CHAPTER OVERVIEW

27: Euler Angles

So far, our analysis of rotational motion has been of essentially one dimensional, or more precisely one angular parameter, motion: rotating about an axis, rolling, precessing and so on. But this leaves out many interesting phenomena, for example the wobbling of a slowing down top, nutation, and so on. We need a well-defined set of parameters for the orientation of a rigid body in space to make further progress in analyzing the dynamics.

The standard set is Euler's Angles. What you see as you watch a child's top beginning to wobble as it slows down is the direction of the axis—this is given by the first two of Euler's angles: θ, ϕ the usual spherical coordinates, the angle θ from the vertical direction and the azimuthal angle ϕ about that vertical axis. Euler's third angle, ψ, specifies the orientation of the top about its own axis, completing the description of the precise positioning of the top. To describe the motion of the wobbling top as we see it, we evidently need to cast the equations of motion in terms of these angles.