VISUALISATION OF THE MASS DEFECT

- **As of the writing of this document, science does not have clear definitions for the concepts of *mass* and *matter:* In documents F1 and G0, the author defines and elaborates upon the concepts of mass and matter. The properties of *matter* can normally be measured directly; the properties of *mass* cannot!**

- **At the lowest level, that of the photinos, matter is non-existent. Only mass is present, always combined with charge, magnetic spin and kinetic energy. The transition from *mass to matter* occurs when *the center of a photon rotates arounds its axis with the speed of light.***

- **The reverse, the *matter to mass* transition, occurs on annihilation of equivalent particles matter and antimatter. During this process, the light-speed rotation is cancelled, transforming all matter into photons in the form of light and heat:**

- **In document F1, the author deduced the system of subatomic particles together with their fractional parts of the 1) mass, 2) electric charge and 3) magnetic spin of the proton or electron. The transition of mass *to* matter and of matter *to* mass is clearly indicated: It is further deduced in document F1 that across the universe, subatomic particles result in only four very stable particles: 1) the proton, 2) the anti-proton, 3) the electron and 4) the anti-electron:**

- **In this document F2, the so-called "*mass defect"* is examined. This defect always occurs when bound protons/electrons are compared to unbound protons/electrons:**

- **In this bound, flexed proton/electron, the present charge and magnetic spin is covered slightly more than in the unbound straight proton and electron. The amount of mass and matter is exactly the same in both instances:**

- **A mass spectrometer will *indicate* slightly lower values for charge and magnetic spin and therefore "mass" when compared to the free, straight, unbound proton and electron:**

- **In reality there is no matter/mass defect between both varieties! The measured mass defect is purely *optical and* the result of measurements using "mass" spectrometers. This measured, but non-existent mass defect occurs in all types of mass spectrometers.**

- **In this document, the author visualizes the so-called "*mass defect".* There is no reason the supplement the measured mass/matter defect with artificial subatomic (massive) particles:**

- **By developing a system for correcting for the "mass defect", the methodology of current mass spectrometers may be preserved. Previous publications based on results of mass spectrometers will however need to be updated and revised.**

Ir. A.P.B. Uiterwijk Winkel *) **) *)**

***) With thanks to Frank Roos for his comments**
****) With thanks to Adarshi Yadava for the figures,**

***1 INTRODUCTION; HOW ARE MATTER, PROTON, ELECTRON AND ATOM FORMED:**

-) Formation of mass and matter:
The author starts his discussion of the mass defect with an abbreviated version of his Elementary (subatomic) Particles Model; document F1 www.uiterwijkwinkel.eu.

The author calls the smallest conceivable massive particles *photinos* which are equivalent to mainstream physical concepts such as the *neutrino* or *Higgs boson.* Three names for the smallest massive particles of which the author uses only photino. These smallest of massive particles, photinos of the proton and of the electron, can primarily be visualized as a standing vibration of mass of which there are only two varieties: the 'mass vibration' of the proton and the mass vibration of the electron: **figures 1a and 1b**. There is only mass, there is no anti-mass!

Both the proton and the electron consist of 625 photinos so that the massive particle of the electron is 2,95 smaller than the massive particle of the proton in terms of length or vibration energy. See also document F1.

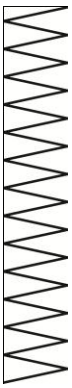


figure 1a
Proton photino

figure 1b
Electron photino

Both mass vibrations rotate either clockwise (RO) or counterclockwise (LO) around their respective long axes, which causes them to attain the spatial form of a "rugby ball". This basic rotation can in no way be cancelled, reduced or increased. This rotation is always present as a constant property.

One can distinguish between the proton photino (LO)/(RO) and the three times smaller electron photino (LO)/(RO); a total of four possible photinos. As free particles these photinos move through the universe at speeds exceeding the speed of light; **figures 2a and 2b.**

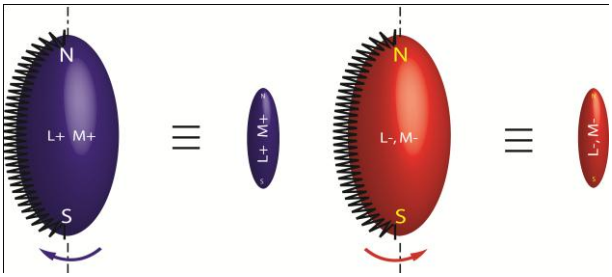


figure 2a
Proton photino **Proton anti-Photino**

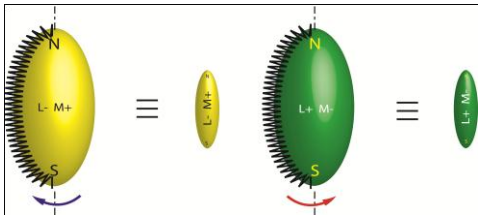


figure 2b
Electron photino **Electron anti-photino**

-) Charge and magnetic spin are created by rotation:
This fixed basic rotation generates an electric charge in the center and magnetic spin at each end of these four "rugby balls". This makes all photinos small, electrically charged magnets with a north and a south pole! Depending on the direction of rotation of the photinos, the charge and magnetic spin are either positive or negative. It is quite logical that photinos with equivalent charge repulse one another while photinos with opposite charge attract one another. The same applies to magnetic spin.

It is worth noting that both the charge and magnetic spin of the proton photino is *quantitatively* exactly equal to that of both electron photinos. The author as yet has no explanation for this. Probably, the photinos rotate around their axes at the same velocity.

-) Rotation around the short axis is not possible:
Theoretically, these photinos could rotate clockwise or counterclockwise around their short axes as depicted in **figures 3a and 3b**. Such a rotation would result in another north/south pole along the short axis.

