THE NOBEL PRIZE

Speaker's manuscript – All Nobel Prizes 2021

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 Nobel Prizes 2021

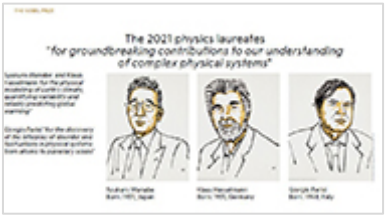
- The Nobel Prizes are announced at the beginning of October every year. In 2021, 13 men and women were awarded a Nobel Prize.

Let's take a closer look at the achievements of the 2021 Nobel Laureates and how they have benefitted humankind.

2021 physics prize

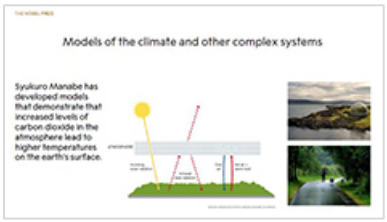
- Our world is full of complex and disordered phenomena and processes. The 2021 physics prize is awarded for models that describe the earth's climate and other complex systems.

The 2021 physics laureates



- One half of the prize is awarded jointly to Syukuro Manabe and Klaus Hasselmann, who developed models for the earth's climate and produced reliable predictions of global warming.
- The other half of the prize is awarded to Giorgio Parisi, who demonstrated how disorder and fluctuations interact in physical systems at different scales.

Models of the climate and other complex systems



- Syukuro Manabe has developed models that demonstrate that increased levels of carbon dioxide in the atmosphere lead to higher temperatures on the earth's surface.
- Klaus Hasselmann has demonstrated how climate can be predicted even though the weather is difficult to predict. His methods have been used to demonstrate that climate change is being caused by humanity.
- Obtaining a climate model from noisy weather data can be illustrated by walking a dog: the dog runs off the lead, backwards and forwards, side to side and around your legs. How can you use the dog's tracks to see whether you are walking or standing still? Or whether you are walking quickly or slowly? The dog's tracks are the changes in the weather, and your walk is the calculated climate. Is it even possible to draw conclusions about long-term trends in the climate using chaotic and noisy weather data?
- Around 1980, Giorgio Parisi discovered hidden patterns in disordered complex materials. The discoveries make it possible to understand and describe many different and apparently entirely random complex materials and phenomena, not only in physics but also in other, very different areas, such as mathematics, biology, neuroscience and machine learning.

The 2021 chemistry prize

- Nature has incredibly precise tools – enzymes – for constructing different complex molecules that give colour, form and function to life.
- When chemists tried to imitate these tools in order to build their own complex molecules, it didn't go very well at first. The tools they developed were clumsy, and with them the chemists produced not only the desired molecules but a lot of unwanted ones as well.
- In time, these tools have been improved, and slowly but surely chemistry has evolved from carving stone with big, blunt chisels to something more akin to fine woodworking using precise, specialised tools.
- The tools for which the 2021 Nobel Prize in Chemistry is awarded have taken molecular construction to an entirely new level. They have made it possible for chemists to construct new molecules in ways that are faster, cheaper and more environmentally sustainable.

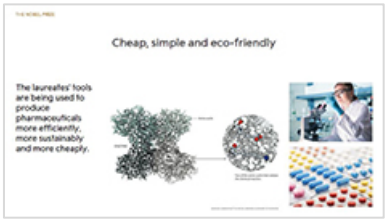
The 2021 chemistry laureates

- The 2021 Nobel Prize in Chemistry is divided between Benjamin List and David W. C. MacMillan. Both have conducted research – though independently of each other at different universities – on how chemical reactions can be accelerated.

- One way of accelerating chemical reactions is to use a catalyst. A catalyst is a substance that accelerates a reaction without itself being affected by the reaction.
- Before the twenty-first century, the commonly used types of catalysts were either metal complexes or enzymes. Thanks to the work of this year's chemistry laureates, there is now a third kind of tool that can be used as a catalyst.

