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Other ways of measuring 'Big G'

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In 1798, the British scientist Henry Cavendish performed the first laboratory experiment to determine the gravitational force between two massive bodies. From his result, Newton's gravitational constant, G, was calculated. Cavendish's measurement principle was the torsion balance invented by John Michell some 15 years before. During the following two centuries, more than 300 new measurements followed. Although technology – and physics – developed rapidly during this time, surprisingly, most experiments were still based on the same principle. In fact, the most accurate determination of G to date is a measurement based on the torsion balance principle. Despite the fact that G was one of the first fundamental physical constants ever measured, and despite the huge number of experiments performed on it to this day, its CODATA recommended value still has the highest standard measurement uncertainty when compared to other fundamental physical constants. Even more serious is the fact that even measurements based on the same principle often do not overlap within their attributed standard uncertainties. It must be assumed that various experiments are subject to one or more unknown biases. In this talk I will present some alternative experimental setups to the torsion balance which have been performed or proposed to measure G. Although their estimated uncertainties are often higher than most torsion balance experiments, revisiting such ideas is worthwhile. Advances in technology could offer solutions to problems which were previously insurmountable, these solutions could result in lower measurement uncertainties. New measurement principles could also help to uncover hidden systematic effects.