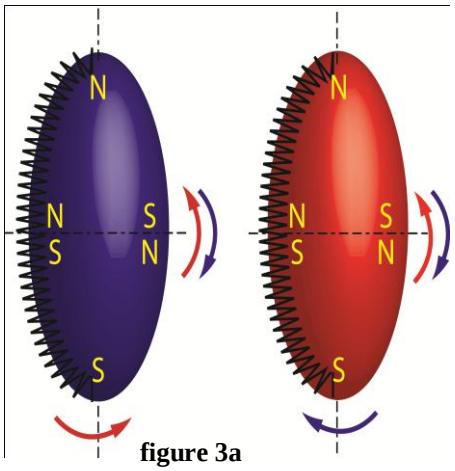


figure 3a
Proton photino **Proton anti-photino**

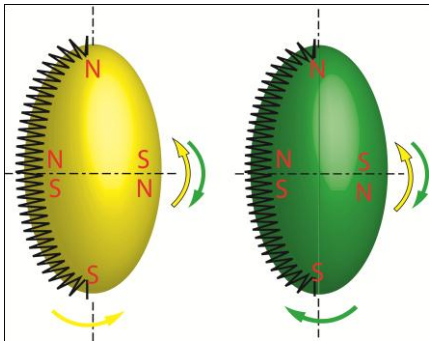


figure 3b
Electron photino **Electron anti-photino**

Photinos only rotate around their long axes and *are unable to also rotate around their short axes*. This can be seen intuitively when considering the shape. What remains is only the rotation around the long axis as depicted in **figures 2a and 2b**.

The photinos have but two degrees of freedom: 1) the vibration along the long axis and 2) the rotation around the long axis causing charge and magnetic spin. At all levels of matter formation, the structure of the proton and electron is such that at the very lowest level neither the mass vibration nor the rotation causing elementary charge and magnetic spin can be cancelled. *Mass, charge and magnetic spin are absolute inalterable quantities in the universe!!*

Because of their opposite rotation around the long axis (LO)/(RO), these primary mass particles have both an opposite charge and opposite magnetic spin. This causes both proton photinos to attract each other reciprocally. Larger constructs can be made using both proton photinos. The same applies to both electron photinos.

Between proton photinos and electron photinos exists always a *combination* of attraction through charge and repulsion through magnetic spin. This is why larger constructs cannot be made using combinations of proton photinos and electron photinos!

As was previously stated, the basic rotation of both mass particles around the long axis is always present can't be cancelled or altered in any way. The mass particles (LO) and (RO) are therefore unable to annihilate with each other. We cannot yet speak of matter and antimatter. In any case there is no such thing as anti-mass. It is for that reason that mass, contrary to what Einstein thought and contemporary science thinks, cannot be destroyed in any way nor can the elementary basic rotation of mass be converted into energy!

Annihilation can only occur between equivalent particles of matter and antimatter. These photinos have no properties of matter or antimatter yet.

-) Formation of photons from five photinos:
Stable photons and anti-photons can only be made from a rhombus shape consisting of 5 photinos in proportions of 4 (LO) and 1 (RO) or 1 (LO) and 4 (RO). The velocity of all photons through the universe is *limited to the speed of light c*. If it exceeds light speed, the photon disintegrates into its 5 photinos.

The combination of 5 larger photinos, 4 : 1 or 1 : 4, results in the proton (infrared) photon/anti-photon. The three times smaller photinos in the electron in proportions of 4 : 1 or 1 : 4 result in the (visible light) photon/anti-photon. **See figures 4a and 4b**.

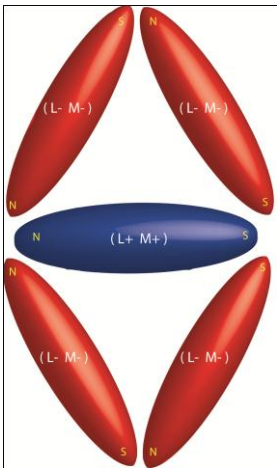


figure 4a
Proton photon (infrared)

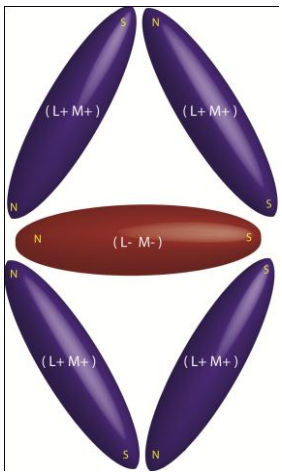


figure 4b
Proton anti-photon (infrared)

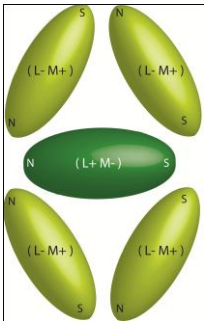


figure 5a
Electron photon (visible light)

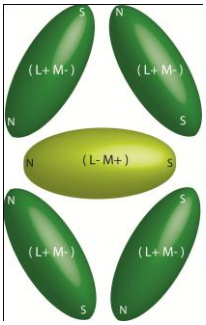


figure 5b
Electron anti-photon (visible light)

These photons and anti-photons of the proton and electron also have opposite charge and magnetic spin and so mutually attract each other. Inside every beam of electromagnetic radiation, both visible and infrared, the photon and anti-photon are bound together through opposite charge and opposite magnetic spin. There are more ordinary photons than anti-photons in the universe (60,8% vs. 39,2%); **Schema 1 page 8 document G0**; causing all electromagnetic radiation to exhibit a slight *net* electric charge and magnetic spin. This is why electromagnetic radiation's orbits are deflected by the electric and magnetic fields of stars, galaxies and black holes.
In the universe, all electromagnetic radiation and particle radiation is subject to a very slight deflection: **document G9** www.uiterwijkwinkel.eu. The universe provides for us on earth a completely distorted view.

