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The Wave and the Quantum State

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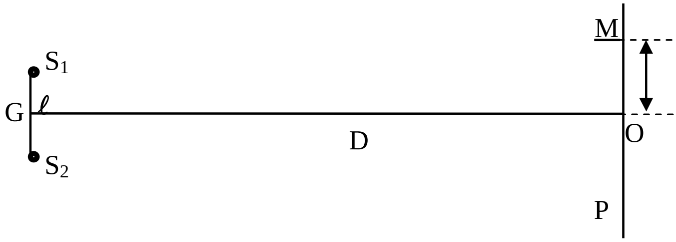
Abstract: After the beginning of the corpuscular model, the dis function has seemed a better approach to describe the atom and ha Copenhagen School. The adherents of this conception up to now ha convince all the researchers. Among the difficulties, the interferences photon" where the photons arrive successively on the screen of o experiments one photon considered as a wave, his supposed able to go s the both holes apart of about a distance of the order of one centimeter. Thi the photon necessarily associated to a wave which implies the existen situation lead to research an alternative approach. That suppose exchanges proton and the electron which are the alone manifestation of the wave.

1 Introduction

One hundred years ago Bohr proposed the first quantum model base of electrons in the atom [1]. With the discovery of the wave properties of th has now lost almost right to be cited. In an attempt to understand the orig I would start by recalling the origin of the concept of wave, then interfere seem to establish the corpuscular approach of matter.



microscope, the radio and television, the light wave approach is far fro
explanation of interference. In the classical experiment, known as Young
beams of light are observed on a screen and its explanation based on th
light, does not seem to give any difficulty. However it is known for more
is possible to significantly reduce the intensity of the two beams while c
interference by increasing the duration of the light received. This type of
interference of photons one by one. Proponents of the wave model the
photon passes through the two holes of Young. This assumption remain
from an experimental point of view.

Explanation of interference in fact forgets to consider the possibility
to be absorbed on the screen where they are observed. With this assumpti
photons to wait to be in sufficient numbers to be subsequently remitted, c
on their position M on the screen, which gives interference. The periodic
actually that of the periodic motion of electrons that absorb photons [4].

2 Landé factor or g factor

The study of Dirac's article [5] shows that the quantum number k of
supposed characteristic of angular momentum, could take either positiv
characteristic of the two subshells. Furthermore Dirac emphasized that
remained the same for $k = \ell$ and $k = -(\ell + 1)$. This remark shows that the
between the Dirac's model and that of Schrödinger where one finds the pr
positive values are considered [6]. In the second part of this Dirac's artic
g of spectral decomposition, also called factor of Landé, the expression:

$$g = k\left(k + 1/2\right)^{-1}$$

Thus the g factor depends in this approach of the subshell. These re
understand the physical meaning of the number k and Landé factor.
quantum mechanics. The g factor is also at the origin of understanding in

3 The quantum mechanics in its corpuscular approach

Bohr in 1913 suggested the first quantum interpretation of the move
in the atom, with his theory of the hydrogen atom [1]. At that time Rutherf
an atomic model with a positive nucleus containing most of the mass, the
periphery [10]. He introduced the Planck constant h, as ***quantum of action***

the accuracy with which these equations, with relativistic corrections, giv
energy levels and lines of the hydrogen spectrum [12]."

Wilson [13] and Sommerfeld offered virtually independently abo
quantify the different degrees of freedom. They thus quantify in the plane r
and radial momentum:

$$\oint p_{\varphi} d\varphi = kh$$

$$\oint p_r dr = rh$$

where *k* and *r* take only integer values. Solutions of these two equati
to the relationship:

$$k + r = n$$

For atoms, regarded as hydrogen-like, this approach allows to calcul
energy levels. However The quantification of the movement of an electro
confined to only two degrees of freedom; to resolve this aspect of the qua
is place to introduce a third quantum number. It is the spatial quantization
Sommerfeld imagines the atom in a uniform magnetic field H. Let then O
this field perpendicular to the equatorial plane containing axes Ox, Oy (*fi*
corresponding to the component parallel to the Oz axis of motion is quan
integer number of quanta that characterize this movement. The quantum c

$$\oint p_r dr = rh\,, \quad \oint p_{\theta} d\theta = th\,, \quad \oint p_{\varphi} d\varphi = mh$$

with $k = t + m$

and $-k \le m \le k$

Excluding the value of *m* = 0, this approach gives the right number
different integer values of *k*. However this model does not explain the e
furthermore the introduction of branch Oz to quantify the magnetic mom
One has to seek to quantify space without arbitrariness in a more genera
three quantum numbers *n*, *k* and *m* are interdependent.

