

LAWS BIOCHEMISTRY LIVING MATTER IN THE UNIVERSE

OR THE 6 LAWS OF BIOCHEMISTRY

-) The systematic deduction of the biochemical basic principles of living matter:
-) All over the universe matter consists of atoms which have been mainly formed during the H₂ supernova's and therefore constructed of protons and electrons only:
-) After stabilization these atoms formed from H₂ have been classified imperatively regarding their structure in accordance with the elements/ isotopes of the *periodic table* as found on Earth:
-) Throughout the universe those elements qualitatively have exact the same system of 12 fundamental forces:
-) The exact same total amount of about 1 – 2 million mono-molecules and 1 -2 billion polymer-molecules can be constructed with the elements of the *periodic table* / system all over the universe each in about 10 physical positions:
-) In the universe as on Earth these molecules result in the same varied system of chemical, physical-chemical and biochemical reactions in all facets and varieties in for example, the biochemistry of the various forms of living matter:
-) That total amount of 10 – 20 billion molecules and physical positions permits only one biochemical basic system for living matter. The central part of this biochemical system on Earth has been represented in Gerhard Michal's et al. schema's of Biochemical Pathways (BP):
-) Biochemically all living matter in the universe is based imperatively on *Biochemical Pathways* and on exactly the same system of biochemical reactions as in the various life forms on Earth:
-) Living matter is formed in a totally autonomous and spontaneous selection procedure driven by anaerobic and aerobic photosynthesis and the forming of glucose in this process:
-) Living matter may be found in the universe on billions (10⁹) earthlike planets with sufficient liquid water and land:
-) The vulnerability of the hydrogen bonds in both RNA and DNA severely limits velocity on all living organisms in the universe:
-) In relation to Earth, human, vegetable and/ or animal organisms cannot move in the universe faster than at a maximum of about 300 – 400 km/sec or merely only 1% of light speed:

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***0) SUMMARY:**

-1) All matter in the universe is exactly the same and categorized according to the *periodic table*:

With the H₂ supernovas and all other supernova's atoms are formed from H₂ which are exclusively constructed of protons and electrons in the total universe. After stabilization, the fusion products by means of atoms are eventually emphatically categorized according to the remaining 92 stable elements/ isotopes of the *periodic table*.

All matter in the universe has been constructed of protons and electrons and categorized exactly according to matter found on Earth. (**Supplement 1**)

Coupled to those about 90 stable elements of the *periodic table* is a system of 12 fundamental physical and chemical forces and their bonds. See the documents **F1c & F1d** www.uiterwijkwinkel.eu . This system of forces and bonds in the universe is also *qualitatively* exactly the same (supplement 2). Different physical and chemical forces depend quantitatively on the velocity of the atom in the universe and the number of velocities.

All conceivable forces in the universe are inseparably coupled to or originate from matter in the form of radiation. Such *forces in the form of radiation* standardly move universally at light speed because under normal circumstances radiation cannot stagnate in one location. Forces unconnected to matter are impossible. Nor can forces develop independently.

-2) Total set of about 1 – 2 billion mono and polymer molecules and about 10 physically positions:

Based upon these 92 elements of the *periodic table* all kinds of different mono molecules together with the 2 different types of real chemical forces/ bonds and 1 physical chemical force/ bond can be formed (**Document F1d; or Supplement 3**). The author estimates that number on a total set of about 1 – 2 million mono molecules including their isomers and their stereo isomers.

Only a small part of all mono molecules can polymerize. Another set of about 1 – 2 billion polymer-molecules can be formed with the polymerizing part of those 1 - 2 million mono molecules.

Each of those mono molecules and polymer molecules can on average exist in about 100 chemical and physical conditions of theoretically 1024 possible conditions which have been deduced in this document (**Document F1f; Supplements 4, 5, 6 and 7**). These are bonds of various physical and chemical forces and their bonds.

In universe the *periodic table* of elements results in the same, theoretically finite, set of about 1 – 2 million mono-molecules, 1 – 2 billion (10⁹) different polymer-molecules in all conceivable spatial forms and in about 10 physical surcumstances of those atoms, molecules and polymeric molecules.

That total set of 1 – 2 billion molecules is possible on Earth and resulted in living matter. On Earth all forms of life have been categorized biochemically around *Biochemical Pathways* (BP) which schemes have been noted by Gerhard Michal at al. (See schemes of BP on the internet)

A similar total set of 1 – 2 billion molecules is potentially possible and can be expected on all planets in the universe with liquid water and an atmosphere with lightning discharges. In the total universe there are many billions of planets with the possibility and potential for the development of living matter (**Supplement 8**).

Conservatively estimated the author globally expects 1 planet with living matter per billion stars or 100 – 300 stars per stellar system. Living matter may be found on many *billions* of planets in the universe (**Supplement 9**).

The development of living matter is a totally autonomous process activated by photosynthesis and glucose standardly formed in the process. This development mostly occurs everywhere in the universe more or less along the same paths. The development of 'dead' to 'living' matter with reproduction takes about 0.1 – 1.5 billion years (**Supplements 11, 12 and 13**).