Cheap, simple and eco-friendly

- Independently of each other, Benjamin List and David MacMillan made discoveries that led to an entirely new concept of catalysis, asymmetric organocatalysis. Since then, they have designed lots of cheap and stable organocatalysts and inspired countless researchers to make new discoveries in the field.
- Today organocatalysis has become an important tool in pharmaceutical manufacturing, among other things. It makes it possible to produce pharmaceuticals that contain only the active substance and form only minimal unwanted by-products.
- Thus, the laureates' tools are being used to produce pharmaceuticals more efficiently, more sustainably and more cheaply. For example, the method is being used to make medications that treat depression and fight viruses.



The 2021 medicine prize

- Imagine walking barefoot across a lawn on a hot summer’s day. You can feel the heat of the sun, the caress of the wind, and the individual blades of grass underneath your feet. These impressions of temperature, touch and movement are what we usually call “the senses”, and they are essential for our survival amidst changing surroundings.
- We often take our sensory impressions for granted. But how do our bodies translate sensory impressions into nerve signals that allow us to interpret and perceive the surrounding world? This is what the 2021 Nobel Prize laureates in physiology or medicine have explained.
- The two laureates’ groundbreaking discoveries deal with how a certain specific group of receptors in our nerve cells react to temperature and pressure.

The 2021 medicine laureates

- The 2021 Nobel Prize in Physiology or Medicine is jointly awarded to David Julius and Ardem Patapoutian.
- David Julius utilized capsaicin, a pungent compound from chili peppers that induces a burning sensation, to identify a sensor in the nerve endings of the skin that responds to heat.
- Ardem Patapoutian used pressure-sensitive cells to discover a novel class of sensors that respond to mechanical stimuli in the skin and internal organs.
- These breakthrough discoveries launched intense research activities leading to a rapid increase in our understanding of how our nervous system senses heat, cold, and mechanical stimuli. The laureates identified critical missing links in our understanding of the complex interplay between our senses and the environment.

For the benefit of humankind

- The Nobel Prize-awarded discoveries have explained our vital ability to register temperature, touch and the position of our body parts in space (proprioception).
- The receptors identified by the laureates are important to a number of different biological processes, such as breathing, blood pressure, skeleton formation and chronic pain. They are also important for our perception of space and are linked to our sense of balance.
- The laureates' discoveries can be used in further research as tools for studying the systems that maintain the body's well being – like what happens in the body when someone gives us a hug – and for developing new treatments for various disease conditions, including chronic pain.

The 2021 literature prize

- Abdulrazak Gurnah was born in 1948 on the island of Zanzibar, at the time a part of Tanzania.
- Gurnah has written ten novels and many short stories.
- His first language is Swahili, but he writes literature in English.
- He has also worked as a professor of literary criticism at the University of Kent.
- Gurnah is usually considered to be among the most important post-colonial authors, though he does not want to be labelled as such. In an interview, he has said, "I'd rather not be called anything other than my own name. "
- Colonialism and refugees' experience of displacement are themes that recur in Abdulrazak Gurnah's books.
- Gurnah sheds light on how colonialism has affected East Africa and what happens when different worlds and cultures collide.

The 2021 literature laureate

- While Abdulrazak Gurnah was growing up on Zanzibar, the island was liberated from British colonial rule. What followed was a revolution that led to oppression and persecution of citizens of Arab origin, and Gurnah was among them.
- At the age of eighteen, he was forced to leave behind his family and his life on Zanzibar to live in exile in England.
- As a twenty-one-year-old living in England, Gurnah began to write. In a 2008 interview, he explained why.

Debut and breakthrough

- In 1987, Gurnah made his debut with the novel *Memory of Departure*. It is about a gifted young man on the east coast of Africa who tries to find a way out of a difficult situation at home, with an alcoholic father and a sister who has been forced into prostitution. His prosperous uncle in Nairobi refuses to help him, and he is sent back home.
- Gurnah's breakthrough as a writer came with the 1994 novel *Paradise*. The book is based on stories from the Old Testament and the Quran about Joseph, who rises out of slavery in Egypt to become chief advisor to the Pharaoh. Gurnah sets his version of the story in Tanzania in the early twentieth century.

