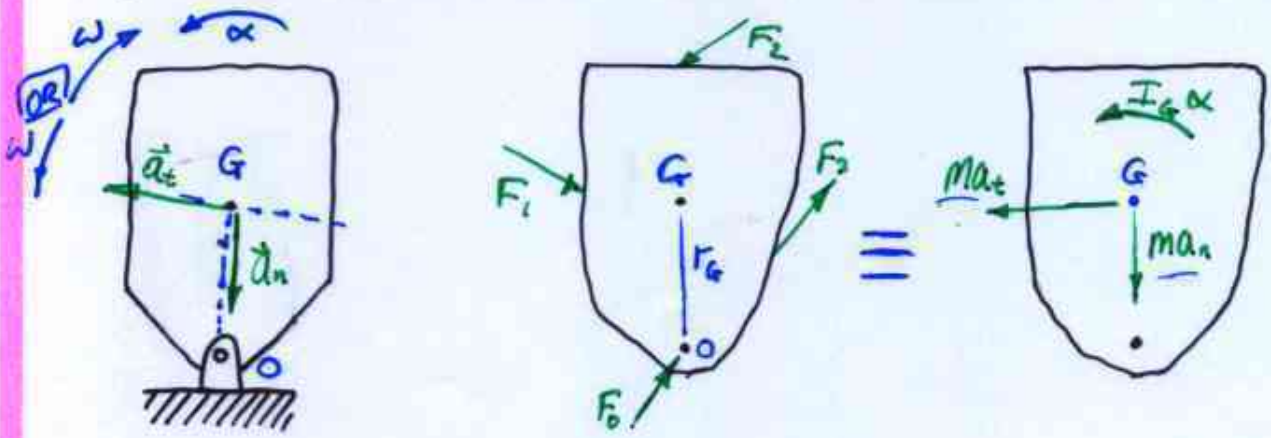


# PLANE KINETICS OF RIGID BODIES

Last week we looked at TRANSLATION

## THIS WEEK: FIXED AXIS ROTATION

ALL POINTS ON BODY MOVE ALONG CIRCLES WITH A COMMON CENTRE AT THE AXIS OF ROTATION



$$a_n = r_G \omega^2$$

$$a_t = r_G \alpha$$

N.B. note that a force occurs at O

As before we can write

$$\sum \vec{F} = m \vec{a}_G$$

*vector sum*                      *combination*

$$\sum M_G = I_G \alpha$$

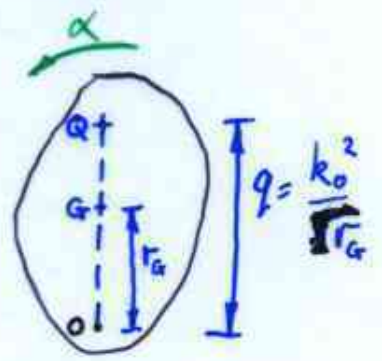
*SCALAR BECAUSE 2D PROB*

Often handier to sum moments about O

$$\Rightarrow \sum M_O = I_O \alpha \quad (\text{derived last week})$$

## Center of Percussion

combine resultant force  $ma_t$  and moment  $I_G \alpha$  by moving  $ma_t$  to a parallel pos'n @ point Q



$$m \overbrace{r_G}^{a_t} \alpha q = I_G \alpha + m r_G \alpha r_G$$

$$\Rightarrow q = \frac{k_O^2}{r_G} \leftarrow (\text{radius of gyration})^2 \text{ about } O$$

$$\sum M_O = 0$$