

PHOTONS, THEIR NATURE, AND MECHANISM OF THEIR FORMATION
(together with the clarification of the Balmer-Rydberg formula)

by Yuri Dunaev (dunaev@bg.net.ua)

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The Summary

Light (visible and invisible) is of undulate nature and propagates in an etheric medium named in former times as "luminiferous ether". Light energy quanta or photons are those discrete parts of space that lack the etheric medium elons or ultra-mundane corpuscles with velocities directed from the nuclei of those atoms or molecules, in which the photons generate themselves owing to the orbital motion of the atomic or molecular electrons. Elons lacking such velocities lose them while striking electrons towards the nucleus of an atom or molecule. Photons, which are discrete undulate formations, create themselves due to the intersection of encountering primary waves. Encountering primary waves are the electromagnetic waves formed due to the encountering rotation of electrons, particularly of the both encountering electrons of a hydrogen molecule. Primary waves form themselves resulting that those elons (ultra-mundane corpuscles) that strike an electron from the exterior along the radius connecting it with the nucleus, rebound at least partly losing their kinetic energy, that energy which is consumed for bending the electron's trajectory from a straight line to a circle.

Introduction

Ever since the famous Michelson-Morley experiment and those conclusions that were inferred from it by Albert Einstein the modern science remains prisoner of a singular taboo purporting to prohibit the acceptance of the ether as well as of any idea that might base thereupon. Modern scientists resolve their problems passing by the concept of ether, which enforces them to resort to extraordinary mathematical constructions and sophisticated postulates. Contrary to the common sense pitilessly mocked by the same Einstein, a modern theoretician can imagine waves propagating themselves without any conducting medium; he can imagine these waves propagating to distances of thousands light years without any losses of their capacities; he can imagine immaterial electromagnetic, gravitational and other fields; he believes matter capable to turn itself to energy, which would as he deems open way to the creation of a free energetic paradise; following biblical and other religious beliefs he can imagine the beginning and the end of the world, as well as various other absurdities.

The negation of ether entailed the creation of theories based not so much on physical models as on mathematical fictions. Experimental data become object of mathematical manipulations. The comprehension of physical phenomena modifies to mathematical calculations.

Nonetheless the acceptance of ether may explain a number of problems, especially in the world of electromagnetic phenomena. The ether as a conducting medium for electromagnetic waves explains the constancy of the speed of light and makes unnecessary the Einstein's theories of relativity. As one may convince himself from this article the acceptance of ether explains the mechanism of photons' creation and helps to understand known experimental data without the arbitrary postulates of Bohr and other quantum mechanics' inventions.

Prehistory

From the very beginning of civilizations people try to perceive the nature of light that beyond any doubt makes one of the greatest mysteries of the natural world. Numerous were theories of light, but during the last centuries scientists and philosophers founded their theories just on two main conceptions: the corpuscular according to which light is created with miniscule material particles, and the undulate according to which light is a wave motion of a medium known under the name of “luminiferous ether”. The wave theory of light which principles were established in the 17-th century by Dutch physicist and astronomer Huygens progressively strengthened its influence owing to works of Thomas Young, Augustin Fresnel and other prominent scientists, and in the end of the 19-th century was definitely formulated by James Clerk Maxwell as the electromagnetic theory of light. According to the Maxwell’s theory light consists in the transverse undulations of the same medium which is the cause of electric and magnetic phenomena http://en.wikipedia.org/wiki/James_Clerk_Maxwell. The Maxwell’s theory however failed to harmonize with discoveries of Max Plank, and his conception of quantum of light proposed in 1900, which conception estimated this quantum of light as an energy packet named photon. Consequently during the two decades following the announcement of this conception, scientists had to revise all the contemporary science in order to get it correspond with the Plank’s theory. The characteristic feature of the modernized theory was representing energy as consisting of similar to particles quanta, which later were called photons.

In 1925 Max Born, Ernst Pasqual Jordan and Werner Karl Heisenberg mathematically proved that photons are radiated or absorbed when charged particles are repulsed or attracted under the action of electromagnetic forces. Photons carry electromagnetic force from one particle to another, but they themselves have neither mass, nor electric charge. In spite of lack of mass, photons’ energy creates impulse that is the possibility to affect other particles.