The 2021 peace prize

- The 2021 Nobel Peace Prize calls attention to the work of journalists around the world and underscores the importance of free, independent and fact-based journalism.
- Freedom of expression and freedom of the press are fundamental rights and preconditions for democracy and lasting peace. Independent journalism contributes to an informed public and serves as a defence against the abuse of power, lies and war propaganda.
- In awarding the peace prize to Maria Ressa and Dmitry Muratov, the Norwegian Nobel Committee underscores how important it is to defend these fundamental rights at a time when journalists' ability to do their critical work is becoming increasingly difficult.

The 2021 peace laureates

- The 2021 Nobel Peace Prize is awarded to journalists Maria Ressa of the Philippines and Dmitry Muratov of Russia.

- Ressa and Muratov are awarded the prize for their courageous efforts on behalf of freedom of expression. For many years, and at risk to their own safety, they have reported on corruption, abuse of power and violations of human rights in their respective countries.
- They have also documented how social media is being used to spread fake news and harass people who are critical of those in power in their countries.

Representative of all journalists who stand up for free speech

- As an investigative journalist and head of the digital news company *Rappler*, Maria Ressa has distinguished herself as a courageous defender of freedom of expression.
- Dmitry Muratov is the editor-in-chief of *Novaja Gazeta*, one of Russia's few independent newspapers. The paper's journalists have been harassed, threatened and killed.
- In its announcement of the prize, the Norwegian Nobel Committee proclaims that the two laureates are representative of all journalists around the world who stand up for free speech in a world in which democracy and freedom of the press face increasingly adverse conditions.

The 2021 prize in economic sciences

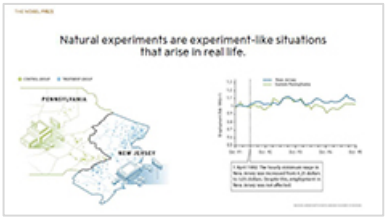
- If we want to make good decisions, we need to understand the consequences of our choices. This applies to both private individuals and public policy makers.
- For example, young people might consider how more years of education could affect their future earnings, whilst politicians might want to know what effects different reforms could have on unemployment.
- Answering questions about cause and effect is not easy, since it's hard to know what would have happened if a different choice had been made.
- This year's laureates have demonstrated that, despite the challenges, it is still possible to answer these kinds of questions by using so-called natural experiments. The key is to make use of situations in which chance or policy changes result in groups of people being treated differently.

The 2021 economic sciences laureates

- The 2021 prize in economic sciences is awarded with one half to David Card and the other half jointly to Joshua Angrist and Guido Imbens.
- David Card has used natural experiments to answer important questions for society.

- Joshua Angrist and Guido Imbens have demonstrated exactly what conclusions we can draw about cause and effect from natural experiments.

Natural experiments are experiment-like situations that arise in real life.



- If researchers in the natural sciences want to determine the effects of a certain medicine, they can randomly divide the study participants into two groups – one that gets the medicine and one that gets a placebo.
- But this method is not useful in some other cases, such as studying how minimum wages affect unemployment. Policy makers cannot decide that in the interest of research one group of people will be paid more than another group for the same work. That would be unethical.
- The solution developed by the economic sciences laureates is instead to use so-called natural experiments – that is, experiment-like situations that arise in real life. For example, they could study how people are affected by policy decisions that have already been made.
- One of the laureates compared how unemployment in two neighbouring states in the U.S. was affected when the minimum wage was raised in one state but not the other.
- Together, the laureates have revolutionized empirical research in the economic sciences. Thousands of researchers around the world now use the laureates' methods to answer questions that economists in the past were unable to answer.

The awarding of the Nobel Prize

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