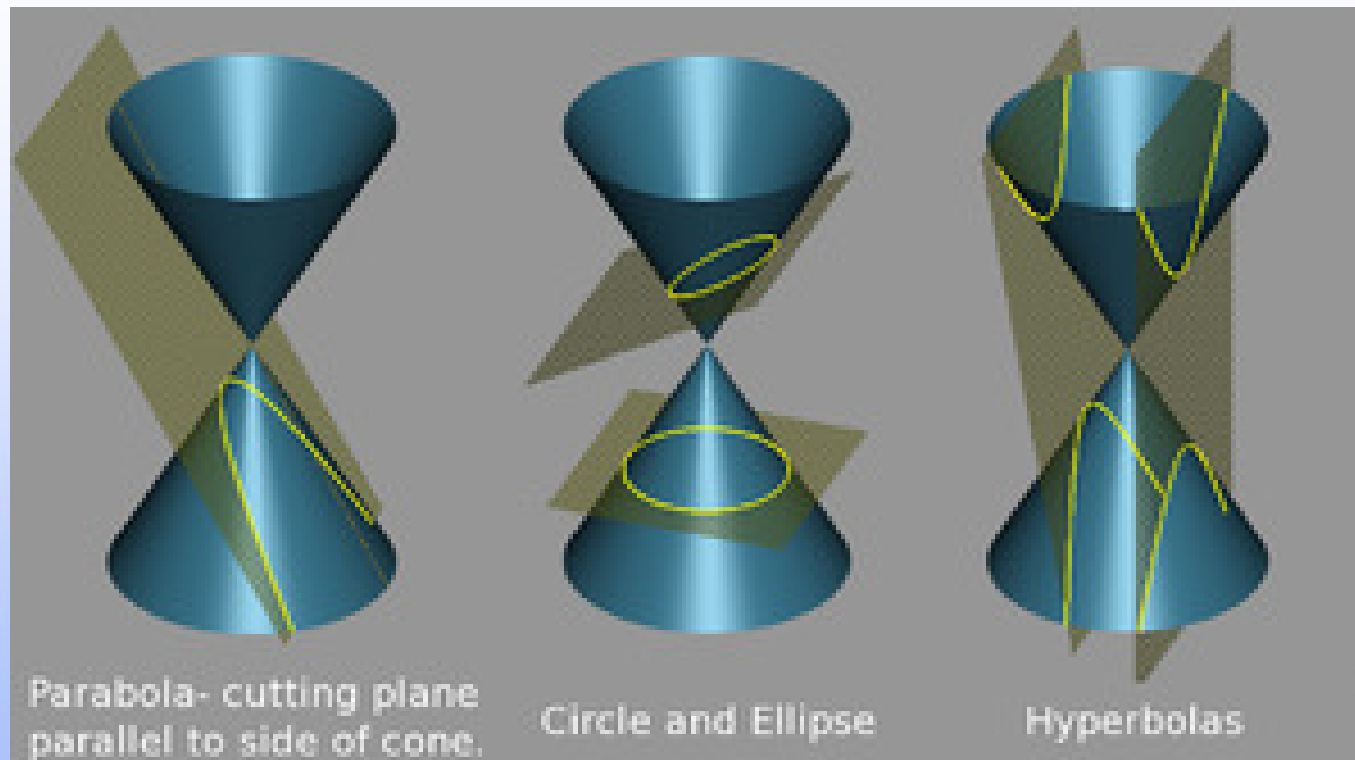
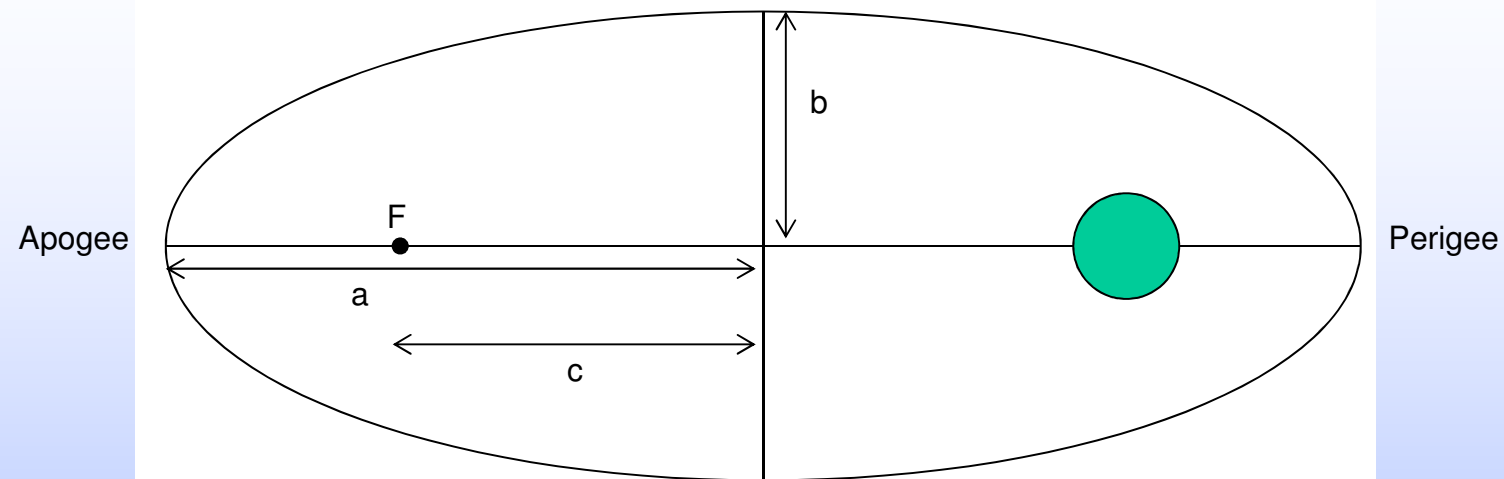