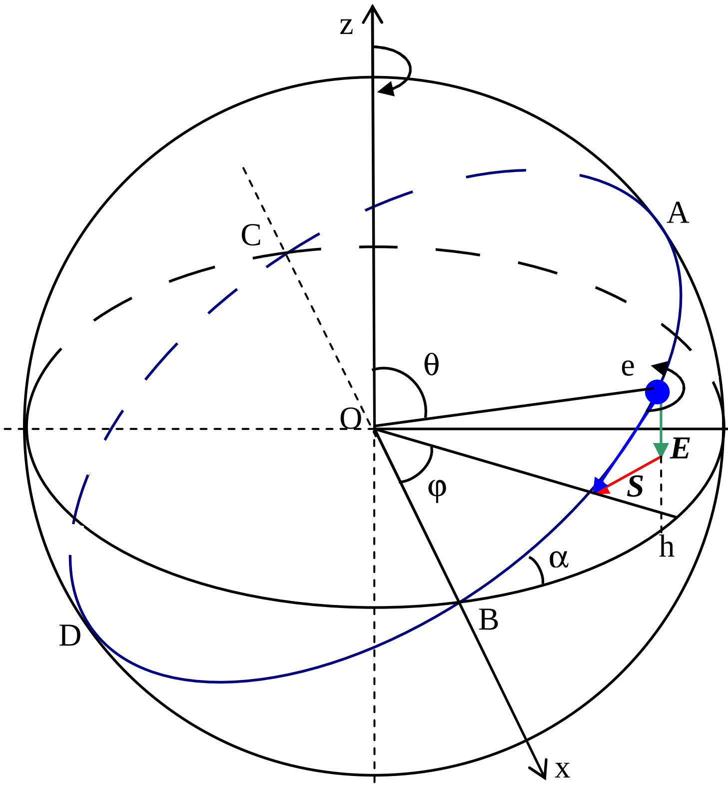


Figure 2. The movement of the electron to a state "1s". The point O is the cent
of the movement ABCD, the equatorial plane Ox, Oy. The "e" circle represents
The arrow on the semicircle at the top of the z axis identifies the direction o
reverse to that of the electron e. The vectors E and S represent the momentum of
flows amounts.

4 The space

Einstein in 1905 with his study of relativity showed that there is n
that *physical laws should be independent of the place of observation*, wh
in physics [14]. As a result it did not come to anybody the idea that there c
analysis. Yet the difficulties encountered by the corpuscular approach o
are well related to the notion of space. Indeed there is no absolute space a
how the space is built. On the macroscopic scale it is easy to define it in
which occupy it, without forgetting the gas that fill volumes between objec
the sound for example. But what about the scale of the atom? Up to now
has allowed us to write the motion of the electron around the nucleus.

a fluid whole and it is the motion of one in connection with the other that
them. It is the two fluxes which are the support of the notion of wave. The
is that of the quantum state of the electron, it is very small before the mo
particles. This approach allows to be in agreement with the conclusion of
the electron is at the infinite it has received the energy that linked it to
total inert mass and there is no more wave function to consider.

This approach leads to consider the volume of the electron and
consider the volume of the particles is important because it gives phy
existence of an axis of rotation in the movement. Furthermore this nee
conscience not only of the relative motion of rotation between the proton
also of the fact there is necessarily a relative motion of translation parall
Indeed these two motion impose themselves to distinguish the two p
directions of the space as their respective masses.