Addition of one force would block this development because Biochemical Pathways would be blocked completely. The presence of any real super-natural force would block this development as well and the phenomena of living matter as a whole.

The development of intelligence is the inevitable process. As far as intelligence and technology are concerned more highly developed individuals and civilizations may be envisaged in the universe than currently on Earth! The stability of the very vulnerable hydrogen bonds in the DNA and RNA restricts speed for space travel for all living creatures. In relation to the Earth or planet of departure a limitation of speed/ travel speed of only about 1% of light speed (**Supplement 10**) applies to all living creatures.

-3) Essential characteristics of living matter on Earth:

- a) All forms of life anyhow manifest with biochemical activities.
- b) Biochemical reactions cannot occur in gases or in solids but only in mono molecules dissolved in a liquid. Many chemical reactions and all biochemical reactions occur in a liquid which facts both as a reaction medium and a cooling medium.
- c) Charged mono molecules/ ions can dissolve in water only which means that all biochemical reactions can be accomplished in no other liquid than water. Water is the only liquid in which:
 - 1) gases, 2) ions and 3) non-gaseous and non-charged (*nopression*) molecules can be dissolved at the same time.
- d) To preserve this biochemically necessary reaction medium water and protect it from evaporation, living matter is always emphatically limited to a small screened part of the cell or group of cells. Active cells are always largely filled with liquid water and surrounded by a semi-permeable wall. The cell wall screens the content of the cell from the outside world but the cell wall permits an exchange in the form of: 1) intake of nutrition, materials and water and 2) the exchange of waste matter/ gases. Many organisms have been constructed from several cells,
- e) All living cells or organisms have a limited life span caused by wear and tear, internal pollution and damage by cosmic radiation after which the cell or organism dies. Living matter disintegrates irreversibly to lifeless inorganic material.
- f) *Spores* of bacteria and *seeds* of plants can be viable for thousands of years in dry, cold or anaerobic conditions but eventually they also have an ending life span: all living matter is mortal by definition.
- g) To compensate the effects of death, life can only be preserved by a system of sexual and asexual reproduction. For this reason, all forms of living organisms are capable of sexual and/or asexual reproduction.

-4) Methodology:

The author unravels the construction of the biochemistry of living matter by carrying out:

a) The top down analysis of Biochemical Pathways (BP) itself.

In **chapter 6** the chemical, physical and energetic basic foundations of BP will be deduced.

b) The bottom up deduction on the basis of the elements/ isotopes of the *periodic table* as well as all, roughly 10 – 20 billion molecules, based on the 92 elements, including all possible physical and chemical (phy/che) conditions of these molecules.

From this total of 10 – 20 billion molecules, universally similar, the biochemical structures of all possible physical and perhaps non-physical forms of 'life' in the universe will be deduced in **chapter 7 (2016)**.

By means of these two-opposed top down and bottom up approaches which elements, chemical bonds, molecules and liquids do and which do not fit in the biochemical processes of living matter will be systematically argued and deduced. The bottom up deduction is more complex than the top down analysis.

The bottom up deduction also unequivocally results in *Biochemical Pathways* as the only possible biochemical system for living matter in the universe but also considers the possibilities for non-physical forms of 'life'.

-5) The 6 Laws of biochemistry:

Both methodologies (top down / bottom up) occur inside molecules constructed from the elements of the *periodic table*. Both methodologies have one mutual edge. The author explains this edge as the 6 Laws of the biochemistry of living matter; viz. the 6 Laws of biochemistry. Besides the general premises of living matter these Laws also encompass the more specific physical, chemical and energetic side conditions which are emphatically imposed on the biochemistry of all conceivable forms of living matter *universally*.

-6) Biochemistry of living matter on Earth only functions with liquid water:

The *periodic table* only allows one biochemical system for living matter in Biochemical Pathways (BP). This biochemical system of BP only works in liquid water as reaction medium.

Water is the only liquid which can dissociate in H_3O^+ and OH^- and is the only liquid in which: a) gases, b) charged particles or ions and c) non-gaseous as well as non-charged (*nopression*) mono molecules can dissolve simultaneously. Ions cannot be dissolved in any other 100% pure liquid than water.

Also from energetic requirements water is universally the only suitable liquid to act as reaction medium to finalize any system of biochemical reactions in living matter.

-7) Universal wide the same systematics in the biochemistry of living matter:

The biochemistry of living matter on Earth is unique but at the same time acts also as a standard for the universe for all its forms of living matter. All living matter is emphatically based on the same:

- a) carbon chemistry (C, H, O, N, S and P),
- b) aerobic and anaerobic photosynthesis with 4 types of chlorophyll linked with ADP/ ATP,
- c) reaction medium; viz. water,
- d) carbo hydrates, fatty acids, amino acids,
- e) enzymes / co-enzymes and
- f) aerobically / anaerobically forms of life.

The central biochemical life processes of living matter occur on the mono molecular level and have been described in the biochemical schemes Biochemical Pathways (BP). Central in BP are: 1) the citric acid cycle, 2) the fatty acid cycle and 3) the amino acid synthesis. These are in fact *the biochips* in the biochemistry of living matter.

