Double Surface and Atom Orbit

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Previously (*Progr. Phys.*, 2013, v. 2, 105–106), one introduced the double surface model to explain the heterogeneous curvature of the present world. In this paper one investigates the strength of the mentioned concept in the light of forming the stable electron orbits around the atom nucleus. The conclusion is that the nature of the elliptic side of the proposed double surface offers the possibility of providing the uniform motion of the electron on the atom orbit as well as prevents the electron falling into the nucleus.

1 Theoretical background

The double surface [1] has the elliptic and hyperbolic side where the path with its translation and rotation component [2] is provided. According to this concept we have to deal with two different paths whose average is a mirror of the inverse fine structure constant. The fact that the elliptic path s can equal its translation component n [1] seems to be crucial for forming the stable electron orbits around the atom nucleus.

1.1 The elliptic side

The path on the elliptic side of the double surface can be described with the sphere law of cosines:

$$\cos\frac{s}{R} = \cos\frac{n}{R}\cos\frac{\pi}{R}\,. \tag{1}$$

On the left, s denotes the elliptic path. On the right, n and π denote the translation and rotation component of that path, respectively [2].

At $s = n$ the elliptic radius R has the potency to occupy the infinite values, since

$$\cos\frac{\pi}{R} = 1\,, \quad \text{when} \quad \frac{\pi}{R} = 2m\pi\,. \tag{2}$$

The elliptic radius expressed in Compton wavelengths of the electron is then related to the arbitrary natural number m by

$$R_{elliptic} = \frac{1}{2m}\,, \quad \text{where} \quad m \in \mathbb{N}_0\,. \tag{3}$$

For the electron only the first 431 radii are physically plausible unless one cannot imagine that the sphere could be smaller than the physical body itself. In the units of Compton wavelengths of the electron the selected elliptic radii are the next:

$$\begin{aligned} R_{elliptic} &= R_0, R_1, R_2 \cdots, R_{430} \\ &= \infty,\ \frac{1}{2},\ \frac{1}{4},\ \cdots\ \frac{1}{860} > r_{electron}\,. \end{aligned} \tag{4}$$

The greatest elliptic radius is infinite:

$$R_0 = \infty\,. \tag{5}$$

The greatest finite elliptic radius is a half of the Compton wavelength of the electron:

$$R_1 = \frac{1}{2}\,. \tag{6}$$

The smallest elliptic radius is a little bit greater than the classical electron radius itself:

$$R_{430} = \frac{1}{860} > r_{electron} = \frac{1}{2\pi\alpha^{-1}} \approx \frac{1}{861,02}\,. \tag{7}$$

1.2 The hyperbolic side

The path on the hyperbolic side of the double surface can be described with the hyperbolic law of cosines:

$$\cosh\frac{s}{R} = \cosh\frac{n}{R}\cosh\frac{\pi}{R}\,. \tag{8}$$

On the left, s denotes the hyperbolic path. On the right, n and π denote the translation and rotation component of that path, respectively [2].

According to the double surface model [1] where the characteristic values for the path and its translation component on Bohr orbit are $s = 137.072031\cdots$ and $n = 137$, the hyperbolic radius R is calculated by the equation (8) as the only one and finite:

$$R_{hyperbolic} \approx 71,520117 \text{ Compton wavelengths of the electron}\,. \tag{9}$$

2 Physical consequences on the atom level

In the double surface model Bohr radius expressed in the units of Compton wavelengths of the electron is deduced from the average path on the elliptic and hyperbolic side of the orbit:

$$R_{Bohr} = \frac{\alpha^{-1}_{elliptic} + \alpha^{-1}_{hyperbolic}}{4\pi} = \frac{\alpha^{-1}}{2\pi}\,. \tag{10}$$

The difference between $\alpha^{-1}_{observed}$ and $\alpha^{-1}_{measured}$ on the fifth decimal which was important for predicting the exact inverse fine structure previously [1], is not significant enough to be taken into account in the calculations made in this paper. From the relation (3) and (4) is seen that the radius of the elliptic side of the double surface is greater than Bohr radius only once, i.e. when $R_{elliptic} = \infty$. The infinite elliptic radius allows the electron to move uniformly on Bohr orbit. On the other hand the 430 finite elliptic radii do not permit the electron to fall into the nucleus, because they are always much smaller than Bohr radius:

$$R_{1,2,\cdots 430} \ll R_{Bohr},$$
$$\text{since} \quad \frac{1}{2}, \frac{1}{4}, \cdots, \frac{1}{860} < R_{Bohr} \approx 22,81. \tag{11}$$

The conclusion would be the same, if the number of the finite elliptic radii is infinite.

Thus according to the present concept the electron is closed on the elliptic sphere of the multi-sizable radius. Its destiny is to be in some way glued on Bohr orbit in the Hydrogen atom. In other atoms the similar phenomenon is expected, because their atomic radii are greater than the Bohr one and therefore still greater than the finite elliptic ones:

$$R_{atom} \geqslant R_{Bohr} \gg R_{1,2,\cdots 430}\,. \tag{12}$$

3 Conclusion

The infinite elliptic radius of the double surface enables the uniform motion of the electron on the atom orbit. The finite radii prevent the electron falling into the nucleus. From this point of view the concept of the double surface with its elliptic side as a sphere of the multi-sizable radius satisfies the demand for forming the stable electron orbits around the atom nucleus.

Respecting Plato the correct theory is only one amongst many ones revealed in the realm of the reasonable ideas.
(The Author)

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Dedication

This fragment is dedicated to my sister Darinka.

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