Together, photons/anti-photons of the infrared (the proton) and those of visible light (the electron) form an electromagnetic wave that has: 1) mass, 2) charge, 3) magnetic spin, 4) movement at the speed of light and because of that 5) kinetic energy. Photons however still lack the property of matter!

Separation of both types of photons (photon and anti-photon) occurs only when electromagnetic radiation is polarized and this separation of photons and anti-photons becomes visible during interference.

-) Rotary photons possess matter:
It is in orbits around the black holes central to galaxies that photons both of the proton and of the electron start rotating ever faster around their axes until they acquire a rotational velocity of *c*. Because of this light-speed rotation, these *matter-less photons* transform into *matter-possessing rotary photons* and *anti-rotary photons* and thus into (anti-)matter.
These (anti-)rotary photons add the property of (anti-)matter to their basic properties of: 1) mass, 2) charge, 3) magnetic spin, 4) speed of light and 5) kinetic energy!

From that point onward, the rotary photon (LO) is complete antimatter to the rotary photon (RO) and vice versa. Physical contact causes annihilation which results in cancelation of the light-speed rotation, creating two (anti-)photons which travel through the universe with the speed of light.

At this lowest level of matter, the so-called rotary photon-level, *all* ***matter*** in the universe consists completely of only four such rotary photons and anti-rotary photons of the proton and of the electron. See **figures 6a, 6b, 7a and 7b**.

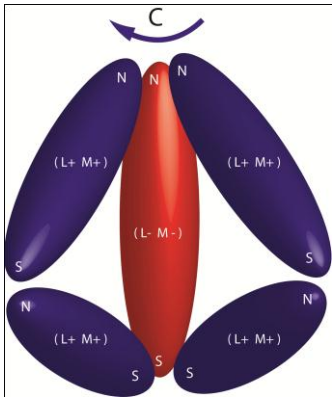


figure 6a
Proton rotary photon

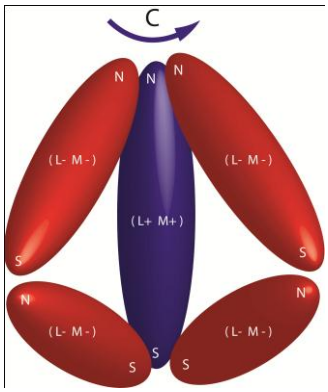


figure 6b
Proton anti-rotary photon

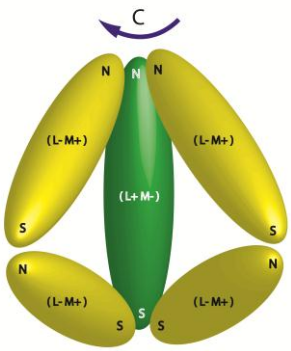


figure 7a
Electron rotary photon

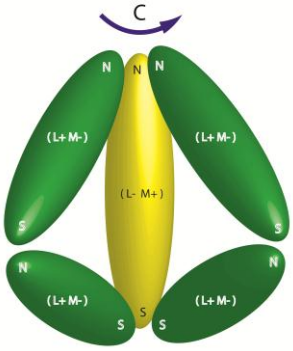


figure 7b
Electron anti-rotary photon

-) Further structuring of matter:
The universe, people and measurement equipment consists of 100% *matter* and as such of said four (anti-) rotary photons. These rotary photons rotate either clockwise (RO) or counterclockwise (LO) with the speed of light *c*, have opposite charge and magnetic spin and are as such mutually attracted to each other.

In orbits around black holes, ever larger constructs can be formed from these (anti-)rotary photons: (anti-)strings, (anti-)quarks and eventually the (anti-)proton and (anti-)electron. This process is extensively covered in **document F1** www.uiterwijkwinkel.eu. See **figure 8** for the structure of the (anti-)proton and **figure 9** for the structure of the (anti-)electron.

