New insights into quantum measurements

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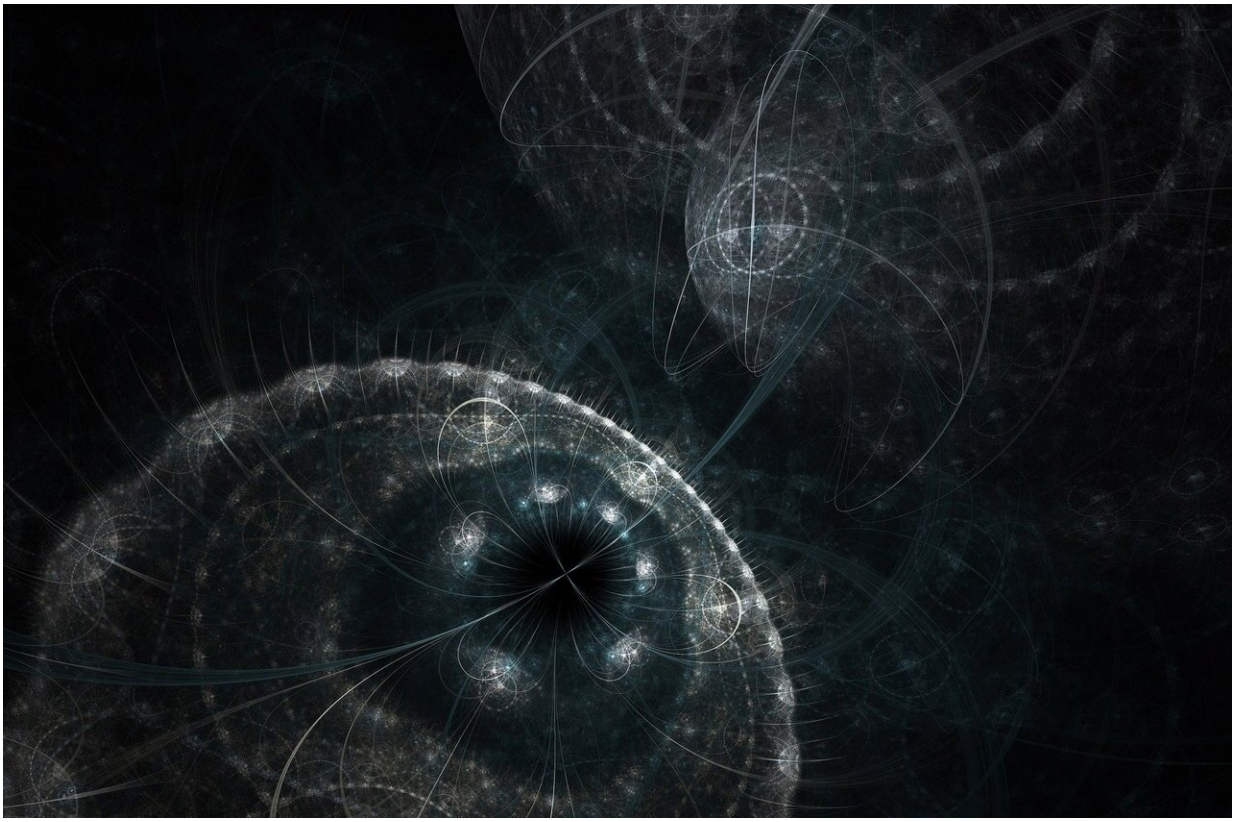

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Researchers from the University of Bristol have shed new light on the process of quantum measurement, one of the defining, and most quantum features of quantum mechanics.

As reported in *Physical Review Letters*, Dr. Paul Skrzypczyk and

Professor Noah Linden looked at the way in which we gain information about the world at the quantum scale through the process of measurement. This work has been selected as an Editor's Suggestion "due to its particular importance, innovation, and broad appeal."

They found that the ability for a measurement to be highly informative is intimately related to how robust the measurement is to imperfections or noise. They also uncovered a connection to a branch of quantum information science which concerns communication. Viewing the measurement as a special type of communication channel, they found that its ability to communicate well is related in the same way to how robust the measurement is to imperfections.

"Understanding the process of measurement in quantum mechanics is a fundamental question, that has been extensively studied in the past," said Dr. Skrzypczyk, from Bristol's Quantum Information Institute.

Prof Linden added: "As with any basic question, a true understanding is going to be multifaceted. We have added a new facet to our understanding of the measurement process, by linking the informativeness of a measurement to its robustness against noise and to quantum communication theory."

Quantum mechanics is a field of research that has a reputation for being counterintuitive. This latest study is likely to inspire further investigation, since the links uncovered in this work appear to have analogues in other contexts, concerning other aspects of quantum mechanics beyond the measurement process.

Dr. Skrzypczyk added: "We would like to explore the generality of our results more widely in quantum mechanics and in quantum information science. Our initial explorations hint that we have uncovered a first example of a much more general phenomenon. It is very exciting to

embark on our investigations of just how general they might ultimately be."

More information: Paul Skrzypczyk et al. Robustness of Measurement, Discrimination Games, and Accessible Information, *Physical Review Letters* (2019). DOI: 10.1103/PhysRevLett.122.140403