To describe the motion of the electron around the proton we conside
Ra, formed of a system of orthogonal axes, the center of gravity O of th
origin (*figure2*). This center O is also the center of the potential that acts
intensity of the potential at a point P is inversely proportional to the dist
of matter which is used to describe the potential is itself subsequently inv
this distance. Let then γ be the center of gravity of the electron. *Phy*
independent of the place of observation *as a result*, as for the potential v
volume of the electron the density of matter that is used to describe the c
is inversely proportional to the distance of the center γ of gravity of the
that delimits the volume of proton and that of the electron is subs
corresponds to the minimum density. It is through this surface that
determine the action and trajectory. In a coordinate system where the cen
fixed, the rotation of the proton is represented by an arrow of direc
symbolizing the rotation of the electron, (*figure 2*). In the approach of
variables describing the time and space one considers the relationship E =
the period of the movement, then in the orbital plane radial distance;
trajectory is a circle, in other cases it is an ellipse. It misses the perpen
Sommerfeld knew. Among the attempts to solve this absence one has to
G. Mastrocinque who introduces the oscillations of Bernoulli supposing f
and variations of mass [16].

Assuming that the vacuum cannot transmit the interaction and tha
form of grains which passes it, there is a place to quantify all directions
the axis of rotation of the movement may also contribute to the quantifi
the electron moves around the proton; apart from variations in the radia
interval of time, there are three degrees of freedom: the rotation, the tran

own movements. There is therefore to count negatively, that is -$\hbar$
momentum, if the proper rotation is counted positive. Let us underline t
also generating the translation motion parallel to the rotation axis is eq
intrinsic action.

If the electron receives additional momentum, it will be quantified a
degrees of freedom space: rotation, translation, and the radial distance; It
mass that allows the increase in the number of quanta. The angular mome
or negative depending on the direction of rotation relative to the o
positively. Thus the first shells are states "ns" with only two states; then
from n equals two. Additional states may be added to the rotation or to the
birth to two subs-hells.

For orbital movement, each additional quantum generates a moment
subtract to the original half-quantum and that introduces a g factor in t
angular momentum of each quantum state. Indeed compared to the
Sommerfeld one has to take into account that half of the quantum of
induced movement along the axis of rotation. It comes:

$$g\left(k+\tfrac{1}{2}\right)=k$$

We find the relationship (1) of Dirac. In this relationship *k* is an inte
states "*ns*"; for the other states they are generated by absorption of a phot
negative for "*n*" > 1. It is this relation which gives access to the theoretica
magnetic momentums of the metals and various compounds [8]-[9].

Thus, the quantum of action appears acting as well on the direction
on the rotation itself, it thus quantifies all directions of space. Interactions
in mass, the trajectory can be changed so as to keep the number of quan
which allows to understand the stability of the quantum properties of the
their compounds. It is that testify the calculus of the magnetic momentum
the periodic table of the elements.

5 The Quantum Mechanics in its wave approach

In describing the interactions between the proton and the electron w
becomes natural that variations of this mass can be described by a differe
Schrödinger in 1926, taking support of the wave associated with the electro
de Broglie, who first proposed such an equation. Then Dirac in 1928 of
which has all the levels of energy i.e. doublets levels in addition to those

material reality remains the discontinuous. It was in noting that light ca therefore emitted from a finite set of atoms, that Einstein was brought to p of the photon. Come back then to the symmetry between the motion propagation of a wave which led de Broglie to associate a wave to the e possible to associate a flow of material particles in the wave, for example the hypothesis of the photon of Einstein [15]. However if the number of ph then the support of the continuum which is the wave can no longer inter has then to consider the stocking of the photons where the interferences a

6 Research and Paradox

The wave particle duality remained an enigma for me. The algebr that used by Dirac was hermetic. Without a clear physical meaning to m operators remained mysterious and Bohr Sommerfeld model has always With it several questions related to the Crystal structure of the compounds for example the reduction of the freezing temperature of water in the p (Raoult's law), similarly found in paramagnetism with the decrease of th This property, if we accept the existence of a periodic motion for bond e of perturbation of the synchronous movement of these electrons by impu

As we have seen repeatedly the notion of point is a significant barri a better understanding of atomic physics. Behind this difficulty th prevailing in physics as master while it is physics or in a broader way allowed to build mathematics. The result is the difficulties of the Cope members who do not takes into account the fact that that any object has the atomic scale the concept of point almost lost much of its value. The lan is remarkable and I always liked it; I remember Professor Laurent S symbolic algebra where operators can be manipulated as numbers th equations, I was full of admiration and I still remain so. But despite the el the difficulties of continuous and infinite remain. I hope that these researchers. There is a whole field of research that I recommend to my y

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