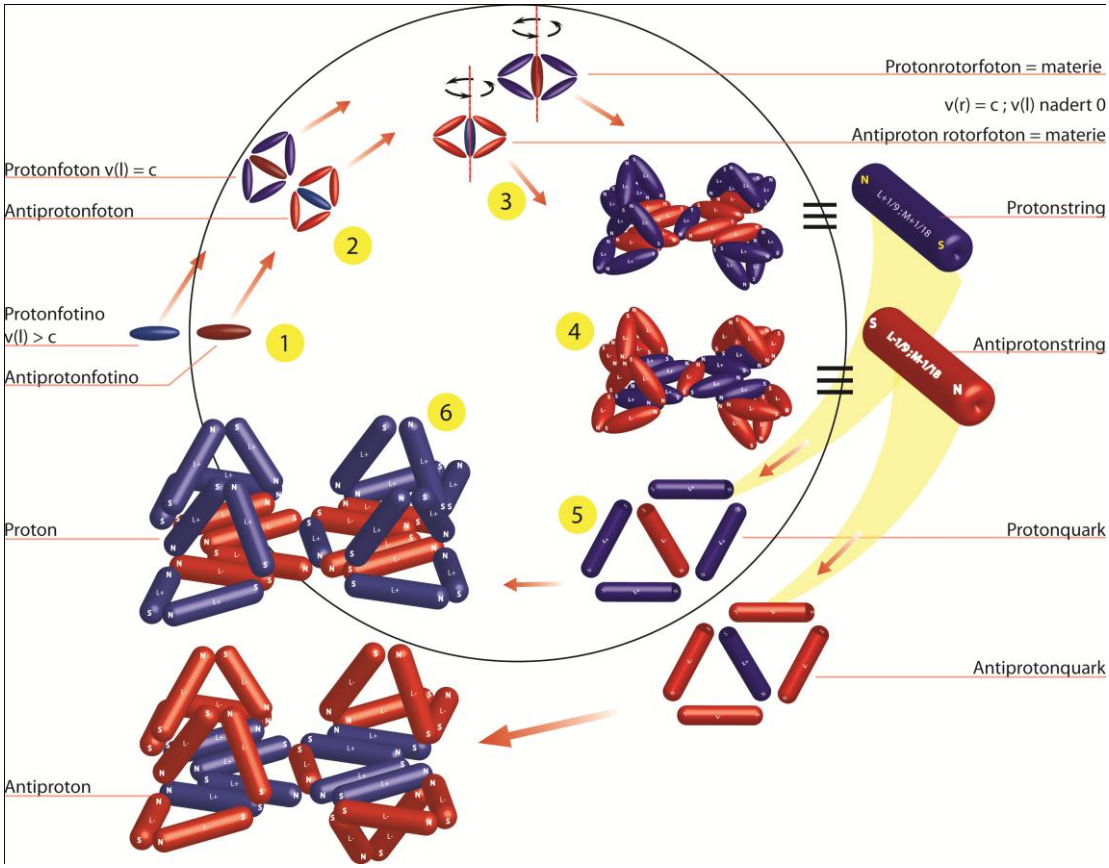


figure 8: The structuring of the proton and anti-proton from: 1) proton anti-photinos through 2) infrared (anti-)photons, 3) proton (anti-)rotary photons, 4) proton (anti-)strings, 5) proton (anti-)quarks resulting in 6) the proton/anti-proton.

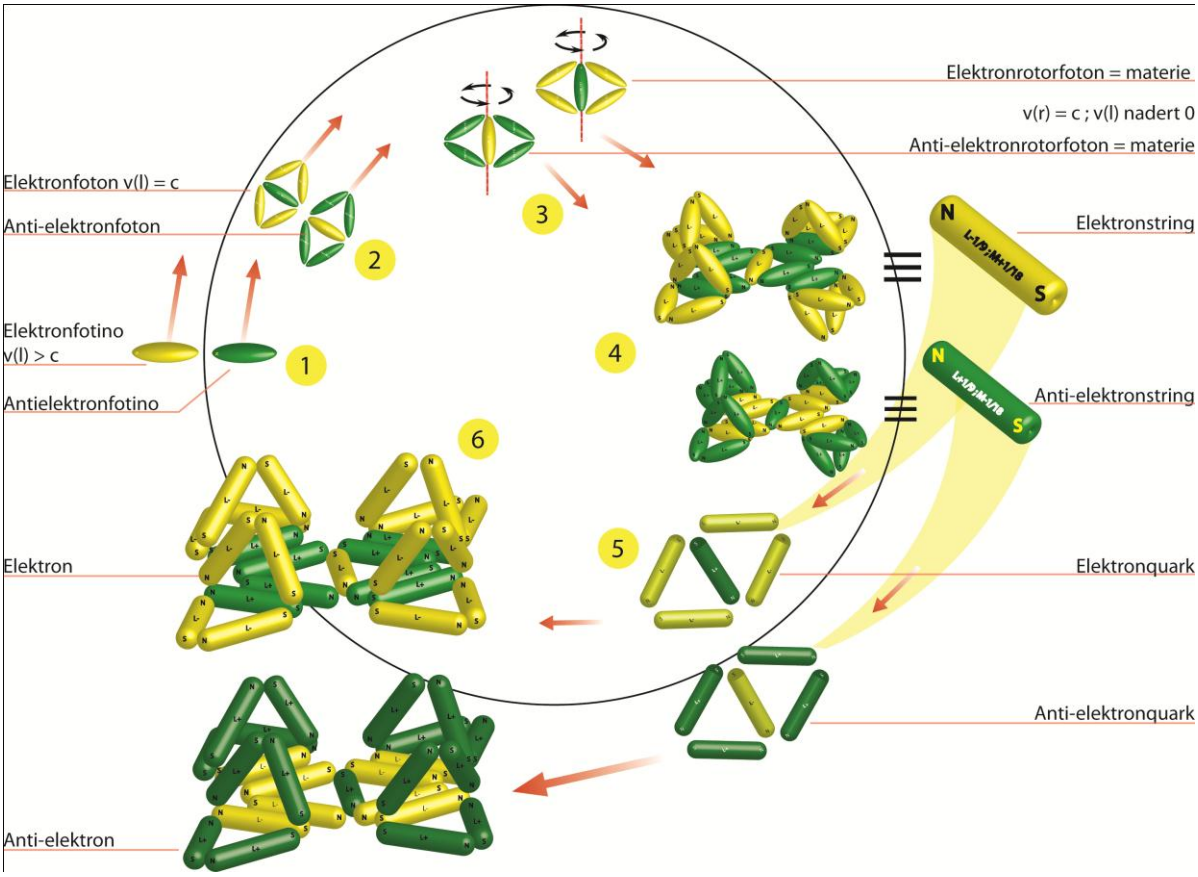


figure 9: The structuring of the electron and anti-electron from: 1) electron anti-photinos through 2) visible light (anti-)photons, 3) electron (anti-)rotary photons, 4) electron (anti-)strings, 5) electron (anti-)quarks resulting in 6) the electron/anti-electron.

The proportions of the number of rotary photons and anti-rotary photons (60,8% versus 39,2%) is such that this universe always contains an equivalent number of ordinary protons and ordinary electrons.

