has been able to demonstrate the genetic differences between *Homo sapiens* and our closest extinct relatives.



The 2022 medicine laureate

- The term *hominin*, which appears in the prize motivation, refers to humans and all of our closest extinct relatives. However, this group does not include other primates, such as chimpanzees, gorillas and orangutans.
- Present-day humans (*Homo sapiens*) emerged in Africa 300,000 years ago. About 70,000 years ago, groups of *Homo sapiens* migrated from Africa into the Middle East and to the rest of the world beyond.
- For tens of thousands of years, *Homo sapiens* and Neanderthals coexisted. When *Homo sapiens* migrated eastward, they also encountered the Denisovans.



- Pääbo also found that gene transfer had occurred from these now extinct hominins to *Homo sapiens* following the migration out of Africa around 70,000 years ago.
- Pääbo's discoveries have provided important information on how the world was populated at the time when *Homo sapiens* migrated out of Africa and spread to the rest of the world. Neanderthals lived in the west and Denisovans in the east on the Eurasian continent. Interbreeding occurred when *Homo sapiens* spread across the continent, leaving traces that remain in our DNA.
- In modern day humans with European descent, approximately 1-2% of the genome originates from the Neanderthals. And approximately 1-6% of the genome originates from Denisova in present-day humans in South East Asia.
- This ancient flow of genes to present-day humans has physiological relevance today, for example affecting how our immune system reacts to infections.
- Why Neanderthals and Denisovans died out about 30,000 years ago is not entirely clear.
- Svante Pääbo's father, Sune Bergström, was also awarded the Nobel Prize in Physiology or Medicine. He was awarded the prize in 1982.

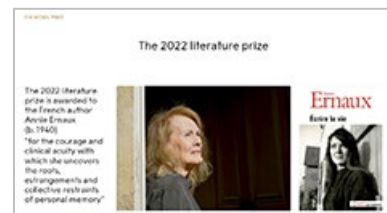
The 2021 literature prize

- **Annie Ernaux** was born in 1940 and grew up in the little town of Yvetot in Normandy, France.
- Ernaux's childhood home can be described as poor but ambitious, her parents having risen up from the bottom of the working class to attain a somewhat better life.
- Ernaux's humble childhood often provides the background for her writing, which is therefore usually characterised as autobiographical.
- In 1983, she published her fourth novel, *A Man's Place*, which was her literary breakthrough. The work may be described as an exposé of her father and the whole milieu that shaped his underlying character. The novel was soon translated into several languages and established Ernaux's place on the map of world literature.
- Ernaux's works are widely read and translated, counting more than twenty published titles in all.
- It is interesting to note that many of her books, in keeping with the themes of her work, have pictures of herself in her youth on their covers.



Excerpt from *Happening*

- "I turned all my intention to sport, hoping that my strenuous efforts or maybe even a fall might dislodge 'that thing', making it unnecessary for me to visit the woman in the 17th arrondissement. When Annick left me her skiing gear, which I couldn't afford to hire, I would repeatedly tumble, imagining each time I did that I was inflicting the fall that would save me."
(From *Happening* (2000), *Seven Stories Press* 2021, translated by Tanya Leslie)
- The passage is from her novel *Happening*, a work the Swedish Academy describes as "a masterpiece from her production".



- This book is narrated in the first person – here, for once, Ernaux does not use the third-person voice – with a 23-year-old woman narrator describing with unflinching honesty the unwanted pregnancy and illegal abortion she goes through, which nearly costs her her life.
- Annie Ernaux’s narrative style is often described as restrained and clinical. In an interview, she says that “feelings don’t belong in my writing – it’s not a description of feelings.” Instead, Ernaux believes, her books should provoke some feeling in the reader. This excerpt from *Happening* might be an example of that.
- The title of the novel is a consciously euphemistic way of referring to the tragedy of becoming pregnant as an unmarried young woman – particularly in 1960s France, when abortion was both taboo and illegal.

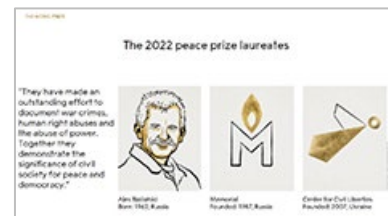
The 2022 peace prize – the fight for human rights

- The Peace Prize for 2022 is awarded to one individual and two organisations: Ales Bialiatski from Belarus, the Russian human rights organisation Memorial and the Ukrainian human rights organisation Center for Civil Liberties.
- Bialiatski was born in Russia to Belarusian parents. The family later returned to Belarus.
- For many years, the three peace prize laureates have been standing up for the right to criticise the powerful and in defence of citizens’ fundamental human rights. They have made extraordinary contributions to documenting war crimes, human rights violations and the abuse of power.
- Together they demonstrate how important civil society is for peace and democracy.



The 2022 peace laureates

- **Ales Bialiatski** has been fighting for democracy in Belarus since the 1980s. In 1996, he founded the human rights organisation Viasna, which means “spring”. Among other things, the organisation has worked to document and protest against the authorities’ use of torture against political prisoners.
- **Memorial** is an organisation founded in 1987 to collect and document violations of human rights committed by the authorities of the former Soviet Union. Memorial believes that we must confront the crimes of the past if we are to prevent the commission of new ones in the future. In addition to collecting important information on victims of the Soviet regime, they document political oppression in today’s Russia. Memorial is also a powerful voice in the struggle against militarism and the effort to promote human rights and the rule of law. The organisation was banned by the Supreme Court of Russia in December 2021.
- **The Center for Civil Liberties** is a Ukrainian human rights organisation that was founded in 2007. Prior to Russia’s invasion, the organisation was working to promote democracy in Ukraine. They have striven to strengthen the country’s democratic institutions and develop Ukraine into a state governed by the rule of law. Since the onset of war in February 2022, the organisation has also been working to document Russian war crimes against the civilian population of Ukraine.



The 2022 prize in economic sciences – the role of banks in financial crises

- The 2022 economic sciences prize is about banks, bank regulations and how financial crises should be managed.
- In times of economic crisis, there is a risk that this system breaks down and banks collapse. This could happen when many people withdraw their savings at the same time. Such so-called bank run can occur due a rumour that the bank is short of money and is unable to cope with its operations.
- When banks collapse, it causes problems for the entire economic system. In addition to people losing the money they had saved in the bank, it also becomes harder to buy things and to borrow money. And if several banks collapse at the same time, it becomes difficult for companies to borrow, to invest and to get paid by their customers.
- The work of this year's laureates has made it possible to manage recent financial crises better and to avoid the kind of deep and long-lasting depression we experienced in the 1930s.



The 2021 economic sciences laureates

- **Ben Bernanke** analysed the Great Depression of the 1930s. His research showed that the collapse of the bank system was the reason why the economic downturn became so deep and long-lasting.
- **Douglas Diamond** and **Philip Dybvig** developed theoretical models that explain why we have banks. That knowledge is important in explaining how a bank crisis can have such devastating consequences for the national economy. They also presented a solution to the bank run problem in the form of a government deposit insurance programme. When depositors know that the government guarantees they'll get their money out, they don't need to rush off to the bank at the first rumour of a bank run. The insurance stops bank runs before they even get started.



The awarding of the Nobel Prize

- The Nobel Prize Award Ceremony is held at the Stockholm Concert Hall, Sweden, for all prize categories except the Peace Prize, which is awarded in Oslo, Norway.

