NATURE

100 YEARS AGO

A few weeks ago the new anthropological collections in the American Museum of Natural History in New York were opened to the public, and these valuable collections now occupy five halls, and others are being provided. We learn from our contemporary, *Science*, that the accessions to the anthropological collections of the museum obtained during the last three years have largely been due to extended scientific research undertaken by the institution… an endeavour has been made to build up representative collections and to obtain, at the same time, the fullest and most detailed information in regard to specimens, so that each addition to the exhibit of the museum can be made thoroughly instructive and will represent a material contribution to science. There is no doubt this is the best way to build up a museum, and it is to be deplored that various museums of the British Islands do not follow the example so worthily set by this and other American museums. Our English method is rather to wait like a spider in its web in the hope that something will eventually be caught … we are content with occasional specimens which usually have no history, or at most a very imperfect one, and for these we often have to pay a stiff profit to a dealer.

From *Nature* 20 December 1900.

50 YEARS AGO

For one of the staff — one of the "working staff" as Sir James Dewar used to call us — to be asked to give a Friday Evening Discourse is, I think, quite without precedent and I am very conscious of the honour the Managers have conferred on me in inviting me to give a talk about fifty years in the service of the Royal Institution. According to tradition, on one occasion many years ago, a Friday Evening lecturer had a sudden attack of stage fright at the last moment and, being unattended, fled. Fortunately, Faraday was present and stepped into the breach. So that there should be no recurrence of a similar catastrophe, every Friday evening someone waits outside with the lecturer to ensure that he enters this theatre as the clock strikes. For many years that has been one of my duties; but to-night the position has been reversed and I have been the guarded one. I can assure you I have every sympathy with Wheatstone, the one that ran away.

Ralph Cory, Librarian of the Institution.

From *Nature* 23 December 1950.

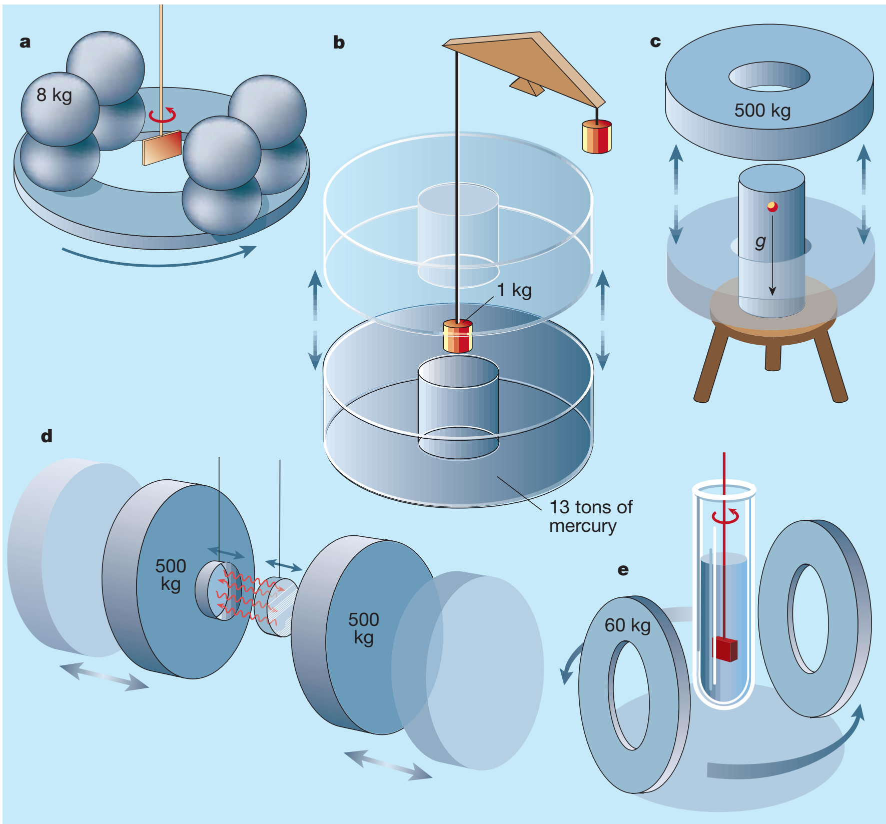

Figure 1 **Updating Cavendish in measuring *G*.** a, **Gundlach and Merkowitz[2] have set a new standard for measuring *G* with a torsion-balance experiment in which eight spheres on a rotating disc turn to follow a thin plate suspended on a fibre, driven by the gravitational torque from the spheres. There are other ways to measure *G*, for example:** b, **an experiment in which a beam balance is used to measure the weight of a 1-kg mass on the pan of the balance when 13 tons of mercury are displaced from above to below it;** c, **an experiment in which laser interferometry is used to measure the change in downward acceleration of a falling body when a 500-kg mass is displaced from above to below it;** d, **an experiment using the gravitational attraction of large 500-kg masses to displace small masses hanging from a pair of pendulums that act as optical or microwave cavities; and** e, **a cryogenic torsion balance in liquid helium in which doughnut-shaped masses (at room temperature) turn around a thin plate suspended from the cold fibre.**

attraction from the effects of *g*. However, whether *G* is measured using a torsion balance or any other device, it is necessary to construct test masses whose dimensions and density are known with sufficient accuracy. If spherical or cylindrical masses are used that have perfect geometry, the effects of density variation can be eliminated by random changes in orientation. But this does not work if the geometry is not perfect and, in any case, becomes more difficult with larger masses.

In the absence of any advances in physics linking gravity to the rest of science, there have been no really new methods of measuring *G* since the time of Cavendish. Despite a flurry of excitement over the 'fifth force' in the 1980s, or apparently strange gravitational effects acting on spinning rotors reported in the 1990s, Newton continues to reign supreme in laboratory gravitation. Nevertheless, measurements of *G* hold great interest for both cosmology and particle physics; in the latter case it has been suggested that the compact dimensions predicted by 'superstring theory' might show up in the behaviour of *G* at small (< 1 mm) distances[3].

The current interest in measuring *G* was stimulated by the publication[4] in 1996 of a value for *G* that differed by 0.6% from the accepted value given in the previous 1986 CODATA report. To take account of this, the 1998 CODATA report recommends a value for *G* of 6.673×10^{-11} m^3 kg^{-1} s^{-2} with an uncertainty of 0.15%, some ten times worse than in 1986. Whereas the other fundamental constants were more accurately known in 1998 than in 1986, the uncertainty in *G* increased dramatically. The *G* community appeared to be going backwards rather than forwards.

Since 1998, several groups around the world have set about measuring *G*, using a range of different methods. At a symposium held in London in 1998 to celebrate the bicentenary of Cavendish's experiment, reports of eight experiments then under way were presented[5], some of which are shown in Fig. 1. The target uncertainty for these experiments is between 0.01% and 0.001%. Mostly preliminary results have been published so