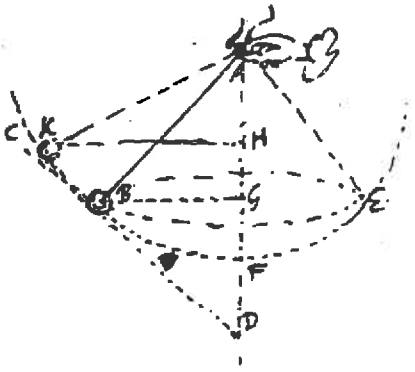
HUYGENS' METHODS OF MEASURE

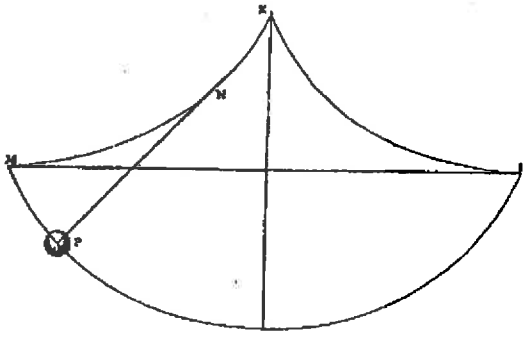
Theoretically derived law of the conical pendulum:

$$P = \pi\sqrt{2h/d_g} = 2\pi\sqrt{h/g}$$



Theoretically derived law of the cycloidal pendulum:

$$T = \pi\sqrt{\ell/2d_g} = \pi\sqrt{\ell/g}$$



Therefore, by measuring P and h, or T and ℓ, to high accuracy, can obtain a theory-mediated accurate measure of d_g, the distance of vertical fall in the first second in the absence of air resistance.

MEASURING THE STRENGTH OF GRAVITY

	DATES	METHOD	VERTICAL FALL IN FIRST SECOND	EQUIVALENT g in cm/sec^2
MERSENNE	mid-1640s	DIRECT	12 Paris ft	788.8
RICCIOLI	late 1640s	DIRECT	15 Roman ft	935.0
HUYGENS	1659	CONICAL PENDULUM	15.6 Rhen ft	979.4*
	1659	CYCLOIDAL PENDULUM	15 Rhen ft 7 1/2 in	980.9
	1660s & 70s	SECONDS-PENDULUM	15 Paris ft 1.1 in	980.7
{NEWTON	late 1660s	CONICAL PENDULUM	195 London in	989.4}**

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* Without rounding, 15.625 Rhen ft and 980.9 cm/sec^2

** Apparently just to check Huygens's value

NB Modern measured g at Paris = 980.970 cm/sec^2

MEASURED LENGTHS OF THE SECONDS-PENDULUM

	LOCATION	LATITUDE	LENGTH (Paris units)	IMPLIED g (cm/sec^2)
HUYGENS	Paris	48°50′	3ft 8 1/2 lines	(980.7)*
RICHER	Paris	48°50′	3ft 8 3/5 lines	(980.9)*
	Cayenne	4°55′	$\Delta\ell$ = 1 1/4 lines	(978.1)
VARIN et al	Paris	48°50′	3ft 8 5/9 lines	(980.7)*
	Goree	14°40′	$\Delta\ell$ = 2 lines	(976.4)
	Guadaloupe	15°00′	$\Delta\ell$ = 2 1/18 lines	(976.3)
PICARD	Paris	48°50′	3ft 8 1/2 lines	(980.7)*
	Uraniborg	55°54′	$\Delta\ell$ = 0 lines	(980.7)
	Cape Cete	43°24′	$\Delta\ell$ = 0 lines	(980.7)
MOUTON	Lyons	45°47′	3ft 6 3/10 lines	(975.8)

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* Modern measured g at Paris = 980.970 cm/sec^2

Modern average g at Equator = 978.032 cm/sec^2

NB Latitudes vary slightly from individual to individual