Up until now no other biochemical systems than *Biochemical Pathways* have been found on Earth; nor biochemistry based on silica (Si) or on reaction mediums such as liquid NH_3 or liquid H_2S . In this document, why such alternative biochemical forms are not possible will be deduced and explained.

-8) Automatic and totally spontaneous development of living matter:

In this document proof will be given that the *periodic table* of elements does not permit any other biochemical option/ system than *Biochemical Pathways*. This has not been described in the literature before.

Because only one biochemical system such as Biochemical Pathways is possible living matter develops totally spontaneously and autonomously around BP. In principle, this occurs on all planets in the universe with sufficient liquid water/ land and an orbit which mainly needs to consist of free inert N_2 gas.

-9) The necessity of demonstrable driving force for both all forms of physical life and possible non-physical forms of life:

Maintaining all physical forms of life requires a continuous driving force which is obtained by converting chemical bond energy into heat for all living matter.

All non-physical forms of life can manifest in the form of radiation which inherent to radiation moves at light speed. Only by means of a continuously generated driving force such radiation may be maintained whatever this driving energetic force/ form of physical or chemical energy it may be.

-10) Presentation as one concluded whole:

After more than 30 years and thousands of hours of work the author has concluded his various visions regarding:

- a) The classification of all matter according to the *periodic table* of normal elements (from H, **document F1d**) and of atoms in a black hole condition (from beryllium (Be, **document F1e**),
- b) The 12 fundamental forces and bonds on normal matter and the 8 fundamental forces on black hole matter or black hole atoms as well as forces on anti-matter,
- c) The biochemical basic foundations of living matter in the form of the 6 Laws of biochemistry,

- d) An ultra-cold Little Bang which takes place without any form of explosion at 0 ° kelvin. Subsequently the universe cycle (the Tæutcycle) has been deduced which is accomplished in energetically totally neutral fashion in 29 steps and in about 2-3 trillion (10^{12}) billion years. See **documents G7 & Figures G8**. The universe as a whole is a perpetual motion. The universe can be mathematically modelled.
- e) This cycle explains the origin of the current universe, the elements of the *periodic table*, the forces on those atoms and where the universe is going to.
- f) The structure of all forms of normal matter, black hole matter and anti-matter deduced on the basis of no more than 4 different strings / Higgs , string, snare particles, 4 different photons and quarks (**F1c + Figures**).
- g) The foundation of all matter is based on only 2 elementary Higgs particles (**F1a 2014 + Figures**).

Documents: www.uitewijkwinkel.eu

***1) ESSENTIALS LAWS OF BIOCHEMISTRY OF LIVING MATTER ON EARTH:**

The author first shortly indicates the essentials of the biochemistry of living matter or the Laws of Biochemistry in short. For the sake of clarity these Laws have been described sometimes a little more extensively; sometimes a bit shorter. For the complete Laws and a more extensive explanation see **chapter 9**.

1.1 1st LAW OF BIOCHEMISTRY: REQUIREMENTS OF LIFE IN CELLS, MORTALITY AND COMPENSATION OF MORTALITY:

Law I a): All forms of life are characterized by biochemical processes which complete in a liquid encompassed within a cell. Standardly such cells are enveloped by a semi-permeable cell wall.

Law I b): All living cells and matter by definition have a finite lifespan due to pollution and damage; all forms of life are without exception mortal.

Law I c): To compensate that mortality all cells or organisms are capable of sexual and/or of asexual reproduction.

Explanation Law I):

1) Only in liquid water can the biochemistry take place and be accomplished. Liquid water as the reaction medium, can only be preserved and be protected from evaporation or precipitation when enveloped by a semi-permeable cell wall.

2) Because of the chemical pollution, damaging by cosmic radiation and mechanical damage all living cells have a finite lifespan. The phenomenon life can only be preserved when such living cells have an asexual and/or sexual reproductive system.

1.2 2nd LAW OF BIOCHEMISTRY: REQUIREMENT OF THE IRREVERSIBLE DRIVING FORCE:

Law II a): The driving force of living matter is deeply rooted in the biochemistry and develops by converting the chemical bond energy of chemically covalent charge bonds (+L2cb) into heat.

Law II b): This conversion and the driving force are irreversible. The driving force also drives living matter unilaterally and irreversibly forward in time.

Law II c): This driving force cannot be derived from any other form of energy:

- **physical: light, electricity, radiation, electron magnetism, kinetic or potential energy,**
- **physical or chemical charge bonds (+Lb),**
- **chemical covalent radical bonds (+R1cb).**

Explanation Law II):

1) At each chemical step within BP chemical bond energy is irreversibly converted into bond heat and heat is released in the process. This results in an irreversible driving force with which the molecule can bridge the physical steps within the BP bio chip(s) to the following chemical reaction step. This way the molecule is led through the biochemical chains; rather through energy decay driven forward 'energetically'.

2) Looking at it through time all biochemical reactions are irreversible. Time is completed unilaterally and linearly and is coupled 1 : 1 to the universe clock time of the cycle of the universe (the Taetucycle). In the universe differences in time cannot occur and no dilation of time is possible.

3) Living matter can neither reverse in the (universe clock) time as dead matter nor advance on this universe clock time. **Law II b)** of biochemistry is incompatible with the *Theory of Relativity* currently in 2016.