The so-called standard model encompassing modern scientific views, divides particles in two categories: fermions particularly including electrons and protons, and bosons associated with the force fields acting on fermions. Similarly to electromagnetic field combining electric and magnetic fields, there exists according to modern scientific views a more generalized electroweak field uniting electromagnetic forces with weak nuclear force, whereas photon is one of four bosons associated with this field.

The above exposed views might be understood as a return to the already mentioned corpuscular theories of light, in spite of a paradox that none of the disclosed in the previous period wave properties of light had been abolished, which enforced them to be in some way united with the modern ideas. Such unification had realized itself in form of the wave-particle dualism conception in which the light composed with particles-photons had to possess wave properties, which properties though had to come about in the absence of any conducting medium, the luminiferous ether being already abolished by that epoch theoreticians.

In my previous article “Quantum mechanics’ foundation, how strong is it?” <http://www.wbabin.net/physics/dunaev1.pdf> there was notified that one of the founders of the quantum mechanics Niels Bohr based on empirical data on relations between frequencies of light radiated by hydrogen incandescent in a gas discharge tube, created a hydrogen atom model, while ignoring the light generated in such tube is emitted not by monatomic but molecular hydrogen. In the hydrogen atom proposed by Bohr the electron, depending on the amount of its energy had to occupy orbitals differently distanced from the proton, and a photon had to be emitted by this atom when the electron jumped from a more energetic orbital to a less energetic one.

In view of existing data testifying that the light radiated by incandescent hydrogen is not generated by its atoms H but by its molecules H₂ the model of this atom, as well as the model of the molecule H₂ need radical revising, as well as needs such revising the principle of photons' formation not in hydrogen atom but in its molecule. The undulate nature of light being unreservedly proved by some centuries labor of thousands of scientists, and waves' propagation without any conducting medium being imaginable only mathematically, let us begin the study of photons' formation in a hydrogen molecule with a disclosure of the luminiferous ether conception, taking into account that its "luminiferous" property is just only one of its known and unknown ones.

Although the official physical science keeps denying the existence of ether and for backing such denials up keeps referring to the Michelson-Morley experiment as well as to works of Albert Einstein, it would be proper to remind that in his speech delivered on May 5, 1920 in Leyden University on the occasion of his election as its honorary professor, the same Albert Einstein said: "Recapitulating, we may say that according to the general theory of relativity space is endowed with physical qualities; in this sense, therefore, there exists an ether. According to the general theory of relativity space without ether is unthinkable; for in such space there not only would be no propagation of light, but also no possibility of existence for standards of space and time (measuring-rods and clocks), nor therefore any space-time intervals in the physical sense. But this ether may not be thought of as endowed with the quality characteristic of ponderable media, as consisting of parts which may be tracked through time. The idea of motion may not be applied to it." www.tu-harburg.de/rzt/rzt/it/Ether.html.

Mechanism of photon's formation

The Bohr's mechanism of photon's formation based on the created by him hydrogen atom model being in use by the modern science, which mechanism was created in a way allowing it to agree with the known empiric Balmer-Rydberg formula http://en.wikipedia.org/wiki/Rydberg_formula, my task is to elaborate such a model of photon's formation, no longer in atom but in molecule of hydrogen, which being founded on the ether conception would completely agree with this formula.

The said formula with regard to light frequencies looks like

$$v = cR_H \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right) \quad (1),$$

where v stands for the frequency of light generated by incandescent hydrogen, c - for the speed of light in vacuum, R_H is the Rydberg constant equaling $10\,973\,731.568\,527\text{ m}^{-1}$, and n_1 and n_2 are whole numbers such that $n_1 < n_2$.

Further to Lesage http://en.wikipedia.org/wiki/Le_Sage%27s_theory_of_gravitation, who proposed these ideas in 1748 in his theory of gravitation I am of the opinion that ether is a pseudo gas composed with a multitude of the most miniscule particles (ultra-mundane corpuscles) chaotically moving in all directions with an average speed equaling the speed of light, and striking each other and greater particles such as electrons, nucleons and other fermions, which "ultra-mundane corpuscles" are not to be confused with those light porting corpuscles figuring in the corpuscular theories of light. In the same way as in real gases, collisions of the corpuscles that in order to avoid the said possible misunderstanding I will further call "elons" are elastic, and if for instance a moving elon strikes a yielding electron, which under this strike would gain an acceleration, the elon itself will stop in the same way, as stops that of billiard balls who has stricken another. (The said elons may in some way be similar to aetherinos of Carlos Labord <http://personales.ya.com/carlosla/model/> or gyrons of Frank Meno <http://www.aetherpress.com/>).