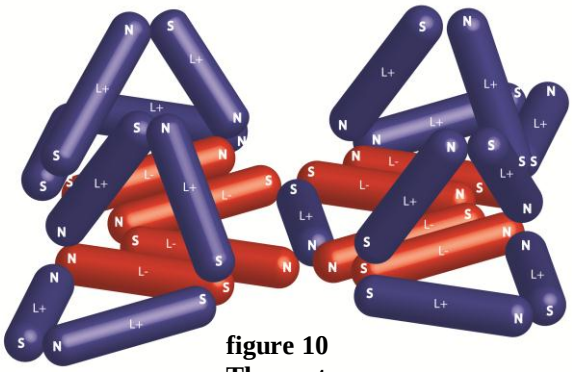


figure 10
The proton

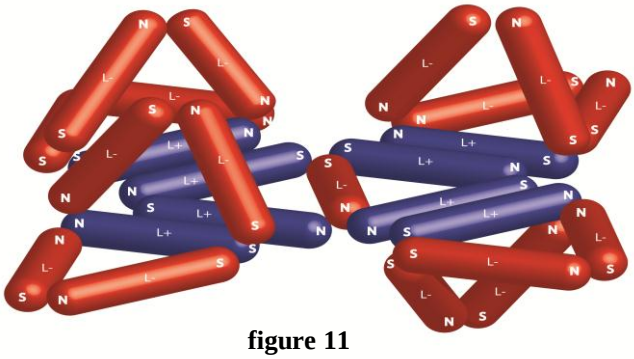


figure 11
The anti-proton

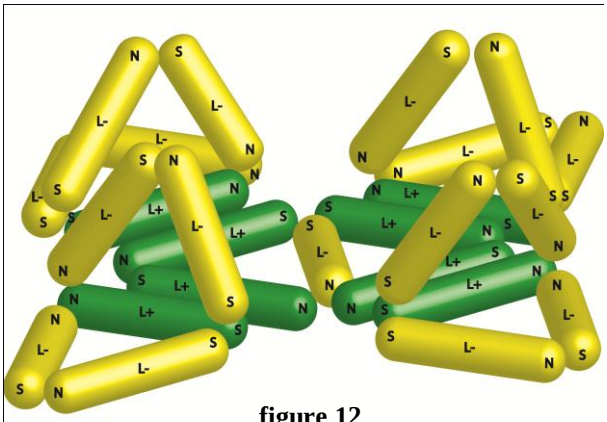


figure 12
The electron

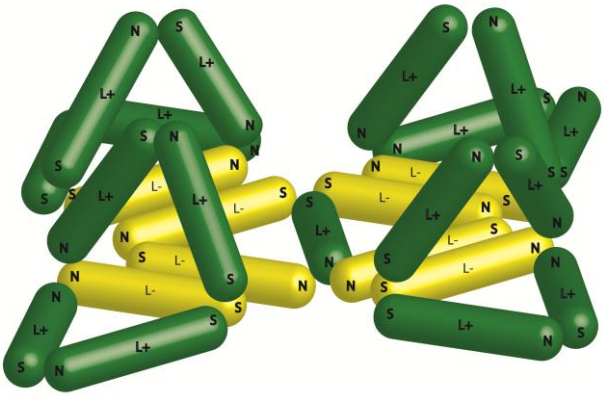


figure 13
The anti-electron

-) Only four stable building blocks of matter:
In his document F1 www.uiterwijkwinkel.eu the author deduces that at the subatomic level only four stable particles are possible: 1) the proton, 2) the anti-proton, 3) the electron and 4) the anti-electron! All other subatomic particles are unstable and quickly disintegrate.

From the spatial constructs shown in **figures 10 - 13** it is apparent why just these particles exhibit such stability. It is in these four stable particles that *all bonds* always consist of just electric and magnetic forces.

Figures 8 and 9 show the structuring of this three dimensional constructs from the smallest conceivable massive particles: the (anti-)proton (anti-)photinos and the (anti-)electron (anti-)photinos.

-) The universe contains only ordinary protons and electrons:
In this universe, only protons and electrons occur naturally; **figures 10 and 12**. From these ordinary protons and electrons, both the anti-proton and the anti-electron can be made; **figures 11 and 13**. All particles can flex along the central, visible (anti-)quarks.

-) Straight and flexed protons and electrons:
When engaging in a bond, protons and electrons inside the atomic nucleus virtually always attain a flexed position; **figures 14 and 15**.

figure 14
Flexed proton

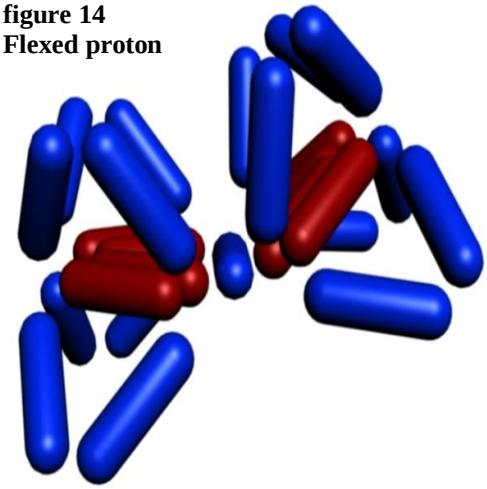
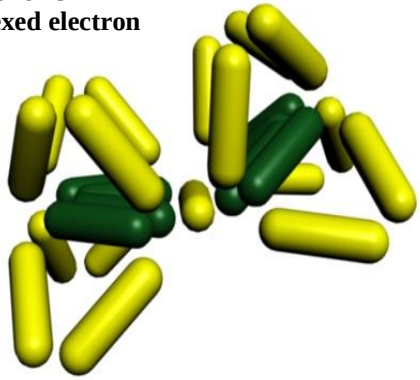


figure 15
Flexed electron



All atoms and molecules are constructs of only two subatomic particles: ordinary protons and ordinary electron(s) in a flexed state rather than a straight position.

-) What is measured: Mass or matter?
Such constructs of (anti-)rotary photons can be measured as matter. The underlying mass, charge and magnetic spin associated with these, originally matter-less photons/anti-photons can however no longer be measured directly.

The very smallest massive particles, photinos, possess five physical characteristics: 1) mass, 2) electric charge, 3) magnetic spin, 4) kinetic energy and 5) a velocity larger than the speed of light. Kinetic energy and velocity are more or less each other's equivalent and these two properties can be measured! The other elementary physical characteristic can sadly not be measured directly!