1.3 3rd LAW OF BIOCHEMISTRY: REQUIREMENTS MONO MOLECULES MUST MEET:

Law III a): For the completion of the biochemistry all chemical bonds on the molecules in the biochemistry must consist of chemically covalent charge bonds (+L2cb). Deduced reactions form the semi radical reactions (e^-) and proton reactions (H^+) which are also allowed.

The molecules in the biochemical reactions may not contain any real covalent radical bonds (+R1cb).

Explanation Law III a):

Between two atoms two totally different chemical bonds are distinguished:

- 1) the chemically covalent radical bond (+R1cb) and
- 2) the chemically covalent charge bond (+L2cb)

sub 1) The covalent radical bond (+R1cb):

This bond is constructed from *two unpaired electrons* which together form one electron pair and so were both radical before being bound. The development of radical bonds occurs unstructured, quite randomly and mostly fairly coincidentally. For the living cell, however, radical reactions occur in a totally uncontrollable manner. In Biochemical Pathways or BP etc. no structural fission of a covalent charge bond into two unbound electrons/ two radical atoms/ molecules occurs.

(Such covalent radical bonds (+R1cb) also occur as bond between two electrons in the electron pairs in the electron shells of atoms; but never occur in Biochemical Pathways as a molecule bond!)

sub 2) The covalent charge bond (+L2cb)

Entering or severing the chemical charge bond (+L2cb) is always a matter of *shifting one complete electron pair*. Fission of the bond into two real radicals (atoms/ molecules with one unpaired electron) does never occur. In Biochemical Pathways and BP etc. in all (bio) chemical reaction steps one whole electron pair and so of covalent (L2cb) charge bonds consistently shift.

This type of chemical reaction never happens in one step but always in a number of steps and by the use of enzymes. With biochemical reactions, each chemical reaction step is fit in between minimally one but mostly two physical changes on the molecule. Biochemical reactions standardly consist of varying physical changes and chemical reaction steps. Due to these physical changes, biochemical reactions as a whole are being accomplished totally predictably and controllably.

-2) the semi radical and proton reactions:

In BP, there are yet two more special reaction steps are notable. It concerns the reactions with the attaching or disconnecting *one electron* or *one proton* on a molecule; the building bricks of the atom:

a) The author explains the semi radical reactions; these are all reaction steps at which either one electron (in itself a radical) is taken up or one electron (e^-) is released.

Semi radical reactions: all (bio) chemical reaction steps at which one electron (e^-) is released or one free electron (e^-) is utilized and is bonded to either an atom or molecule. In Biochemical Pathways, such an electron could also be from an amphoteric metal ion (Co, Fe, Zn and so on).

b) Furthermore, the author explains the proton reactions: these are all reaction steps at which either one proton (H^+ atom) is taken up or one proton (H^+ / H_3O^+) is released.

Proton reactions: all (bio)chemical reactions at which one proton (H^+) is utilized and subsequently released as (H_3O^+) ion or at which one proton is utilized and bonded to an atom or a molecule.

Law III b): Biochemical cycles and chains on the mono molecular level can, physically speaking, only occur with mono molecules which when dissolved can take on 3 physical conditions: 1) gaseous and non-charged, 2) non-gaseous and charged and 3) non-gaseous and non-charged (noprocession).

Explanation Laws III a) and III b):

1) These 3 essential physical conditions are only possible at the mono molecules of the elements C, H, O, N and S. Molecules in other bonds of elements cannot occur in: a) a gas form (almost all molecules with metals and the heavier elements) or b) a charged condition (amongst them the noble gases).

Law III c): Biochemical cycles and chains of reactions can physically as well as chemically only be accomplished with mono molecules of covalent charge bonds (+L2cb) between the atoms C, H, O, N and S.

Explanation Law III c):

1) For physical reasons of being required to occur in 3 different physical types (**Law III b**) all conceivable biochemical systems in the universe are emphatically structured around molecules of the elements C, H, O, N and S. For this reason, *Biochemical Pathways* indeed completely consists of molecules of the elements: C, H, O, N and S.

2) P only plays a limited but very essential part in the storage of energy and in the DNA/ RNA.

3) Possible essential amphoteric metals such as in chlorophyll, hemoglobin (Fe) are always *physically* connected in BP and never occur in a *chemically* bonded form.

4) The mono molecules in BP consist of covalent charge bonds between C, H, O, N and S (only in exception with P), respond chemically controlled and between chemical reaction steps keep assuming the physically correct condition of either: 1) a soluble non-charged gas, 2) soluble charged non-gaseous particle/ ion or 3) soluble non-gaseous non-charged (*nopression*) molecule.

1.4 4th LAW OF BIOCHEMISTRY: REQUIREMENTS OF THE REACTION MEDIUM:

Biochemical cycles and chains can only be accomplished in reaction media which meet the following requirements:

Law IV a): In the reaction medium: 1) gaseous and non-charged molecules, 2) non-gaseous and charged molecules, 3) non-gaseous and non-charged (*nopression*) molecules must dissolve simultaneously.