A free electron placed in the Lesage's ether and receiving elons' strokes from all directions cannot be yielding, the strokes from one side being balanced out by those from the opposite one. Elons who had stricken such electron rebound from it with the same velocities as before the strokes, and the presence in the ether of a free electron would not influence its condition with regard to the chaotic state of its elons. Another scenario will have effect if an electron is orbiting a molecular or atomic nucleus. In this case due to the shielding of the orbiting electron from those strokes which would pass through the nucleus, those ones which strike it from the opposite direction remain unbalanced, which provokes its, i.e. electron's compliance toward the nucleus. Due to such compliance there takes place the orbital motion of electrons in atoms and molecules.

The strokes of elons directed just towards the nucleus force the electron to keep curving its trajectory, while the elons that have produced these strokes stop in the same way as the said billiard ball that has stricken the other. The stoppage of these elons provokes a change in the state of the etheric space in points of the circular trajectory of the electron, which therefore become sources of an etheric or (as it is called today) electromagnetic wave that, as it is known, propagates with the speed of light. Thanks to the electron's rotation with a constant frequency along a circular path the front of this wave that I have called primary wave would have form of an Archimedean spiral, uncoiling in the plane of this circular electron's trajectory (see fig.1).

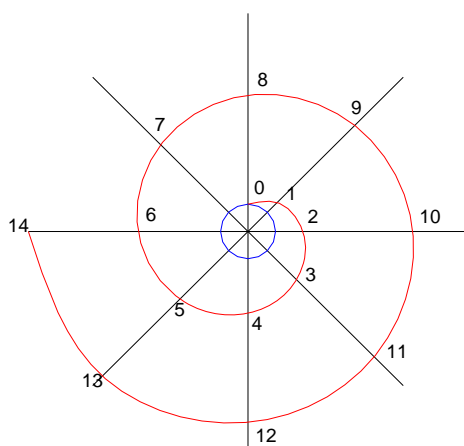


fig.1

On fig.1 there has been marked blue the circular orbit of an electron of a hydrogen molecule rotating counterclockwise. In a moment when the electron is in the point 0, here is initiating a primary wave marked red. The marks 1, 2, 3 ... 14 relate to the points of the wave front initiated $\frac{1}{8}, \frac{2}{8}, \frac{3}{8} \dots \frac{14}{8}$ of the rotation period earlier.

In my previous article "Quantum mechanic's foundation, how strong is it?" <http://www.wbabin.net/physics/dunaev1.pdf> there was expressed a suggestion that the frequency of the electron's rotation in a hydrogen molecule is equal to the product $cR_H = 3.289842 \cdot 10^{15} \text{ s}^{-1}$ of the formula (1), which means that the electrons of such molecule make more than 3289 millions of millions turns in a second.

Every point of the primary wave with a frequency equal to that of the orbiting of its generative electron, is characteristic by a lesser amount of elons with velocities directed off the molecular nucleus and as a result by a property while interacting with other fermions to attract them to it.

Because of the radial propagation of the primary wave in all the directions in its generative plane, it would very soon die away unless the nature had not found a way of its restructuring. Such restructuring though needs the participation in it of another primary wave, which would propagate in the same plane, have the same generative source, and uncoil in the opposite direction. Such requirements would be satisfied by a primary wave generated by the rotating around the same nucleus of the second electron in a direction opposite to that of the first one. The interaction of the two encountering primary waves provokes to generation in places of their intersections of specific undulate formations, that similarly to particles one could imagine as possessing some form, that obviously have neither mass nor electric charge and propagate in space with the speed of light along radii beginning from the molecular nucleus.