From these smallest mass particles, photons can be formed for which 1) mass, 2) charge, 3) magnetic spin cannot be measured directly yet; only velocity and kinetic energy can. That is why, quite delusively, it seems that photons are pure energy when really they are not! Photons possess mass and with velocity also kinetic energy. The fact that the mass, charge and magnetic spin of photons cannot be directly measured has resulted in many misunderstanding, the most far-reaching of which is Einstein's Relativity theory which he deduced *for matter* and *not for the mass of that matter*.

The transitional area from the non-perceptible mass, charge and magnetic spin of photinos and photons to the mass with observable matter and measurable characteristics lies with the transition from ordinary photons to rotary photons; for this see **document F1 or G0**.

In all forms of matter, the associated mass, charge, magnetic spin and kinetic energy present at lower levels cannot be directly measured, causing all sorts of misunderstandings. For all scientific measuring equipment is of course made of matter. There is no measuring equipment specifically focused on only mass. The properties of photinos and photons cannot be measured directly. We only measure matter and never the mass if that matter!

From measurements of matter we *indirectly* deduce the mass and accompanying charge and magnetic spin of that matter. The results of those *indirect* measurements should, with regards to mass, be used with extreme caution.

	Physical Characteristic							
	Mass	**Matter**	**Atom**	**Particle**	**Gravity**	**Radiation**	**Max velocity**	**Kinetic energy**
Building block:								
Photinos	Yes	No	No	Yes	No	Yes	$v > c$	Yes
Photons	Yes	No	No	Yes	No	Yes	$v = c$	Yes
Rotary photons	Yes	Yes	No	Yes	No	Yes	$v = c$	Yes
Strings	Yes	Yes	No	Yes	No	Yes	$v = c$	Yes
Quarks	Yes	Yes	No	Yes	No	No	$v = c$	Yes
Proton/electron	Yes	Yes	No	Yes	No	No	$v = c$	Yes
Atom	Yes	Yes	Yes	Yes	Yes	No	$v = c$	Yes

Schema 1: Overview of physical characteristics of subatomic particles of the proton and electron:

-) There is no *mass defect* but a *matter defect*:
In the author's documents, *mass* with its' accompanying charge and magnetic spin are enduring, unalterable quantities. To the author, Einstein's $E = mc^2$ is complete nonsense for *m = mass*. It does apply for *m = matter* but only during annihilation of equivalent particles of matter and antimatter.

Mass cannot be destroyed. Technically, a *mass* defect is therefore impossible, unlike a *matter* defect. This is why from here onwards, the author employs the term *matter* defect and drops the term *mass* defect.

***2) PROBLEM DEFINITION**
The amount of *matter* (and so indirectly mass), *charge*, *magnetic spin* of both common subatomic particles, the free proton and electron as depicted in **figure 11 and 13**, has been measured extensively and defined using *mass* spectrometers, to be called *matter* spectrometers from now on.

The masses of ions have been measured with the greatest accuracy, although matter spectrometers only measure *indirectly*! This measurement method implies a certain risk of systematic measurement errors.

Using the basic building blocks of the ordinary proton (**figure 10**) and the ordinary electron (**figure 12**), a number of more complex structures can be made:
a) the *electron pair*,
b) the *neutron*,
c) the *alpha particle/helium nucleus* and d) the structure of the helium atom from hydrogen atoms,
e) the *approximately hundred elements* of the Periodical System of Elements with their isotopes and their accompanying *atomic nuclei*,

All of the abovementioned constructs consist of bonds between protons and/or electrons. When engaging in such bonds, the proton and/or electron assumes a flexed position as depicted in **figures 14 and 15**. In this flexed position, the amount of matter (mass), charge and magnetic spin can also only be determined indirectly using matter spectrometers and after calculations.

-1) From *mass* balance to *matter* balance
It has been measured that the mass of an atomic nucleus is smaller than the sum of the masses of all its' constituent particles in a free state. The difference, called the mass defect, was described by Einstein as bond energy using $E = mc^2$.
The author expresses his view on this in chapter 3.

***3) HYPOTHESIS:**

1) Mass/matter difference occurs because the flexed form of the proton/electron:
In this document, the author elaborates on the *hypothesis* that the *matter* defect measured using *matter* spectrometers occurs when the proton or electron engages in a bond and therefore assumes a flexed position, and its' calculated mass is compared to free and so straight particles!
Both straight and flexed protons and electrons contain the exact same amount of mass, matter, charge and magnetic spin but now the charge can no longer be considered a point charge but rather a charge distribution: a charge with a dipole component.

A "mass" spectrometer shows such a bound and flexed proton as having *slightly less charge/magnetic spin* compared to an unbound, non-flexed proton. This dipole component causes slightly less *deflection* to occur in a matter spectrometer and, using $m = RqB/v$, a *slightly smaller amount of matter* seems to be calculated. The mass is present but is not measured! The law of conservation of mass holds.

The *mass* defect therefore does not exist. The mass defect is solely the result of incomplete interpretation of matter spectrometer readings! The concept of a dipole component inside the atomic nucleus was never considered because it was assumed the nucleus contained neutrons and did not contain electrons.

2) Gaining insight into the mass/matter defect:
Such *flexing* of the bound proton and/or electron occurs in: the electron pair in the electron shells, the neutron (which exists only in free form) and all atomic nuclei (except hydrogen).

These atomic nuclei consist for a large part of α particles bound to each other by electrons.

3) The measured mass/matter defect may be predicted quantitatively:
The author posits that at some point, using the proposed three-dimensional structures of atomic nuclei and electron pairs in the electron shells, it may be possible to predict the size of the matter defect. If so, corrections could be made for it.

4) Publications up to 2011 should be revised:
All scientific dissertations and publications up to today should then be revised and amended based on corrected measurement results, to then be reevaluated. Conclusions may also have to be altered. This constitutes an enormous amount of work that nobody looks forward to undertaking.

