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For the first time in the 120-year history of the scientific world's most prestigious award, the Nobel Prize in physics was given to climate scientists.

During the award's announcement on Oct 5, three scientists were lauded for their efforts in shining the spotlight on humanity's role in causing the planetary crisis, and developing tools that can help countries deal with the impacts of climate change.

The award comes in the lead-up to the United Nations' climate change conference at the end of this month - underscoring the urgency of nations taking stronger climate action to limit impacts.

The conference, called COP26, aims to finalise details that will help nations implement the 2015 Paris Agreement, under which nations make pledges to limit global warming to well below 2 deg C, preferably to 1.5 deg C, compared with pre-industrial levels.

One of the laureates, Japanese-born American scientist Syukuro Manabe, 90, was among the first to show that pumping carbon dioxide into the atmosphere would raise earth's surface temperature.

He had projected in the 1960s that the doubling of carbon dioxide concentrations in the atmosphere would cause global temperature to rise by over 2 deg C.

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The senior meteorologist at Princeton University had also built the earliest computer climate model in the 1960s. Scientists today are continuing to fine-tune such models, which can help nations take action to reduce the impacts of climate change.

Climate models show how the earth system responds to factors such as the amount of planet-warming emissions. The models will then project how things such as temperature, rainfall and sea levels will be affected.

Prof Manabe shared half of the 10 million Swedish kronor (S\$1.56 million) prize with German Klaus Hasselmann, 89, who was also recognised for his work in laying the foundations for future climate models and global warming projections.

In the 1970s, Prof Hasselmann, who is from the Max Planck Institute for Meteorology in Germany, developed a model that showed how weather and climate are linked.

This link is crucial in helping scientists detect the fingerprints of climate change - which refers to long-term changes to the earth's systems - in weather events, such as heatwaves and droughts, The New York Times reported.

Prof Hasselmann's work also proved that the increased temperature in the atmosphere was due to human emissions of carbon dioxide.



Decades later, in August this year, the United Nations' Intergovernmental Panel on Climate Change (IPCC) declared mankind's role in climate change to be "irrefutable". Planet-warming carbon dioxide is emitted whenever humans burn fossil fuels or clear forests.

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The other half of the Nobel Prize in physics went to Italian Giorgio Parisi, 73, who unscrambled and made sense of disordered physical systems, from atomic to planetary scales. The earth's climate is an example of a complex physical system - and his work helped provide some structure for scientists studying disorderly systems.

The physicist from the Sapienza University of Rome has also dealt with questions such as why the earth has periodically recurring ice ages.

Ice ages were caused by changes in how the planet moved around the sun, affecting how much sunlight it receives.

But while the climate has changed before due to natural causes, humans are warming the planet at an unprecedented rate.

The laureates' work has had rippling effects through the generations - and inspired climate scientists in Singapore.



Nanyang Technological University (NTU) senior research fellow Dhrubajyoti Samanta, who is from the university's Asian School of the Environment, was especially excited by Prof Hasselmann's Nobel win.

Dr Samanta had previously applied the laureate's climate model while studying how the surface temperature of the western tropical Pacific ocean changes every 100 years. Prof Hasselmann's model explained how fast-changing weather patterns, such as changes in wind speed, can lead to slow-changing ocean characteristics, such as temperature.

Singapore Management University's Associate Professor Winston Chow, who is also an IPCC author, recalls having read Prof Manabe's 1967 paper while pursuing his PhD in geography at Arizona State University.

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"It was definitely ahead of its time," said Prof Chow of the paper that outlined the meteorologist's climate model.

"(His work) laid a strong foundation of how (climate science) developed over the next 50 years, and enhanced our understanding of the causes of climate change."

Weather and climate scientist Koh Tieh Yong from the Singapore University of Social Sciences said the Nobel Prize "signals the growing significance of climate science", and could help spur developed countries to pump in more research funding for the field.

"This means a less bumpy career path for the next generation of climate scientists," he added.

At a press conference, The Royal Swedish Academy of Sciences' secretary-general Goran K. Hansson said the award underscored the fact that declarations of the climate crisis were grounded in science.

The academy selects the laureates across the fields of physics, medicine, chemistry, peace, literature and economic sciences.

This year's chemistry prize, given to two scientists who developed a new tool to build molecules for various uses such as drug-making, also had environmental links. The tool lessens the impact of chemistry on the environment by reducing waste, for instance.

As for the Nobel Prize in medicine, key contenders had been Hungarian-born Katalin Kariko and American Drew Weissman - the brains behind the mRNA technology used in Covid-19 vaccines such as the ones by Pfizer-BioNTech and Moderna. Instead, the award went to two scientists for their discovery of receptors in the body that can sense temperature and touch.

Science journal Nature noted that nominations had to be sent in by Feb 1 - soon after mRNA vaccines were rolled out. Their impact on the pandemic was still unclear then. But scientists are positive that mRNA will be recognised down the road, Nature reported.

Dr Hansson said: "The development of mRNA vaccines is a wonderful success story that has had enormous positive consequences for humankind... We want to give credit to the right people. And for the right discovery... So stay tuned."