There's a kind of Hush surrounding quantum systems

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(Phys.org) —Has a persistent noise ever kept you awake at night? Well it isn't just you. Scientists at The University of Nottingham have had the same problem with quantum technologies.

But their sleepless nights could be over. Inspired by old technology, researchers at The University of Nottingham in collaboration with a team from The University of Queensland have proposed a way to make technologies of the future more stable.

Carrying out Nottingham's theoretical work on improving quantum technologies is Dr Michael Hush in the School of Physics and Astronomy. He said: "Quantum systems are extremely sensitive to noise, and as little as one per cent can stop some quantum technologies from working. Our study, inspired by noise-cancelling headphones demonstrates that by measuring the noise - then feeding it back in the

right way - can cancel the noise's effect on the system.

Scientists already have some tools at their disposal: isolating the system from the noise or using sophisticated encoding and detection to detect when the noise causes an error. Despite these tricks, the noise is still too loud.

Hush by name hush by nature

Research Fellow Michael Hush, working with theoretician Stuart Szigeti and his collaborators, has come up with a new idea. He was helped by James Morley, a summer student funded by The University of Nottingham, who is now back at Oxford University to continue his studies.

Dr Hush said: "Unlike noise-cancelling headphones, in quantum systems it is sometimes impossible to correctly measure the important noise. We solved this problem by showing that, counterintuitively, adding extra noise allows for the correct measurement, which can then be used to cancel the noise with feedback."

It is hoped scientists will soon use this technique to dampen the noise in quantum systems that little bit more, and sleep well at night.

The research: Ignorance is bliss: General and robust cancellation of decoherence via no-knowledge quantum feedback has been published in *Physical Review Letters*.

More information: Stuart S. Szigeti, Andre R. R. Carvalho, James G. Morley, and Michael R. Hush. "Ignorance Is Bliss: General and Robust Cancellation of Decoherence via No-Knowledge Quantum Feedback." *Phys. Rev. Lett.* 113, 020407 – Published 10 July 2014

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