

# What`s on Earth , we are alone ?

## NO!!!

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### Abstract

Kepler Laws exist really as exist Mount Everest. We humans do not create Mount Everest, and Kepler Laws also. They exist. But then who created Mount Everest, Kepler Laws, Schrodinger equation- not Schrodinger himself. In one very short moment of illumination he sees the equation. Why? Because the Schrodinger equation was need for evolution of humans picture of the Created Universe. Physicists understand .Poets know it.

#### **1. The beautiful mathematics / physics**

During my work as a lecturer in Physics Department [2] , Warsaw University I like very much the Kepler – Copernicus ( Kopernik in Polish)- Newton panorama of the planet moving. I started as usual with historical facts and write the basic equations. Considering the FQXI community I left of all steps and start from the equation :

$$\frac{d^2u}{d\Theta^2} + u = -\frac{m}{L^2} \frac{1}{u^2} F\left(\frac{1}{u}\right),$$

$$u = \frac{1}{r}. \quad (1)$$

Equation 1 is the master equation which describes the movement of the body with mass  $m$  in the field of central forces  $F(1/u)$ . We can imagine the following functions  $F(1/u)$

$$F\left(\frac{1}{u}\right) = K_1 u^\pi, \quad K_2 u^3, \quad K_3 u^2, \quad K_4 u^{0.64}, \quad K_5 u^{-4.62}. \quad (2)$$

We can imagine the “other” universes for which the central forces have the different  $F(1/u)$ . But can life be originated and developed in all these universes? This question is answered by the anthropic principle and will be discussed later on. For the moment we can say the following: macroscopic structure of the Universe we live in can be understood with just two forces: Newton and Coulomb. For both forces

$$F\left(\frac{1}{u}\right) = Ku^2. \quad (3)$$

Why?

With the forces described by formula (3) we obtain for equation (1)

$$\frac{d^2u}{d\Theta^2} + u = -\frac{Km}{L^2}. \quad (4)$$

with constant on the right hand side of the equation- only for quadratic in  $u$  forces Only for that force! Can you imagine ! This is miracle, is not ?

This beautiful equation describes the classical motion of the planets, and electrons round the source of the force  $F = Ku^2$ . Moreover, the equation (4) in fact is the harmonic oscillator equation, which can be solved at once The solution to the eq. (4) can be written as

$$u = A \cos(\Theta - \Theta_0) - \frac{mK}{L^2}, \quad (5)$$

or

$$r = \frac{1}{A \cos(\Theta - \Theta_0) - \frac{mK}{L^2}}. \quad (6)$$

Equation (6) describes the conic curves: ellipse, parabola and hyperbola depending on constants A,  $\Theta_0$ , m, K and L. We can choose our coordinate axes so that  $\Theta_0 = 0$  to simplify things just a little:

$$r = \frac{1}{A \cos \Theta - \frac{mK}{L^2}}. \quad (7)$$

This is a conic sections. From plane geometry, any conic section can be written as

$$r = r_0 \frac{1+e}{1+e \cos \Theta}, \quad (8)$$

where  $e$  is called the eccentricity of the orbit.

## 2. Kepler Laws and Mount Everest

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