

27

# Galileo's Parabola

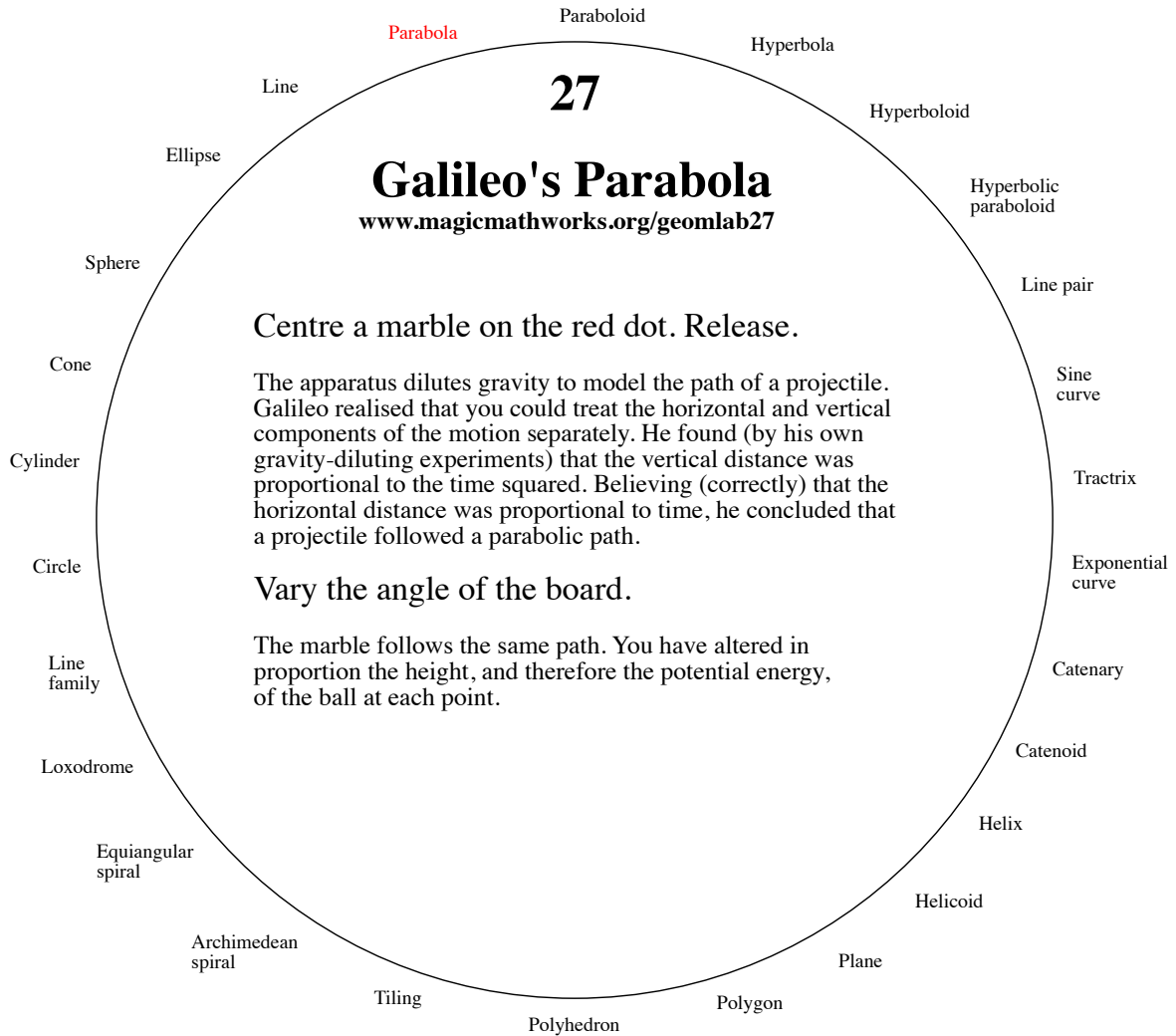
[www.magicmathworks.org/geomlab27](http://www.magicmathworks.org/geomlab27)