Fig.2 shows two encountering primary waves (red and green) initiated by two encountering electrons of a hydrogen molecule, turning on a common circular orbit marked blue. Although such case in nature may be rare, the waves which are symmetric one to another are represented on a presumption that relative to the neighboring ether the molecule is stable. The drawing shows that the primary waves intersect one another in the points 0, 2 etc. on one radius and in the points 1, 3 etc. on the opposite radius. These points of intersection represent the places of generation of photons, propagating in space along the above two radii. Every generated photon characterizes itself by the absence or a lessen amount of elons directed from the molecular nucleus that gives it attractive properties toward the nucleus.

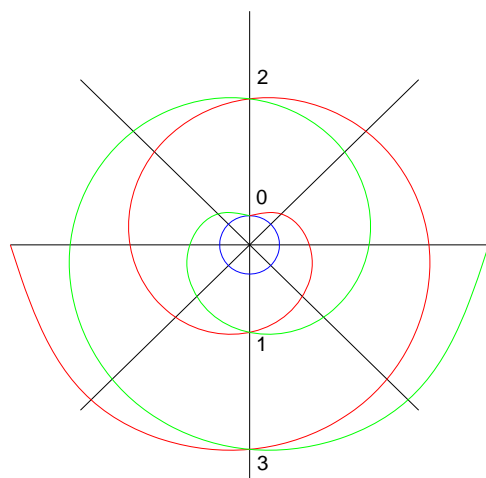


fig.2

Encountering primary waves create themselves in atoms and molecules due to that, as I believe, a part of their orbital electrons (a half or nearly a half) are turning in one, and the other part in the opposite direction. Contrary to Bohr and his followers, who disregarding the III law of Kepler www.physicsfether.kiev.ua/index/4.html asserted and keep asserting that atomic electrons are placed on different orbits (or orbitals) differently distanced from the atomic nucleus, I am sure that all of them are turning on the same orbit, the electrons of one of the said parts turning around the nucleus with one, and

those of the other part turning about it with the same but oppositely directed angular velocity. With such a way of electrons' turning, the atom or molecule obtain the necessary stability, which might be lost in the case of nonconformity of the amounts of orbital electrons to that of the nucleons in the atomic nucleus, which is the case of radioactive isotopes, or in the case of a substantial difference in numbers of electrons turning in opposite directions (ions).

In spite of primary waves' intersections take place in very restricted zones of space, which makes photons very dense, they have nevertheless to be elongated in the plane of electrons' rotation, which may explain the polarization phenomenon.

Here there ought to be made some reservations concerning the relativity principles in the physics of ether, those ones that, as to my mind, would be in conformity with the above expressions of Albert Einstein. It is quite naturally that while studying rules of motion of different objects including photons we simply cannot do without an absolute system of coordinates, for which system we could use the ether. Given the ether is not anything stable, while studying such objects as for instance an atom there would be proper to use as the absolute coordinate system just that ether which is placed in the same part of Euclidean space as the atom.

Let us imagine a molecule of hydrogen composed with a nucleus and two electrons orbiting the nucleus towards one another with a frequency $\nu_e = R$. The molecule itself turns in a plane coinciding with the plane of the electrons' orbits and the frequency ν_M of its turning constitutes a part of the frequency ν_e , which may be expressed as

$$\nu_M = R \frac{m}{n}, \text{ where}$$

m and n – are integers such that $m < n$.

The frequency of the electrons' rotation does not depend on temperature, while as to my belief the frequency ν_M and particularly the index $\frac{m}{n}$ ought to be considered as indicators of the molecules' temperature. They have to rise with its warming and lower with its cooling.

If so, the rotation frequencies of the first and second electrons in the absolute system of coordinates, that is relative to ether will make $\nu_1 = R(1 + \frac{m}{n})$ and $\nu_2 = R(1 - \frac{m}{n})$. Every turn of an electron has to correspond to a turn of a primary wave; therefore the first primary wave will have the frequency of $\nu_1 = \frac{R}{n}(m+n)$, and the second $\nu_2 = \frac{R}{n}(n-m)$. They will intersect with a frequency

$$\nu = \frac{2R}{n}(n^2 - m^2) \quad (2),$$

$\frac{R}{n}$ being common factor for the frequencies of the both primary waves, $(n^2 - m^2)$ being product of their irreducible factors, and 2 being taken because for one turn the electrons meet twice. The frequency ν is that of successive intersecting of the primary waves irrespectively to direction of the further propagation of the created photons; therefore it would be suitable to be named as "irrespective" frequency.