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## Conic sections



# The ellipse

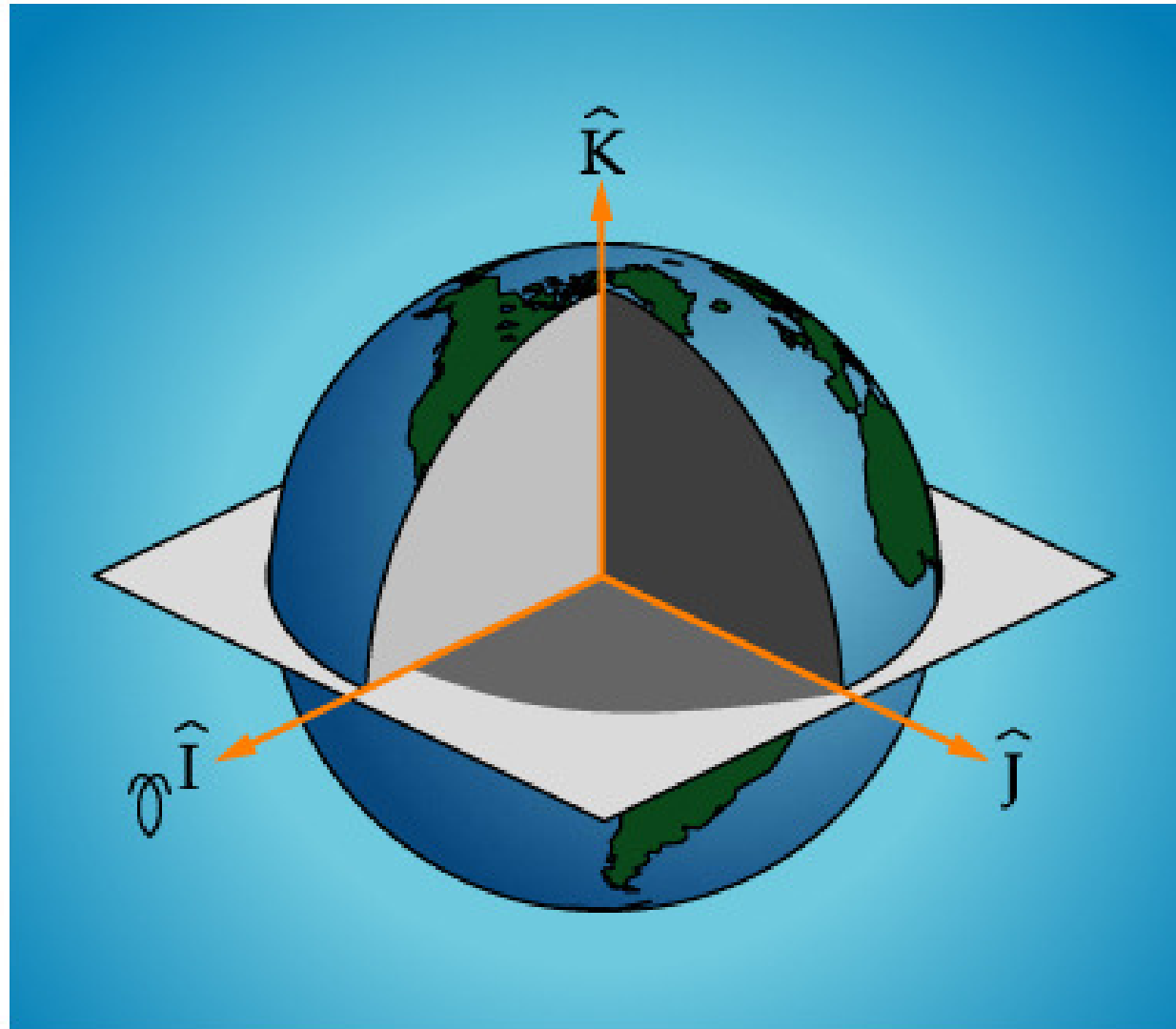


$2a$  is the major axis  
 $a$  is the semimajor axis

$e = c/a$  is the eccentricity  
 $c^2 = a^2 - b^2$

Circle  $e=0$   
Ellipse  $0 < e < 1$   
Parabola  $e=1$   
Hyperbola  $e > 1$

# Defining a reference frame



$\gamma$  is the vernal equinox direction, or towards the constellation Aries (Væren). Obtained by drawing a line from the earth centre through the sun on the first day of spring.