***4) EXAMPLES OF BOUND/FLEXED PROTONS/ELECTRON AND OF THE "MATTER" DEFICIT:**

4.1 ad a) THE FLEX STRUCTURE OF THE ELECTRON PAIR:
The much smaller electron usually occurs in its straight form. Flexing of the electron really only occurs in the case of an electron pair as illustrated in **figure 16**. In all other cases the electron assumes a straight position. Both electrons cross each other.

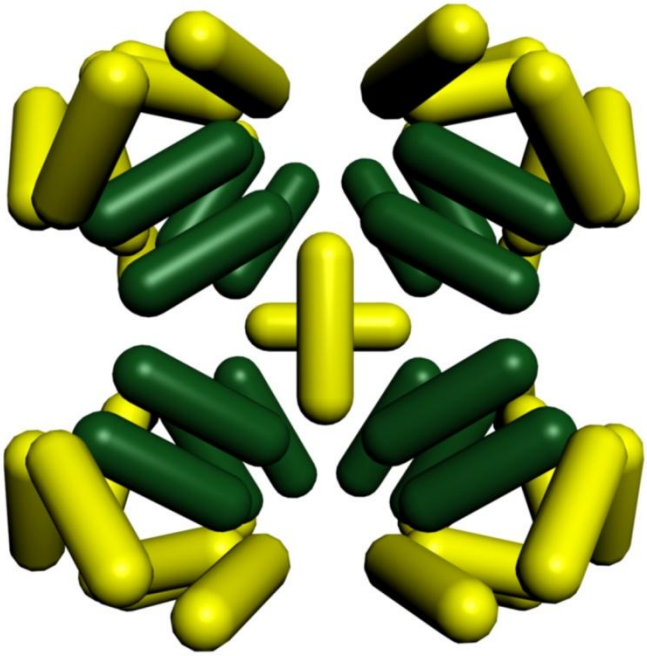


figure 16a: The spatial structure of the electron pair

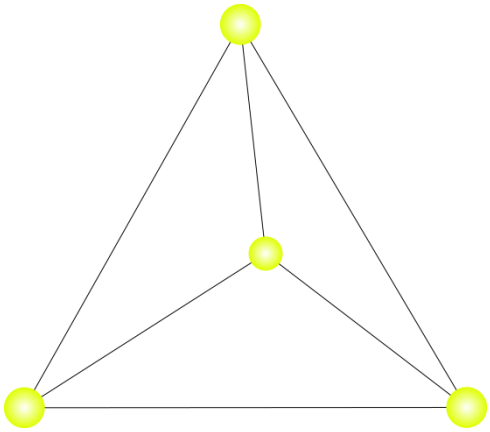


figure 16b: Tetrahedral shape of the electron pair

a) Covalent bond within the electron pair:
In an electron pair, the flexing axes of both electrons face each other. These intersecting axes of both electrons are connected via a *chemical covalent radical bond!* For the origins of this covalent radical force see document C2 www.uiterwijkwinkel.eu.

Both the equal negative charge and the equal magnetic spin cause mutual repulsion and prevent both electrons from making physical contact.

b) Negative ends arrange themselves as a tetrahedron:
The four negatively charged groups on both electrons repulse each other and are arranged in a tetrahedron as depicted in **figure 16b**. The electron pair that curves into a tetrahedron exhibits slightly less mass as measured by a mass/matter spectrometer than two free electrons.

In atoms, each flexed electron pair has its effect on the determination of the matter (mass) of atoms. Wherever possible: a) the "shell" electrons occur as electron pairs and b) the electron shells/sub-shells are filled with 8 electrons and 4 electron pairs. Inside the electron shells of atoms, all electron pairs contribute to the total measured matter defect of the atom.

4.2 ad b) THE STRUCTURE OF THE NEUTRON:
In a neutron, one proton engages in a physical charge bond with one electron. Because of this bond, the proton flexes around the central (blue) string. See **figure 17**.

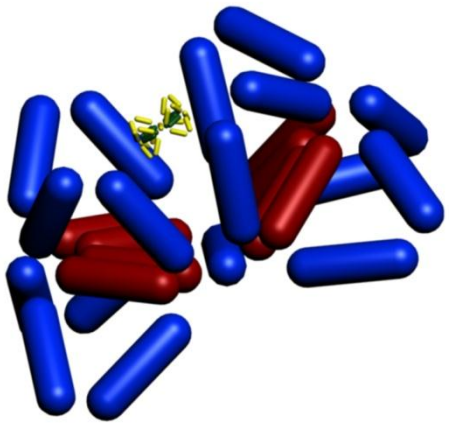


figure 17: The spatial structure of the neutron.

Inside the neutron, the much smaller electron is stretched by the positive charge ends of the proton, causing the electron maintain a straight position. The charge and magnetic spin of the flexed proton inside the neutron are somewhat hidden and therefore appear to be less than those of a straight, unbound proton together with a free electron.