Explanation Law IV a):

1) Of all conceivable liquids liquid water is the only liquid of which the molecules can dissociate in the ions H_3O^+ and OH^- by which only liquid water is divided for a small part into charged particles/ ions. Because of this liquid water is the only pure liquid in which charged atoms or molecules can be dissolved.

2) Liquid water is the only conceivable liquid which meets **Law IV a**.

Law IV b): The chemical and physical bonds of the reaction medium need to have the lowest energy content of all conceivable chemical and physical bonds.

Explanation Law IV b):

1) Chemically, O-H bond is the lowest energy level. For water, this is also valid physically.

2) Energetically, liquid water is the only liquid which meets **Law IV b**.

Law IV c): Liquid water is both physically and energetically the only suitable liquid in the universe as reaction medium for the biochemistry of living matter.

Explanation Law IV c):

1) In order to chemically respond the molecules need to be free and mobile. This is not the case in solids. Mobility only occurs with small molecules in a physical condition of a) a gas or b) molecules dissolved in a liquid.

2) Enzymes are too large to occur as a *gas*. Because of this no single form of living matter can prevail in a gaseous condition. Enzymes and molecules can dissolve in a liquid reaction medium that occurs by condensation of a gas (a real Newtonian liquid).

3) In all conceivable 100% pure (*Newtonian*) liquids only a) gases and c) non-gaseous and non-charged (*nopression*) molecules dissolve but not charged molecules/ ions.

4) But for biochemical reactions *charged particles* are also required to dissolve in the reaction medium.

5) Of all conceivable real liquids (= condensate gas) only liquid water is uniquely able to dissociate into charged particles/ ions: H_3O^+ and OH^- . Therefore, charged atoms/ molecules/ ions can only dissolve in liquid water. This special dissolvable quality for charged particles makes water the only liquid suitable to accomplish biochemical reactions.

6) Through adsorption physical attachment occurs of the dissolved molecule to the equally dissolved enzyme molecule of which several thousands are known. Temporarily such a large 'physical molecule' develops which cannot be dissolved in water anymore so that both molecules attain a temporary undissolved condition. The enzyme also spatially blocks all other chemical bonds except where the reaction may and should take place.

7) The factual chemical reaction step occurs on temporarily non-dissolved molecules of which all but one bond spatially and charge-technically is protected by the enzyme. Only that one bond of the molecule can get into a reaction. So, for each deconstruction and construction step a specific enzyme is required.

8) In all biochemical and many of the normal chemical reactions such charged interim steps exclusively occur in liquid water as reaction medium and the usage of a big number of different reaction step specific enzymes/ co-enzymes that act as catalysts.

9) No single molecule can chemically or physically attain a lower position than the reaction medium itself. The covalent O-H charge bond of the reaction medium water has the lowest energy content of all conceivable covalent bonds. Water also has the lowest energy content of all conceivable physical bonds comparable to water. Of all liquids water has the lowest conceivable energy content both physically and chemically and is thus energetically the only liquid suitable as reaction medium.

10) For chemical, physical and energetically reasons biochemical reactions are only possible in the liquid water as reaction medium.

11) Under all circumstances the reaction medium acts as cooling medium for the reaction heat.

1.5 5th LAW OF BIOCHEMISTRY: REQUIREMENTS OF THE RECYCLING OF C, H, O, N, S and P:

On any planet, chemical reactions and the biochemistry of living matter sooner or later take all present molecules to their chemically lowest energy level. Then all chemical and biochemical reactions and the activity of all living matter end. In order to also keep a system with living matter energetically going in the long run an upgrading of the present chemical bonds will have to occur in some way. This is particularly valid for an upgrading of the CO_2 and H_2O to a C-H bond. This upgrading of chemical bonds to C-H can only occur through physical forms of radiated energy from outside the planet in the form of light (photons) coming from the star in the planet's orbit.

The energy in the form of light photons needs to:

- 1) first be determined in some way and
- 2) then be converted into chemical forms of energy.

Law V a): *From the elements C, H, O, N, S and P minimally one molecule needs to be formed which can absorb photons with a particular energy from light with which one energy electron can be set free via a semi-radical reaction.*

Explanation Law V a):

1) This is in any case the chlorophyll molecule constructed from the elements C, H, O, N with a physically bound amphoteric metal ion (amongst them Co, Zn, Mg) in the core. On Earth 4 types of chlorophyll are known which are related to the amphoteric metal ion which is physically bonded to the core of the chlorophyll molecule.

Law V b): *From the elements C, H, O, N, S and P minimally one molecule needs to be formed which can fasten the energy of that free electron and transform it into a chemical bond.*

Explanation Law V b):

1) This is certainly the ADP / ATP molecule which can dissolve well in water constructed from the elements C, H, O, N and P. Together both molecules are at the base of the photosynthesis at which CO_2 and H_2O are transformed to the water soluble mono saccharide glucose.

2) Up until now no fundamentally different processes with a comparable result as photosynthesis have been discovered on Earth. If this possibility does exist it can undoubtedly be found somewhere in the biochemistry of living matter on Earth.

