199(1): Basic Concepts of Torsion Driven Orbital and Central Motion.

Start with the motion of a point along the curve $s(t)$ in the time interval $t_2 - t_1 = dt$ from $P^{(1)}$ to $P^{(2)}$ (Marion and Thornton pp 30 ff, 3rd. ed.). Then in plane cylindrical coordinates:

$$\underline{e}_r^{(2)} - \underline{e}_r^{(1)} = d\underline{e}_r \quad -(1)$$

$$\underline{e}_\theta^{(2)} - \underline{e}_\theta^{(1)} = d\underline{e}_\theta . \quad -(2)$$

It follows that:

$$d\underline{e}_r = \underline{e}_\theta \, d\theta \quad -(3)$$

$$d\underline{e}_\theta = -\underline{e}_r \, d\theta \quad -(4).$$

Therefore:

$$\frac{d\underline{e}_r}{d\theta} = \underline{e}_\theta \, ; \quad \frac{d\underline{e}_\theta}{d\theta} = -\underline{e}_r . \quad -(5)$$

Also:

$$\frac{d\underline{e}_r}{dt} = \frac{d\underline{e}_r}{d\theta}\frac{d\theta}{dt} = \underline{e}_\theta \frac{d\theta}{dt} \quad -(6)$$

$$\frac{d\underline{e}_\theta}{dt} = \frac{d\underline{e}_\theta}{d\theta}\frac{d\theta}{dt} = -\underline{e}_r \frac{d\theta}{dt} . \quad -(7)$$

Consider the point:

$$\underline{r} = r\,\underline{e}_r . \quad -(8)$$

In Cartan geometry this is generalized to:

$$r^a_\mu = r\, q^a_\mu . \quad -(9)$$

It follows from eq. (8) that:

$$\frac{d\underline{r}}{dt} = \dot{r}\,\underline{e}_r + r\,\dot{\underline{e}}_r = \dot{r}\,\underline{e}_r + r\dot{\theta}\,\underline{e}_\theta \quad -(10)$$

In torsion driven dynamics $d\underline{r}/dt$ is due to the torsion of spacetime. This concept replaces the ideas of Newton and Einstein.

From eq. (10):

$$\frac{d^2 \underline{r}}{dt^2} = (\ddot{r} - r\dot{\theta}^2)\underline{e}_r + (r\ddot{\theta} + 2\dot{r}\dot{\theta})\underline{e}_\theta \quad -(11)$$

which is the acceleration due to torsion.

When the curve $s(t)$ is an ellipse:

$$r = \frac{\alpha}{1 + \epsilon \cos(\theta)} \quad -(12)$$

the acceleration is:

$$\underline{a} = (\ddot{r} - r\dot{\theta}^2)\underline{e}_r = -\frac{MG}{r^2}\underline{e}_r. \quad -(13)$$

The only concept remaining from Newtonian dynamics is the product MG, because α is defined in terms of it. The result (13) was proven in a previous ECE paper. The acceleration of the point $\underline{r}$ for an ellipse is directed along $\underline{e}_r$.

The cause of this acceleration is torsion.

Solar system orbits of m about M are by observation precessing ellipses. The acceleration in eq. (13) is due to geometry, and is not due to Newton's idea of "force". In fact this was Hooke's idea, borrowed from Kepler.

3) In the obsolete dogma eq. (13) is always attributed to Newton and is known as the inverse square law of universal gravitation.

Now consider the straight line:

$$y = ax + b. \qquad -(14)$$

In cylindrical polar coordinates:

$$y = r\sin\theta, \quad x = r\cos\theta. \qquad -(15)$$

Consider for simplicity: $b = 0$. $\qquad -(16)$

Then

$$\cos\theta = \sin\theta \qquad -(17)$$

$$\theta = \pi/4 = \text{constant}. \qquad -(18)$$

i.e.

So when $s(t)$ is a straight line:

$$\dot{\underline{e}}_r = \dot{\underline{e}}_\theta = 0, \qquad -(19)$$

$$\dot{\theta} = 0, \quad \underline{a} = \ddot{r}\,\underline{e}_r, \qquad -(20)$$

$$\underline{v} = \dot{r}\,\underline{e}_r, \qquad -(21)$$

$$\underline{e}_r = \text{constant}.$$

The acceleration in a straight line is:

$$\underline{a} = \ddot{r}\,\underline{e}_r \qquad -(22)$$

and is again due to torsion.

It is observed experimentally that the acceleration between a static m and a static $\underline{M}$ is given by eq. (13). The acceleration due to an ellipse happens to be the same. If the ellipse starts to precess the acceleration is different.

4) <u>Conclusion</u>

The universal gravitation of the logarithm is simply a coincidence, the acceleration for a straight line and an ellipse happens to be the same. The real cause of orbits and central attraction is torsion. The latter gives rise to the four laws of torsional dynamics of the ECE theory.

The Newtonian concept of "force" is merely a definition. It transforms velocity $\underline{v}$ into force via $\underline{a}$:

$$\underline{F} = m\,\underline{a} \quad -(23)$$

$$= m\,\frac{d\underline{v}}{dt}.$$

The Newtonian concept of kinetic energy is the work integral:

$$W_{12} = T_2 - T_1 = \int_1^2 \underline{F} \cdot d\underline{r} \quad -(24)$$

and is another <u>definition</u>:

$$T = \frac{1}{2} m v^2 \quad -(25)$$

From eq. (10):

$$T = \frac{1}{2} m \left(\dot{r}^2 + r^2 \dot{\theta}^2 \right) \quad -(26)$$

which is the sum of translational and rotational kinetic energies:

$$T = T_T + T_R \quad -(27)$$

...) where:

$$T_T = \frac{1}{2} m \dot{r}^2 \quad -(28)$$

$$T_R = \frac{1}{2} m r^2 \dot{\theta}^2 \quad -(29)$$

These are also <u>definitions</u>. The rotational kinetic energy can be expressed as:

$$T_{R\,total} = \frac{1}{2} \omega L = \frac{1}{2} I \omega^2 \quad -(30)$$

where the angular momentum, a constant of motion, is:

$$L = m r^2 \dot{\theta} \quad -(31)$$

and the moment of inertia is:

$$I = m r^2 . \quad -(32)$$

In Newtonian dynamics the equivalence of inertial and gravitational mass m <u>is</u> <u>assumed</u>:

$$\underline{F} = m \underline{a} = - \frac{m M G}{r^2} \underline{e}_r \quad -(33)$$

i.e. m is the same for both types of force.

In ECE theory these concepts are all <u>derived</u> from geometry, including eq. (33). Einstein's ideas are <u>incorrect</u> and are no longer used. The third law of Newton, a conservation law, is derived from geometry in ECE theory.