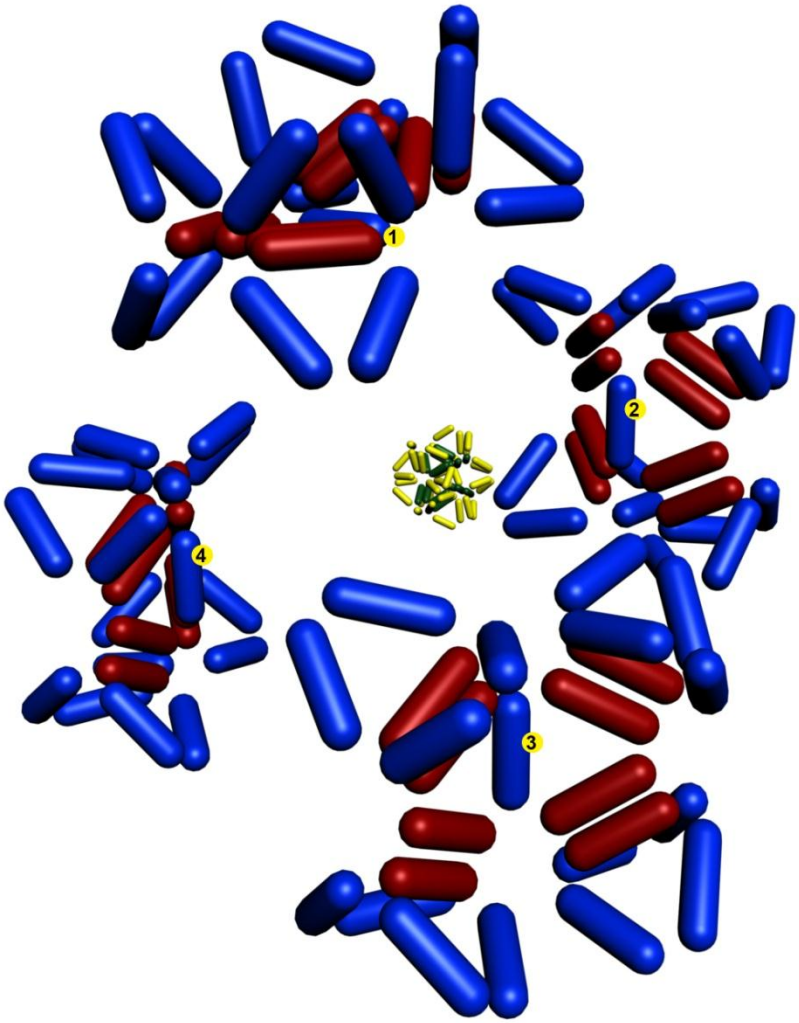
The neutron as depicted in **figure 17** results in an electrical dipole. It should be possible to measure the dipole moment.

The free, straight proton of **figure 10** has no dipole. A determination of the presence of the dipole could confirm the flexed or straight position of the proton and with it the structures proposed in this document.

4.3 ad c) THE STRUCTURE OF THE ALPHA PARTICLE:
The author proposes that the α particle consists of 4 protons and two electrons. Centrally, this He nucleus consists of the tetrahedral structure of the electron pair as depicted in **figure 16a** but is now shown smaller in **figure 18a** and as the smaller, inner tetrahedron in **figure 18b**.

The electron pair in **figure 18a** has four negatively charged ends. Close to each end, one proton is bound. Together, these four protons are arranged in an identical but much larger tetrahedron attracted to the negative charge of the central electron pair. These four protons repulse each other through charge and are in an outwardly flexed position. The flexing lines of these four protons are indicated with the numbers 1 - 4. In the alpha particle, this results in a much larger tetrahedron of four protons located around a central electron pair as depicted in **figure 18b**!

In the helium nucleus, all protons and electrons appear in a flexed position. In the helium nucleus, this results in the highly stable structure as depicted in **figure 18a**.



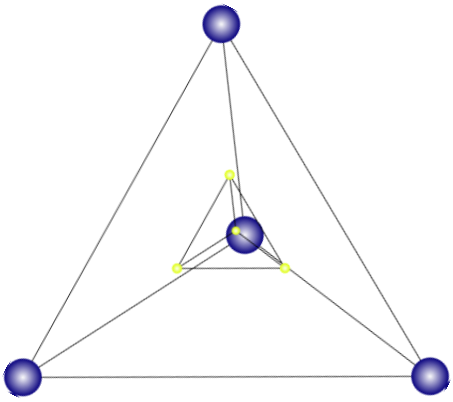


figure 18a:
The spatial structure of the alpha particle/helium nucleus

figure 18b:
The double tetrahedral structure

This atomic nucleus can manifest itself as an independent particle in the form of α radiation. Each proton and each electron of the particle will result in an apparent matter defect when measured by a mass spectrometer.

Except hydrogen, the smaller atomic nuclei are built around at least one α particle by the stepwise addition of electrons and protons. This process of addition is described in document F3 with the nuclear fusion of hydrogen to helium.

***5) CONCLUSIONS:**

1) Protons and electrons can occur in a a) free, unbound, straight state and b) bound and flexed state. In both cases the amount of: a) mass, b) matter, c) electric charge and d) magnetic spin is exactly the same.

2) In all bound and flexed protons and electrons, the core has charge and a dipole moment, an asymmetric charge distribution. Because of this, it appears the bound and flexed nuclear particle has slightly less charge than the free, straight particle.

3) Inside a mass spectrometer, such nucleus composed of flexed protons and electrons assumes a slightly wide orbit inside the magnetic field than expected.

4) Because of this, the bound and flexed proton/electron "exhibits" slightly less matter or "mass" inside a matter spectrometer than the free, straight proton/electron.

5) In both states of the proton/electron, the total amount of mass/matter, charge, magnetic spin is exactly equal!

6) This measured but illusive *matter* defect occurs in all bound protons and electrons. It is the result *of a flawed model of the atomic nucleus*.

7) The *mass* deficit does not exist because mass cannot be measured directly. In matter spectrometers there is only an 'observed' and explainable *matter* defect.

8) Using exact 3D models of the distortions of particles, the matter deficit can be predicted and corrected for, improving upon the table of 'atomic matters'.

9) All publications, dissertations up to 2011 and their conclusions, based on measurements using the old model of the atomic nucleus, should be amended.

10) In science, extreme caution should be taken when using data obtained from indirect measurements. This also applies to the interpretation of such data. One should always be aware of the behavior of the structure of the particle during measurement and the exact method of measurement.

Ir. A.P.B. Uiterwijk Winkel,

18th April 2011, Zwijndrecht, The Netherlands.