Modeling of the Larmor Precession

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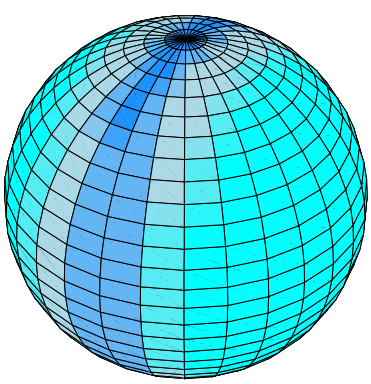
```
<< Calculus`VectorAnalysis`
<< Graphics`ParametricPlot3D`
<< Graphics`Shapes`
<< Graphics`Animation`
<< Graphics`Colors`

SetCoordinates[Spherical];
```

This is a computational appendix to the Stern Gerlach discussion in Chapter 1 of R. Mills, *The Grand Unified Theory of Classical Quantum Mechanics*, January 2004 Edition, posted at: http://www.blacklightpower.com/bookdownload.shtml.

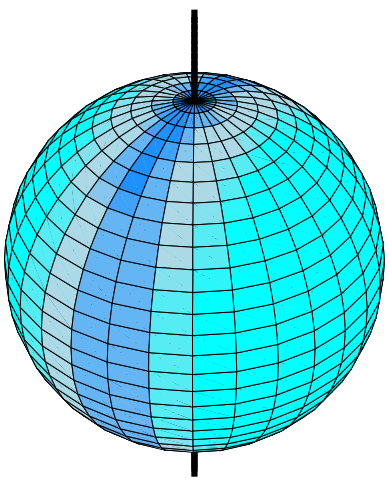
The bound electron is here colored with a blue stripe to show the propagation of current on the surface; however, the charge density of the electron is uniform.

```
colors[theta_, phi_, det_] = Which[
   det < .6, Cyan,
   det < .9, LightBlue,
   det < 1.1, DodgerBlue,
   det < 1.4, LightBlue,
   det ≤ 2, Cyan
  ];

OS =
  ParametricPlot3D[{Sin[θ] Cos[ϕ], Sin[θ] Sin[ϕ], Cos[θ], colors[θ, ϕ, 1 + Sin[θ] Cos[ϕ]]},
   {θ, 0, π}, {ϕ, 0, 2 π}, Boxed → False, Axes → False, Lighting → False];
```



Superimpose the bound electron on its angular momentum axis, which is spherical-coordinate angle $\theta = \frac{\pi}{3}$ from the z axis of the orbitsphere as given in Modeling the Orbitsphere,

```
LVect = ParametricPlot3D[{0, 0, t, {AbsoluteThickness[3]}},
   {t, -1.5, 1.5}, Boxed → False, Axes → False];

Both = Show[LVect, OS, Lighting → False];
```



```
Array[j, {30}];

Do[ j[t] = Show[RotateShape[Both, 8 π / 30 * t, 0, 0],
   SphericalRegion → True, ImageSize → 72 * 5, Lighting → False], {t, 1, 30}]
```

In reality, the current is propagating around the angular momentum axis at approximately 10^5 m/s faster than the Larmor frequency (the frequency of the precession of the $\mathbb{S}$-angular-momentum axis in a magnetic field). Here a representation of the current is shown propagating at three times the Larmor frequency. Click **GIF** or **AVI** for a physical animation (with fixed viewpoint) of the Larmor Precession.

```
Do[Show[RotateShape[RotateShape[j[i], 0, π / 3, 0], 2 π / 30 * i, 0, 0],
  SphericalRegion → True, PlotRange → {{-1.3, 1.3}, {-1.3, 1.3}, {-1.3, 1.3}},
  ViewPoint → {0, 2, 0}, ImageSize → 72 * 6.5], {i, 1, 30}]
```