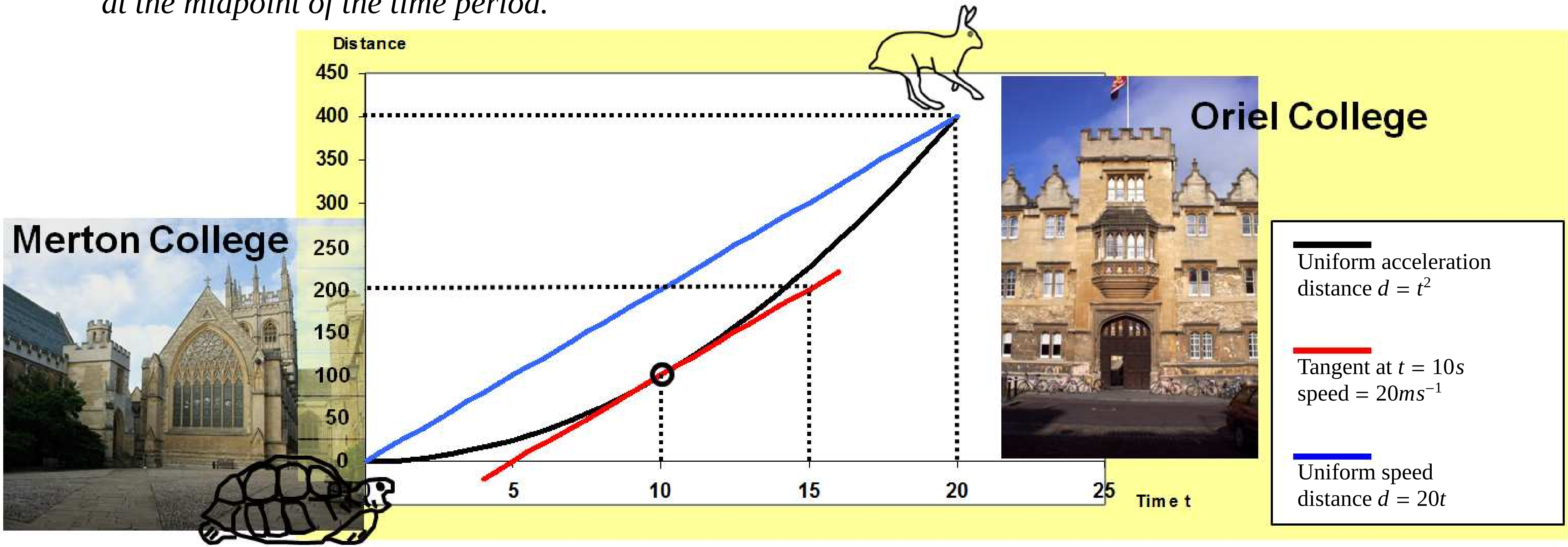
THEOREM OF THE DAY

The Merton College Theorem *During a given time period, the distance travelled by a body A under constant acceleration is equal to that travelled by a body B, moving uniformly at the speed attained by A at the midpoint of the time period.*



Suppose it takes 20 seconds for A (the black line — the hare) to travel, under constant acceleration of 2 ms^{-2}, from Merton College, 400 metres down Merton Street to Oriel College. In the graph, the distance covered at time t is mapped out by the curve $d = t^2$. The derivative of this, $2t$, gives the speed; the derivative of *this* is 2, giving the constant acceleration. Half-time is 10 seconds at which time the speed is $2t = 2 \times 10 = 20\,ms^{-1}$. This has been drawn as a red *tangent* to the black distance curve at $t = 10$; its slope is $(200 - 0)/(15 - 5) = 20$. The distance of B (blue — the tortoise) is mapped by a line exactly parallel to the tangent. Starting at Merton college, B's trajectory will coincide with A's at precisely $t = 20s$: this is what the Merton College Theorem asserts.

The Merton college theorem also goes by the name of the Mean Speed Theorem (and even Merton's Theorem, although Walter de Merton, 1205–1277, founder of Merton college, was not a scientist but a politician, chancellor to Henry III and Edward 1). It was discovered by the famous mathematicians of Merton college in the 14th century, the *Oxford Calculators*: Bradwardine, Heytesbury, Swineshead and Dumbleton, contempories there of William of Occam. It was perhaps first proved rigorously by Nicole Oresme (1323–1382) using a precursor to Descartes' analytic geometry and is closely associated with the *Law of Falling bodies* discovered by Galileo in the early 17th century.

Web link: aleph0.clarku.edu/~ma121/FTC.pdf. The images of Merton and Oriel are from their Wikipedia pages.

Further reading: *Oxford Figures: 800 Years of the Mathematical Sciences* by J. Fauvel, R. Flood and R.J. Wilson, (eds.) OUP, 2000.