Physicist demonstrates dictionary definition was dodgy

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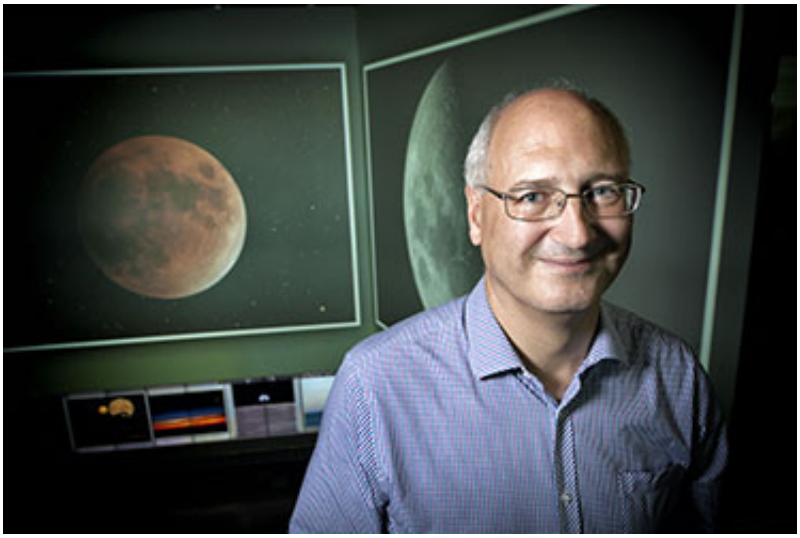

Dr Stephen Hughes says the experiment demonstrates the previous definition of siphon was incorrect.

It is the defining moment that demonstrates a QUT physicist was correct in pointing out a 99-year-old mistake to one of the world's most authoritative dictionaries.

QUT Senior Lecturer in Physics, Dr Stephen Hughes, sparked controversy over how a humble siphon worked when he noticed an incorrect definition in the prestigious Oxford English Dictionary.

In 2010, eagle-eyed Dr Hughes spotted the mistake, which went

unnoticed for 99 years, which incorrectly described atmospheric pressure, rather than gravity, as the operating force in a siphon.

Dr Hughes demonstrated the science of siphons in a paper published yesterday in Nature Publishing Group journal *Scientific Reports*.

For Exploring the boundary between the siphon and barometer in a hypobaric chamber, Dr Hughes conducted an experiment in a hypobaric chamber, which simulates the effects of high altitude, at the Institute of Aviation Medicine at the Royal Australian Air Force's Base Edinburgh in South Australia.

A siphon 1.5 metres high was set up in the chamber and when the pressure was reduced to an altitude of 40,000 feet a waterfall appeared at the top, but the water flow remained nearly constant.

At 41,000 feet, the siphon broke into two columns of water and, when returned to 40,000 feet, it reconnected as if nothing had happened.

Atmospheric pressure at 40,000 feet, which is more than 10,000 feet higher than Mount Everest, is about 18 per cent of the sea level value.

For the experiment, two buckets, one higher than the other and connected by tubing, were set up and a pool pump returned water from the lower bucket to the higher bucket.

"The fact that the water level in the upper and lower buckets is constant indicates that atmospheric pressure is not pushing water into the siphon," Dr Hughes said.

"The stable water surfaces act like energy barriers between the atmosphere and siphon. For energy to be transferred from the atmosphere to the water the water level would have to go down, since the

amount of energy transferred is equal to force times distance.

"If the water level is constant the distance is zero and therefore no energy can be transferred."

Dr Hughes, whose previous research has taken him to Bhutan to examine how siphoning could prevent inland tsunamis, said siphons had been used since ancient times but how they work was still debated.

"If you think of a car, atmospheric pressure is like the wheels, it enables it to work. But gravity is the engine," he said.

"It is gravity that moves the fluid in a siphon, with the water in the longer downward arm pulling the water up the shorter arm."

The Oxford English Dictionary corrected the error and removed the reference to atmospheric pressure after Dr Hughes pointed it out. However, he said the new entry "unfortunately remains ambiguous".

"This definition still leaves the question open as to how a siphon actually works," Dr Hughes said.

"But at least the reference to atmospheric pressure has been removed. The vast majority of dictionaries of all languages still incorrectly assert that siphons work through atmospheric pressure and not gravity.

"I hope these findings are a useful contribution to the debate about how siphons work and will enable people to make more effective use of them."

More information: Paper: www.nature.com/srep/2014/14042 … /full/srep04741.html

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