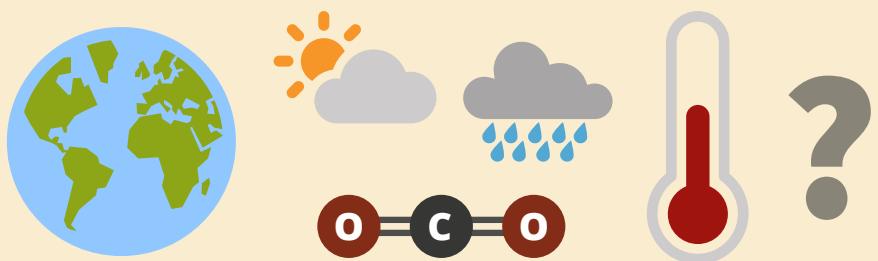


2021 NOBEL PRIZE IN PHYSICS

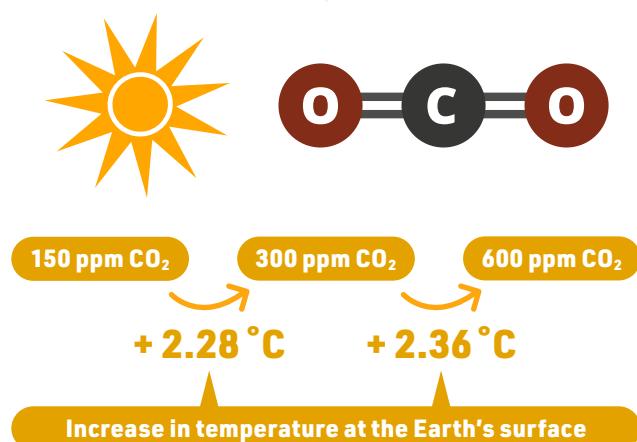


Awarded to **Syukuro Manabe** and **Klaus Hasselmann** for physical modelling of the Earth's climate, and to **Giorgio Parisi** for the discovery of the interplay of disorder and fluctuations in physical systems.

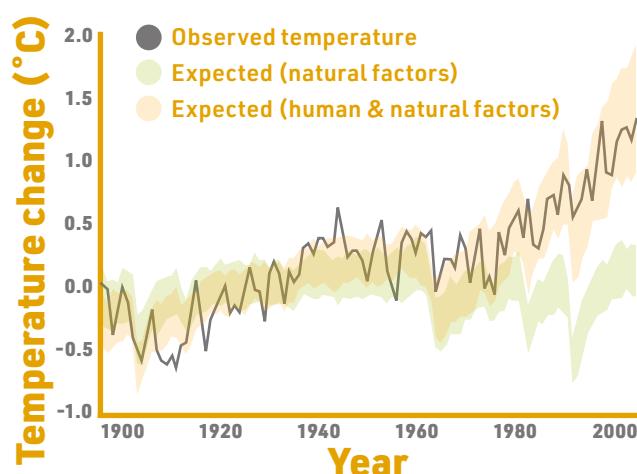


Predicting the behaviour of complex systems like Earth's climate is difficult. This year's prize-winning research allows scientists to describe and predict the long-term behaviour of these complicated and seemingly random systems.

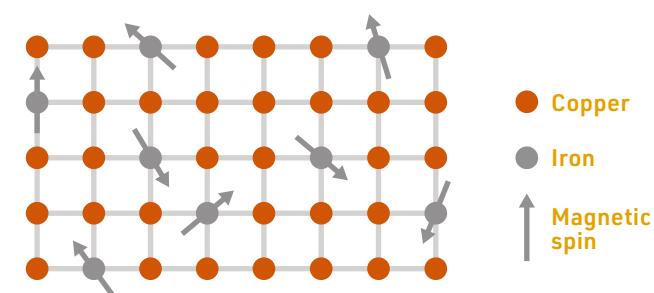
Syukuro Manabe demonstrated how increasing the amount of carbon dioxide in Earth's atmosphere increases temperatures at the Earth's surface. His mathematical models of the Earth's climate informed the climate models used today.



Klaus Hasselmann incorporated the 'noise' of changeable weather data into climate modelling. His work also identified ways in which the impact of human and natural processes on Earth's climate could be identified and compared.



Giorgio Parisi showed that, in complex systems, things which appear random are still subject to hidden rules at a simple level. His work can explain phenomena from magnetic behaviour in complex metal alloys to patterns in starling murmurations.



Spin glass is one of the complex systems Parisi studied. It's an alloy with iron atoms in place of some copper atoms. The magnetic spins of the iron atoms align randomly, without a regular pattern.

WHY DOES THIS RESEARCH MATTER?



The work of this year's winners has helped us understand how humanity influences Earth's climate, and predict how it may change. It also helps us describe and predict the behaviour of other complex systems within and beyond physics.

Nobel Prize in Physics Press release: <https://www.nobelprize.org/prizes/physics/2021/press-release/>