Law V c): *From the elements C, H, O, N, S and P minimally one polymer molecule must be formed with which:*

- a) *the blueprint of the total biochemical functioning of the cell can be determined and*
- b) *this information can be transmitted by sexual and/or asexual reproduction to a next generation and its offspring.*

Explanation Law V c):

1) This happens on Earth via RNA/ DNA etc.

2) It is not very likely that alternative structures based on C, H, N, O, S and P can be created with the same structure in the form of a double helix with the same characteristics and effect as RNA/ DNA.

3) If this possibility does exist it can be found somewhere in living matter on Earth.

1.6 6th LAW OF BIOCHEMISTRY: REQUIREMENT THAT ALL LIVING MATTER IS BASED ON BIOCHEMICAL PATHWAYS:

Law VI a): *The periodic table leaves only one biochemical basic form of living matter. In connection with liquid water Biochemical Pathways is the only possible bio processor of living matter.*

Law VI b): *The biochemistry of all living matter in the universe is emphatically based on Biochemical Pathways as well as on exactly the same biochemical principles as on Earth.*

Law VI c): *In the periodic table and the existing system of 12 physical and chemical forces and bonds living matter develops totally autonomously and spontaneously around Biochemical Pathways.*

Explanation Law VI a), VI b) and VI c):

1) All matter in the universe according to the *periodic table* with 12 fundamental forces in total:

The author has systematically deduced that only protons and electrons are released at the cold non-explosive Little Bang from which only H/ H₂ can be formed. During the H₂ supernova explosions (Big Bangs) only the elements/ isotopes of the *periodic table* are being formed from the protons and electrons of that hydrogen (**document F1d**).

2) The elements of the *periodic table* are generating 12 fundamental forces in total (**document F1d**).

3) The 12 *fundamental forces* are constructed from:

- a) 2 elementary forces,
- b) 1 sub elementary basic force of the atom,
- a) and b) together form the 3 autonomous forces of the atom:
 - c1) 2 mechanical forces related to forces of the atom nucleus
 - c2) gravity related to the 'shell' electron (1) and 'shell' electron pair (2) of atoms,
 - c3) 2 physically forces and 2 chemically forces in the universe related to the single 'shell' electron (1) and to the 'shell' electron pairs (2) of atoms,
 - c4) 1 force related to velocity and kinetic energy of the outer electron shell of atoms,
 - d) 2 forces of photons coupled to temperature.

4) First the author *systematically* deduced these forces: See: www.uitewijkwinkel.eu **document F1d**.

5) Biochemistry of living matter concerns 5 of the 10 fundamental forces under c2), c3), c4) and d) and their bonds.

-) *Physically:*

In total 2 physical forces/ bonds:

- 1) the *van der Waals / London* force (+W2f) / bond (+W2b), electron pair(2) which provides the states of gas, liquid or solid;
 - 1a) the dissolution force/ dissolution bond of the electron (1)/ electron pair (2) *);
 - 1b) the absorption force/ bond of the electron (1)/ electron pair (2) *);
 - 2) the physical-chemical charge force/ bond of the outer electron shell;
- *) These two bonds are related to the *van der Waals / London* force / bond.

-) *Chemically:*

In total 2 chemically forces/ bonds:

- 1) the covalent radical force/ bond of the single 'shell' electron of atoms **),
- 2) the covalent charge force/ bond of the 'shell' electron pair(2) of atoms.

The covalent radical bond (+R1cb) only occurs in the electron shells as electron pair/ Cooper pair and looks the same as the covalent charge bonds (+L2cb).

**) The covalent radical force/ bond is unacceptable in the biochemistry of living matter.

-) *Temperature related forces:*

2 forces:

- 1) the infrared photon force of the proton and atom nucleus (a) and
- 2) the light photon force of the electron.

-6) Forces *without direct influence on the biochemistry:*

- 1) gravity/ gravitation has no direct influence on the biochemistry,
- 2) the centripetal force of the atom core,
- 3) the acceleration/ deceleration force of the atom core,

7) Those 5 forces required for the biochemistry only occur in the metalloid elements C, O, N, S and P in bond with the element H.

In the universe, the forces required for the biochemistry of all forms of life on Earth are found on only 5 of the elements of the *periodic table* of the metalloids C, O, N, S with P for the energy fixation together with H for a simple, easy energy-rich spatial filling of the molecule and can also be used for the very important proton reactions.

Molecules which can take those 3 necessary physical conditions can be constructed only with C, H, O, N and S. So, for *purely physical reasons* all other elements of the P.S are excluded from BP.

Within Biochemical Pathways some amphoteric metals have an important side role as donor/ acceptor of electrons at *semi radical reactions* (Fe, Zn, Co, Se) and some other metals or spore elements.

7) Biochemical Pathways can develop precisely within a very select part of the elements of the *periodic table* (C, H, O, N, S and P with some additional elements) together with the system of in total 12 physical and chemical forces on the outside of these elements of which 8 are used biochemically.

8) Living matter is a biochemically *pure coincidence* and contains *nothing supernatural*:

The origin of the biochemistry of living matter according to the biochemical schemes of BP can be explained totally rationally both physically and chemically. The schemes of BP do not contain anything mystical (= inexplicable) and certainly nothing supernatural.