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# The six classical orbital elements (COE)

$a$  = the semimajor axis

$e$  = the eccentricity

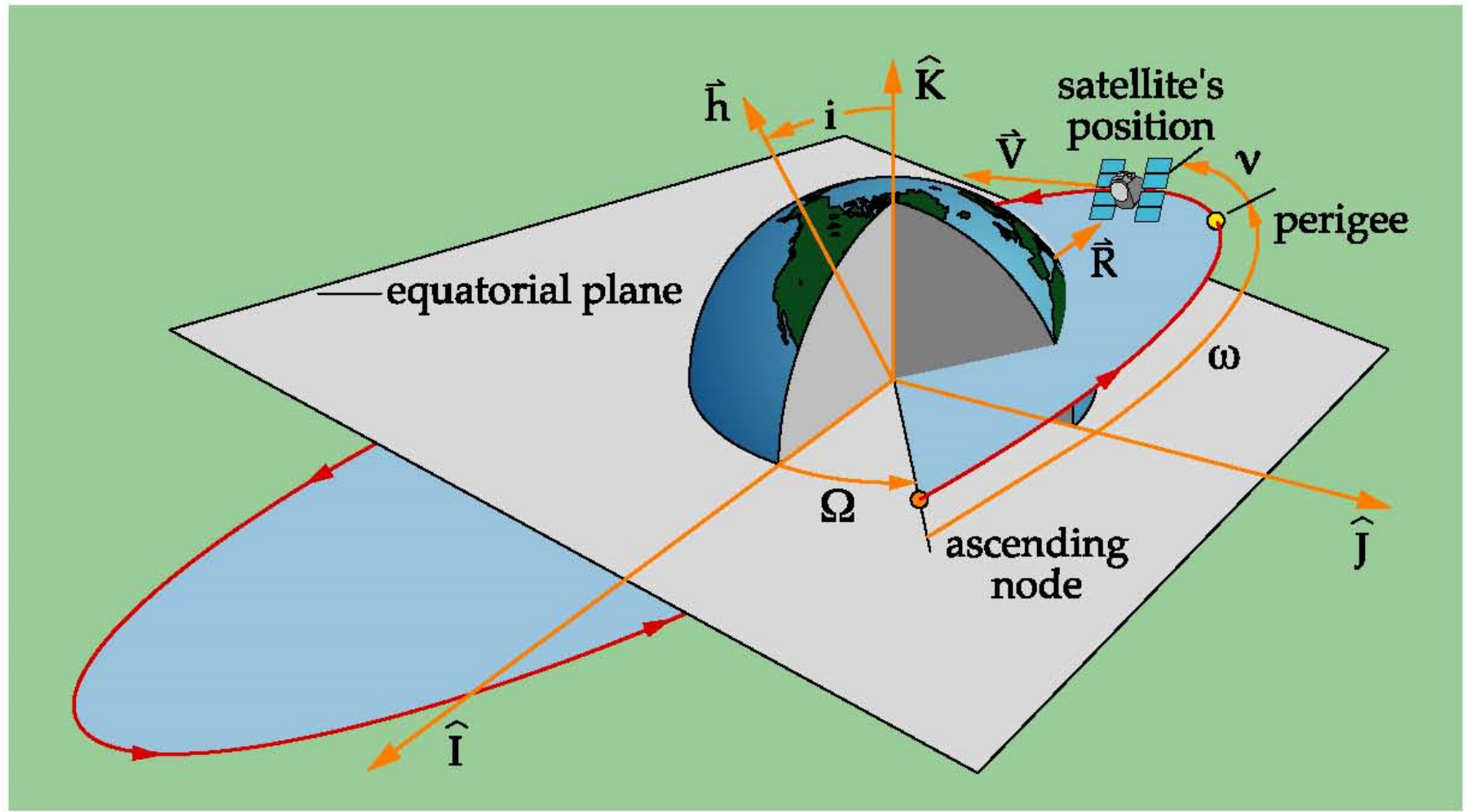
$i$  = the inclination

$\Omega$  = the right ascension of the ascending node

$\omega$  = the argument of perigee

$v$  = the true anomaly (time varying)

# Four of the Classical Orbital Elements



The two last define the ellipse;  $a$  and  $e$