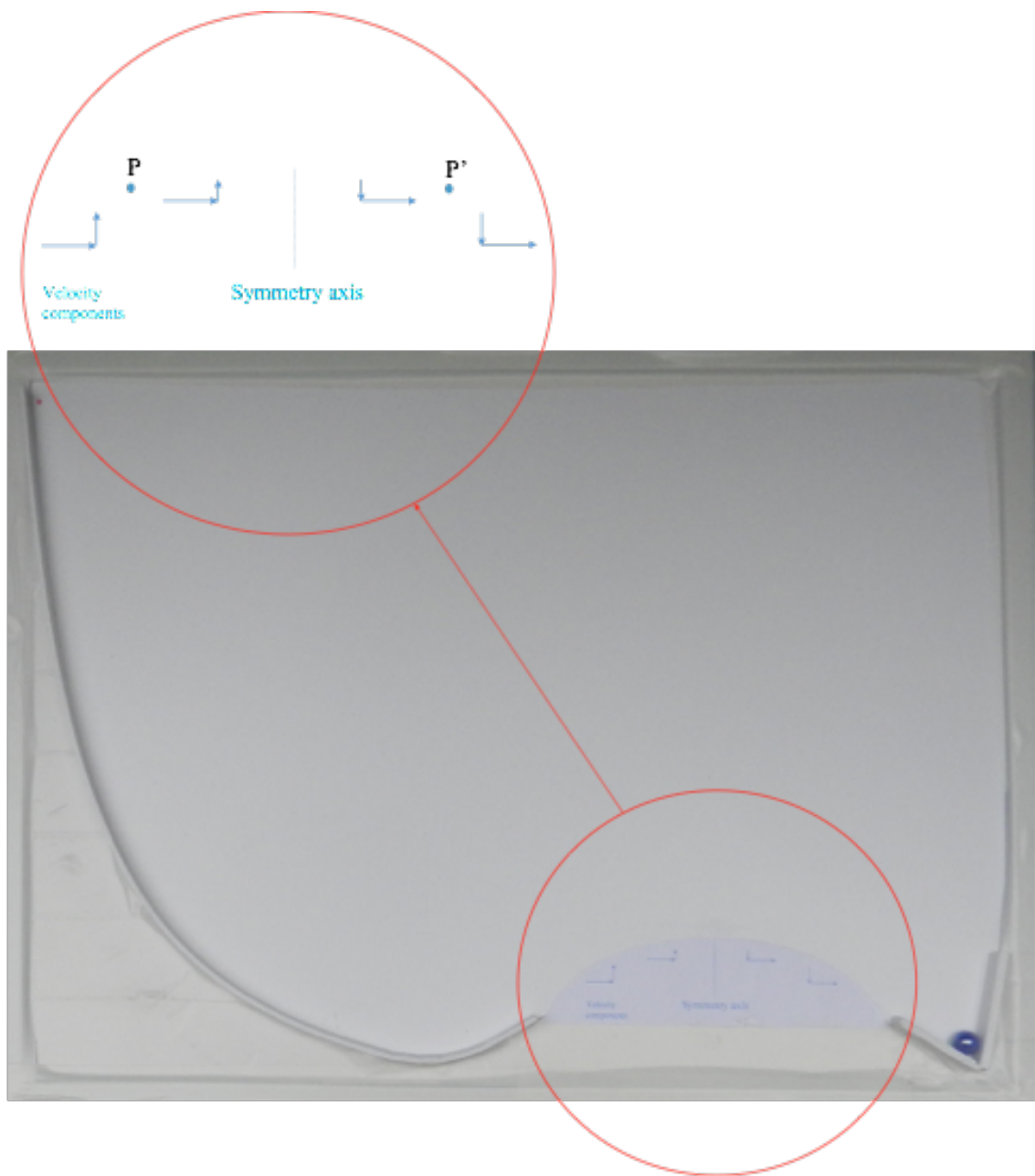
Centre a marble on the red dot. Release.

The apparatus dilutes gravity to model the path of a projectile. Galileo realised that you could treat the horizontal and vertical components of the motion separately. He found (by his own gravity-diluting experiments) that the vertical distance was proportional to the time squared. Believing (correctly) that the horizontal distance was proportional to time, he concluded that a projectile followed a parabolic path.

Vary the angle of the board.

The marble follows the same path. You have altered in proportion the height, and therefore the potential energy, of the ball at each point.





The symmetry is spatial:  $P$  maps to  $P'$ . But the motion is also symmetrical with respect to time. If we set the time on the axis to zero, the ball arrives at the point  $P$  at time  $-T$  and the point  $P'$  at time  $+T$ . At time  $-T$  it is moving upwards at the same speed as it is moving downwards at time  $+T$ .