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# UQ scientists explore the quantum world to fight

A University of Queensland researcher is set to enhance disease-detecting technology through quantum mechanics after winning a $100,000 UQ Foundation Research Excellence award.

Dr Warwick Bowen and his research team will study laws of physics at the microscopic level of atoms, protons, neutrons and electrons to improve medical-sensing devices such as magnetic resonance imaging.

UQ is poised to take a world lead in quantum mechanics research due to strong international collaborations and recent Australian Research Council (ARC) award of $24.5 million, on-campus engineered quantum systems centre.

搃y research will look at using cantilevers as biological sensors to detect target molecules, which may be markers for cancers and other diseases in a patient's body,?Dr Bowen said.

揻or example, using microscopic cantilevers we can enhance MRI to detect and identify single molecules in human samples.

揾t may then be possible to treat patients long before their illness becomes serious.?

His research will also lead to the development of temperature standards to improve the accuracy of temperature gauges.

The $100,000 grant has been used to buy a hi-tech laser, pivotal to Dr Bowen's research team's experiments.

搃his laser is quantum-noise limited, and will give us enormous precision when measuring and analysing atomic forces,?Dr Bowen said.

搃his is critical to the success of all research aims of the project.

The research was based on recent developments in nanotechnology and laser physics.

搃hese recent scientific developments allow for the first-time, micro-structured mechanical springboards, called 慶antilevers', to behave in a quantum way,?he said.

搃hese cantilevers resonate mechanically just like a tuning fork does when tuning a musical instrument ?cantilevers however have a higher frequency ?higher than the human ear can hear.

孳antilevers have many sensing applications, for example, if placed near a surface the pitch of their resonance is minutely changed.?

Dr Bowen also said his research would further explore quantum mechanics to improve

society's knowledge and understanding of the laws of physics.

摩or a century, a great debate has raged between physicists regarding the two most successful theories of physics: quantum mechanics, the physics of the ultra-small; and Einstein's general relativity, the physics of stars, planets, and galaxies,?Dr Bowen said.

摋hese theories are fundamentally incompatible, and hence one ?or both ?must be wrong. 摨owever, due to the huge difference in size scales, experiments, which involve both theories are extremely challenging.

摭ne example is the $10 billion Large Hadron Collider in Europe. The quantum cantilevers being developed in my laboratory are one of only a few other systems which in future may be able to test these ideas.?

Dr Bowen's team includes researchers from Australia, Germany, the United States, New Zealand, and China.

The team collaborates with world-leading physicists at the Max Plank Institute in Quantum Mechanics in Germany and the University of Kyoto in Japan.

Dr Bowen, from UQ's School of Mathematics and Physics in the Faculty of Science, received his award at a special ceremony at Customs House on Wednesday, September 22, as part of UQ's annual Research Week.

The UQ Foundation Research Excellence Awards have been running for 12 years and are an initiative of UQ to recognise outstanding performance and leadership potential in early career researchers. A total of $910,000 was awarded this year.

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