9) Within the totally rational limitation of the *periodic table* to the 6 'living elements' with their 8 forces/ bonds and liquid water only one complex system such as BP could develop totally autonomously and spontaneously around 2 biochemical cycles centrally or 2-real biochemical basic chips of living matter which are:

- a) the citric acid cycle,
- b) the fatty acid cycle supplemented by
- c) the synthesis/ degradation of amino acids.

10) The citric acid and fatty acid cycles form the two central biochemical processors in the biochemistry of living matter:

These two central bio chips are unique able to be completed right as well as left and so can be used at the degradation of molecules as well as the construction of organic molecules: They are the only biochemical chips/processors which can be completed bilaterally. See schemes *Biochemical Pathways* 1993 by **Gerhard Michal at all**, editor, **Boehringer Mannheim**.

11) All forms of life on Earth and in the universe biochemically function around *Biochemical Pathways* (BP) or larger parts of BP.

12) All other chains in living matter on Earth can be linked to Biochemical Pathways: -> BP and such. A large number and a great diversity of possibly unilateral bio chips and biochemical chains may be coupled to the universal basic chip of living matter BP which shows in the several biochemical varieties of living matter on Earth. All forms of life on Earth together contain the total of all biochemical cycles and chains on Earth constructed from biochemical reactions.

13) Definition BP etc.: the total of biochemical reactions of all aerobic, anaerobic and optionally aerobic/anaerobic living matter on Earth together.

Wet VI d): Any conceivable system of fundamental forces with one physical, one chemical of any other either blocks or disrupts more or less than the 8 forces mentioned: 1) the completion of Biochemical Pathways, 2) the biochemistry of living matter, and 3) the development of living matter.

Explanation Law VI d):

1) Biochemical Pathways is only possible on the basis of the current *periodic table* with its 8 physical and chemical forces and bonds of biochemistry.

2) If elements C, H, O, N, S and P would have generated *one force more* or *one force less* than the 8 forces necessary for the biochemistry all kinds of chemical reactions, biochemical reactions and physical processes would have been possible but the completion of the biochemistry in accordance with Biochemical Pathways would not have been possible and life would not be possible anymore biochemically.

3) BP will then either be totally disrupted or totally blocked physically as will the biochemical completion of living matter.

4) The presence of any additional mystical (= supernatural) force whatsoever, as far as can be proved qualitatively and measured quantitatively, also totally disrupts the completion of BP. Such forces are incompatible with the completion of biochemistry in living matter.

1.7 CONSECUTIVE PHYSICAL AND CHEMICAL SINGLE STEP CHANGES IN ALL REACTIONS: MIN/MAX 1 PRINCIPLE:

Closer observation of BP shows that singular physical changes or chemical reaction steps always occur one step at a time.

On any atom/ molecule at exactly the same time there is:

- a) either not any physical or chemical change,
- b) or merely one physical or chemical change.

There are never *two or more* physical and/or two or more chemical changes or of one chemical and physical change on one atom/ molecule at exactly the same time.

Each change on the atom/ molecule in itself can be deduced to:

-) the forming of one bond from two physical or chemical forces of the same kind while those forces disappear because they merge into one bond;

or

-) the disruption of one physical or one chemical bond into the two similar forces of which the bond had been constructed. This results in the release and calculation of these two chemical forces, in two physical forces or two physical-chemical forces.

In both cases a single change in one of the physical, chemical or in physical chemical characteristics of the molecule occurs at each physical or chemical reaction step on the molecule. The principle of always maximally one physical or chemical change is very basic and is universally valid in physics, chemistry, biochemistry, nuclear physics and particle physics and is seen as the common universal principle which has not been accepted before. This single step principle is so simple that this universal principle has been collectively missed until 2007.

For this the author introduces the common notion: the physical, chemical and nuclear physical minimal and maximal 1 principle (min/max 1). See also document F1f.

Min/ max 1 is universally valid and is founded on all kinds of physical changes, chemical reactions, nuclear fission and nuclear fusion reactions and is in principle also valid for all reactions between the elementary particles/ matter.

Min/ max 1 forms the universal fundament for the order in nature and the lacking of each form of disorder and chaos.

1.7.1 MIN/MAX 1 PRINCIPLE FUNDAMENTALS BASIC STRUCTURE BP:

In accordance with min/max 1 every step in BP consists of minimally and maximally one physical step or minimally or maximally one chemical step.

-) In biochemical reactions the same pattern/ screen/ sequence is completed and every chemical reaction step requires its own specific enzyme:

Every chemical reaction step within BP requires a specific enzyme for it which plays an essential role. Bonding the dissolved molecule to the enzyme the 'physical' molecule becomes too large to be able to have dissolved. It temporarily gets into an undissolved condition. At the same time, the enzyme screens all other reactive places on the molecule except the one bond where the chemical reaction has to occur. In this stadium, all other bonds on the molecule are prevented from entering a reaction.