While determining the frequency of photons' propagation in a single direction (radial frequency) we would base on following considerations. If the electrons of a hydrogen molecule rotate relative to it with a frequency R , the frequency of their meetings will make $2R$. If the molecule itself rotates with a frequency $R \frac{m}{n}$, the number of meeting points for one molecule's turn will make $2R: R \frac{m}{n} = \frac{2n}{m}$. The obtained number of meetings occurs on a $\frac{1}{m}$ fraction of the full plain angle (360°) with a center in the center of the molecule. The filling of the full angle occurs on accomplishing by the molecule of m turns, during which m

turns there will take place $2n$ meetings of the electrons. To every meeting point will relate its light propagation radius, on which with an interval necessary for the molecule to accomplish other m turns will occur another intersecting of the primary waves.

At first glance in order to obtain the radial frequency, it would suffice to divide the irrespective frequency ν by the number of light propagation radii $2n$. Here nonetheless we have to consider that:

- 1) In order to bring into play all $2n$ radii the system needs m times more time, during which time the number of radii would rise m times, and
- 2) During this time the wave length (the distance between two consecutive photons) on each radius would rise m times.

Taking into account the above considerations the radial frequency ν' has to equal

$$\nu' = \frac{\nu}{2nm^2} = R \frac{(n^2 - m^2)}{m^2 n^2} = R \left(\frac{1}{m^2} - \frac{1}{n^2} \right) \quad (3).$$

The formula (3) may be recognized as the above mentioned Balmer-Rydberg formula that really has initiated all the quantum mechanics, and that is also presented by the Wikipedia http://en.wikipedia.org/wiki/Rydberg_formula in form

$$\frac{1}{\lambda_{vac}} = R_H \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right) \quad (4), \text{ where}$$

λ_{vac} is the length of light wave emitted in vacuum, R_H is the Rydberg constant for hydrogen, and n_1 and n_2 are integers such that $n_1 < n_2$.

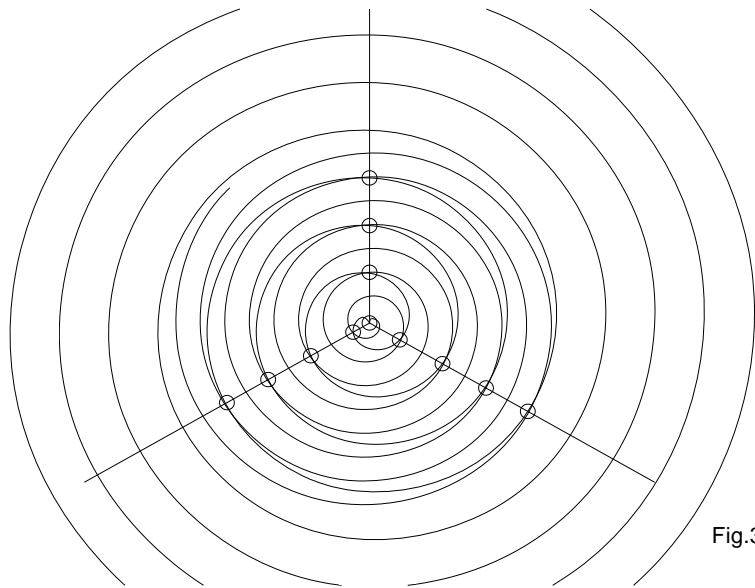
After multiplying the left and right parts of the formula (4) by the speed of light in vacuum c and obtaining

$$\frac{c}{\lambda_{vac}} = R_H c \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right),$$

we can persuade ourselves that in the above obtained formula (3) ν' is associated with the light frequency $\frac{c}{\lambda_{vac}}$, R with $R_H c$, and n_1 and n_2 with m and n .

