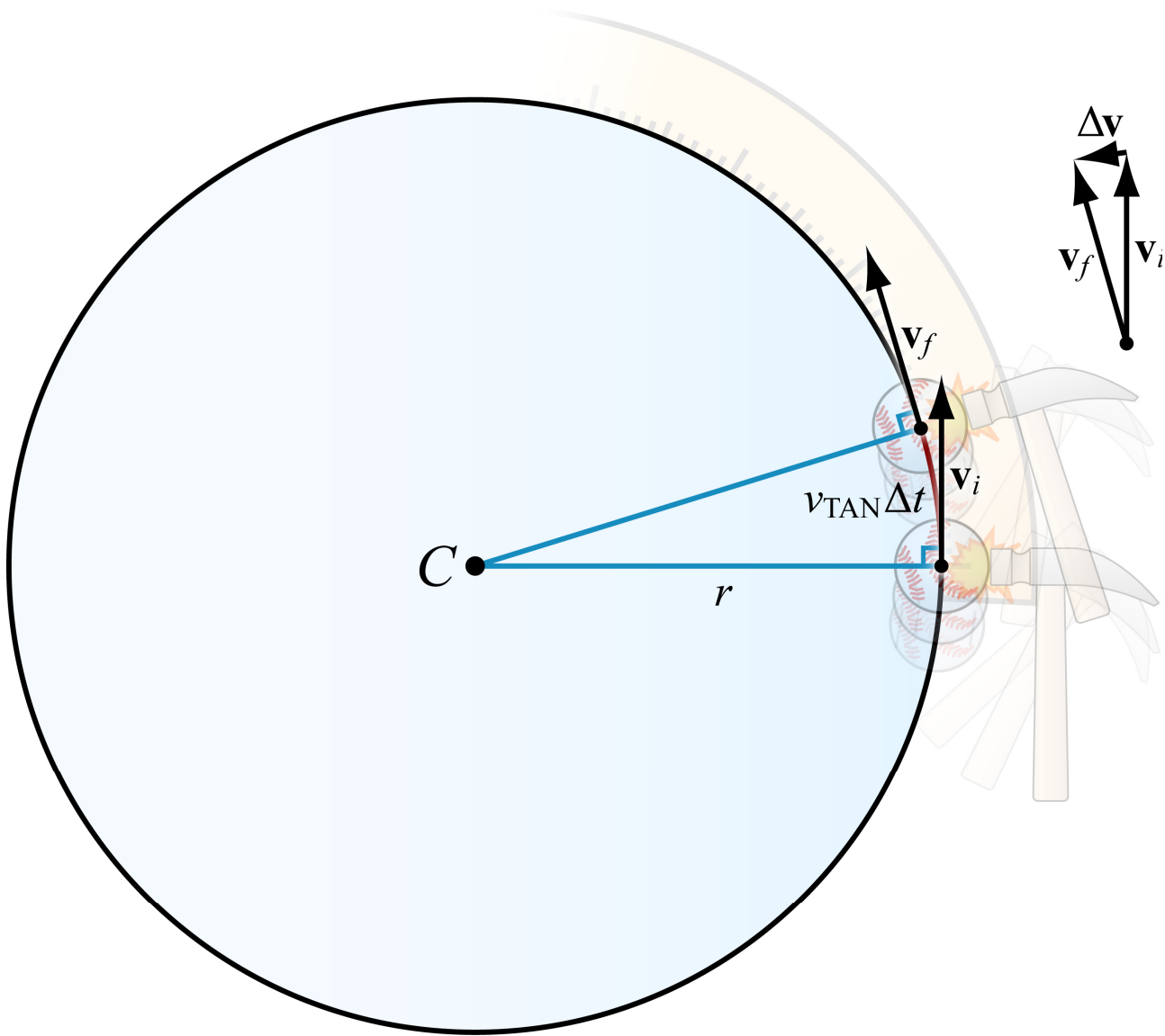


Uniform circular motion: Magnitude of centripetal acceleration



Consider very small $\Delta \mathbf{v}$ and very small Δt

$$\frac{|\Delta \mathbf{v}|}{v_{\text{TAN}}} \approx \frac{v_{\text{TAN}} \Delta t}{r}$$

$$\frac{|\Delta \mathbf{v}|}{\Delta t} \approx \frac{v_{\text{TAN}}^2}{r}$$

$$a_{\text{IN}} = \lim_{\Delta t \rightarrow 0} \left| \frac{\Delta \mathbf{v}}{\Delta t} \right|$$

$$= \lim_{\Delta t \rightarrow 0} \frac{|\Delta \mathbf{v}|}{\Delta t}$$

$$a_{\text{IN}} = \frac{v_{\text{TAN}}^2}{r}$$