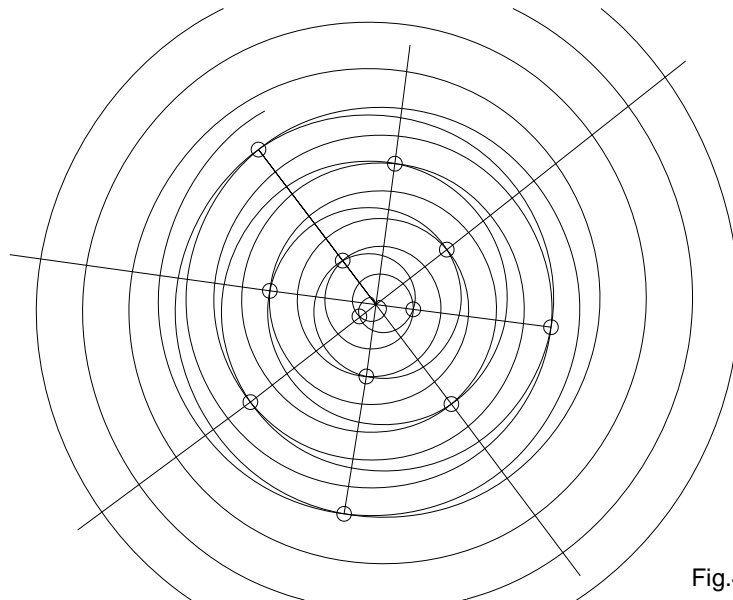
The below figures from fig.3 to fig.10 show schemes of photons' generation corresponding to the 2, 3, 6, and 7 lines of the Lyman series, 3 and 5 lines of the Balmer series and 7 and 8 lines of the Paschen series. Central points of every scheme mark the position of the center of a hydrogen molecule from which start two Archimedean spirals representing two primary waves. The points of primary waves' intersections are placed along $2n$ radii drawn at equal angles one to another, although for cases when $(n + m)$ and $(n - m)$ are even one can count n radii, each of which is indeed double.

Such bifurcation may be explained by that in fact the electrons' orbits cannot be ideally circular, and consequently the complete superposition of two different points of electrons' meetings, as well as of two relevant radii is hard to expect.



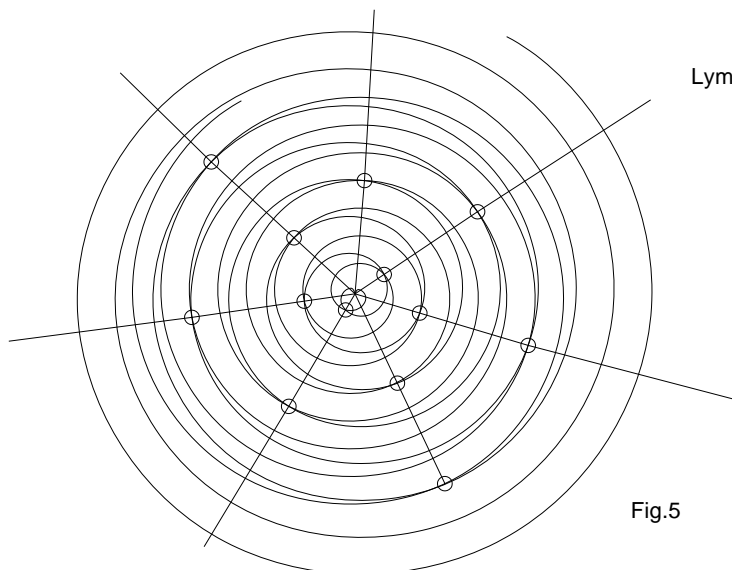
Lyman 2

Fig.3



Lyman 3

Fig.4



Lyman 6

Fig.5

Lyman 7

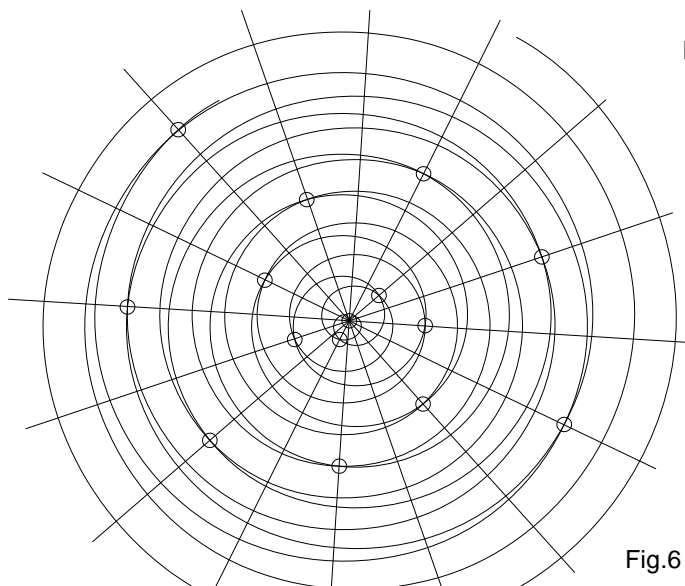


Fig.6

Balmer 3

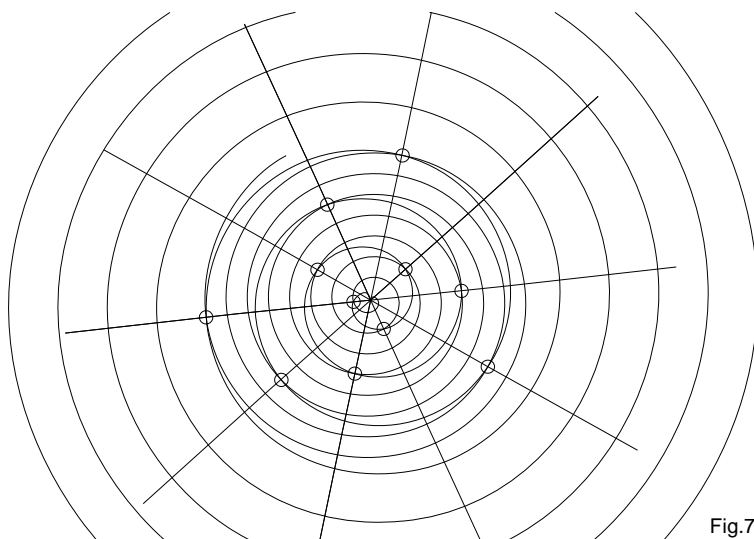


Fig.7

Balmer 5

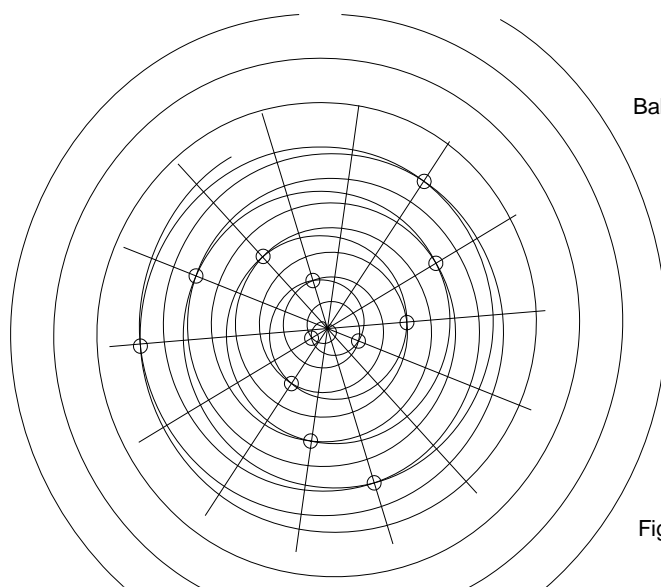
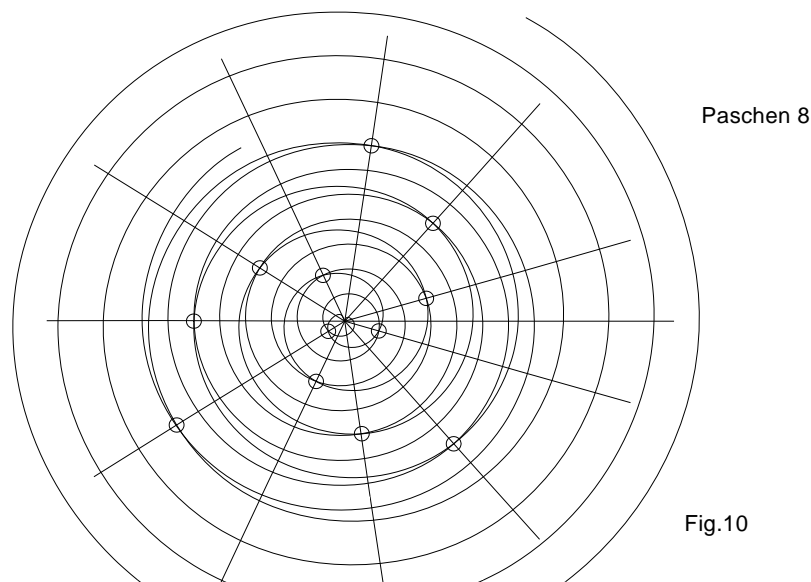
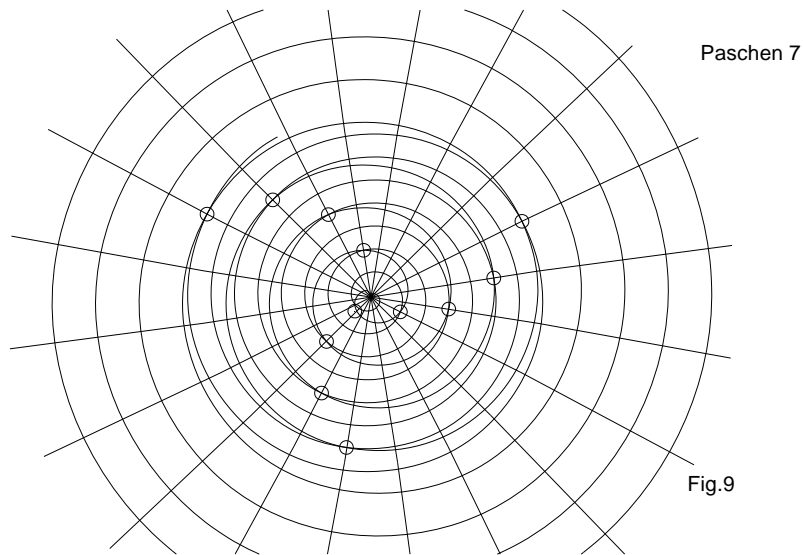


Fig.8



Conclusions:

The above exposed leads to the following conclusions:

- 1) Light (visible and invisible) is of undulate nature and propagates in an etheric medium named in former times as "luminiferous ether", which etheric medium consists of a multitude of ultra-mundane corpuscles, shortly – elons;
- 2) Light energy quanta or photons generate themselves due to the orbital movement of electrons in atoms and molecules by means of taking off and consecutive concentration of energy of those elons, which during their chaotic motion strike the electrons towards the nucleus of an atom or molecule;
- 3) The orbital movement of electrons in atoms and molecules initiates the formation in the surrounding them etheric space of oncoming electromagnetic waves in form of Archimedean spirals (primary waves); and photons are those discrete undulate formations which create themselves by the way of the primary waves' intersection.

- 4) Oncoming primary waves form themselves due to the oncoming rotation of electrons, e.g. of two oncoming electrons of a hydrogen molecule;
- 5) Primary waves form themselves as a result that the elons striking an electron from the outside along the radius linking it with the nucleus of an atom or molecule rebound from it losing (at least partly) their kinetic energy, notably that energy which consumes itself while bending the electron's trajectory (from straight line to circle);
- 6) Primary waves' fronts are those zones of etheric space, which are moving with the speed of light and characterize themselves by a reduced amount of elons with velocities directed off the nucleus of an atom or molecule;
- 7) In spite of a photon has to be very dense resulting that the primary waves intersect each other in very restricted zones of space, it must also be elongated in the electrons' orbiting plane, which could explain the polarization of light, while the said electrons' orbiting plane may serve as a polarization plane;
- 8) In the Balmer-Rydberg formula $\nu = cR_H \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right)$ that determines the frequency of light generated by hydrogen molecule, cR_H stays for the frequency of the electrons' orbiting around the molecular nucleus, and the fraction $\frac{n_1}{n_2}$ which does so for the relation of the frequency of the molecule's rotation to that of the orbiting of the electrons is an indicator of the molecule's temperature;
- 9) The light propagates itself in the electrons orbiting plane, which is the plane of its polarization, and the radial directions of its propagation divide the whole 360° angle with the center in the center of the molecule by $2n_2$ equal parts;
- 10) The frequency of photons' consecutive formation in all determined directions makes $\frac{2cR_H n_2^2}{n_1} (n_1^2 - n_2^2)$;

See also the web-site www.physicsfether.kiev.ua