Within BP the changing molecule always sustains the same pattern because of min/max 1:

- coupling via a physical absorption bond (+Ab) of the dissolved mono molecule to an enzyme also dissolved in water. The molecule formed is too large to have dissolved resulting in a physically undissolved condition (+W2Df) --> (-W2Db),
- creating a charged position on the molecule (+Lk) whilst screening all other chemical bonds, so that the chemical reaction can only occur in that one position.
- the actual chemical reaction on the molecule occurs via making or disrupting of the only remaining chemically covalent charge bond (+L2cb) by shifting one electron pair,
- a re-classification of the electron pairs within the chemically changed molecule followed by
- the disconnection of the one position chemically changed molecule of the enzyme (-Ab) and then the dissolving again of both the molecule changed in one position (-W2Db) --> (+W2Df) and the enzyme,
- coupling of the molecule changed in one position to the next specific enzyme for undergoing the next chemical step in the string of chemical reaction steps, etc.

Biochemical reactions are in principle completed as a string of these consecutively partly overlapping quandaries of physical and chemical single step changes each regulated by its own specific enzyme/ co-enzyme which always overlap on the two physical steps.

Eventually a stereotype of two physical steps emerges, one chemical step, two physical steps, the next chemical reaction step, two physical steps, etc. These quandaries/ trios ensure an exact completion of a string of reactions.

-) Never two chemical steps directly after each other:

In biochemical reactions two chemical reaction steps never occur immediately one after another. It would result in a real radical reaction. In biochemistry, all chemical reaction steps are always separated by intermediate physical changes on the molecule.

Every small step in *Biochemical Pathways* is completed in accordance with min/max 1 and so maximally one physical or of one chemical change occurs at exactly the same time.

-) Physical changes are essential:

Biochemistry is mostly focused on the chemical changes of the molecule and too little on the equally important physical changes as well as the role certain physical changes emphatically play during the completion of biochemical reactions in for example the citric acid cycle and the fatty acid cycle. The physical changes prepare and guide the molecule in a very exact manner to its subsequent chemical reaction step.

-) Always the same and correct order:

Because of the min/max 1 principle in BP and BP etc. all physical and chemical steps can be separately and exactly marked and described and so be followed accurately. All physical changes and chemical reactions within BP are completing patterns of physical changes which can be accurately calculated and marked in advance and of chemical reaction steps which are always completed in the correct order by means of reaction step specific enzymes/ co-enzymes.

At the end of a string of biochemical reactions such a string is always finalized with minimally one physical step in which a gas dissolvable in water develops.

Consecutively, the mono molecular biochemical chains and cycles occur which together form the bio processor Biochemical Pathways as can be seen clearly in the citric acid and fatty acid cycles. Min/max 1 results in a tight guiding so that the citric acid and the fatty acid cycles can in fact most definitely function as two-real central biochemical chips within the BP processor.

**1.8 ONLY ONE BIOCHIP AS BIOCHEMICAL PATHWAYS POSSIBLE;
BP = UNIVERSE STANDARD FOR THE BIOCHEMISTRY OF ALL LIVING MATTER:**

-) On Earth, there is only one biochip as Biochemical Pathways:

Up until now (2016) only one central basic chip as BP has been observed on Earth. Via the bottom-up deduction in **chapter 7** the author shows that this theoretical accumulation of about 1 - 2 billion molecules on Earth indeed only permits one system and / or one 'overall' bio chip as *Biochemical Pathways*. BP as a whole can be considered as the only possible biochemical processor.

The structure of BP is unique but may be explained by analyzing BP itself on the one hand and on the other hand on the deduction based on the *periodic table*, all molecules and all 17 fundamental forces on these elements and their bonds.

-) Ultimate proof of the uniqueness of BP only possible with all molecules in a digital form:

The undeniable scientific and mathematical proof of the universal uniqueness of BP as the only biochemical processor for living matter can only be given when all molecules and their physical conditions have been digitized which will take an estimated 10 - 20 years.

1.9 INTELLECTUAL PROPERTY:

This document is totally intellectual and commercial property of the author A.P.B. Uiterwijk Winkel MSc. See **document A6**.

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***2) ON EARTH ALL ELEMENTS, MOLECULES AND PHYSICAL CONDITIONS OCCUR:**

2.1 ALL MATTER IN THE UNIVERSE ORDERED ACCORDING TO THE PERIODIC TABLE:

In document G6 of www.uiterwijkwinkel.eu the author explains why the universe starts with an equivalent number of protons and electrons hydrogen and an ultra-cold (0° kelvin) Little Bang some 40 – 45 billion (10⁹) years ago at. The universe didn't start with a super-hot Big Bang and a temperature of about 10³⁸. (These superhot Big Bangs took place some 20 billion years after the Little Bang. Every galaxy started some 30 – 25 billion years ago with its own Big Bang, **phase 16 G7 universe cycle and the figures 42 – 54 document G8**). At this super cold totally explosion less Little Bang the Little Bang black hole with a radius of about 50 – 100 million kilometers encompassing all matter and kinetic energy of the universe collapses immediately and exclusively into an equivalent number of protons and electrons. At this Little Bang only protons and electrons but no neutrons develop and no gravity was generated!

After the release of the electrons and the protons from the atom core these protons and all electrons are ordered in ideal totally frictionless layers of alternately 1 proton and 1 electron. These layers of protons and electrons are held together by the mutual attraction of their +1 or -1 electrical charge on the one hand, yet are separated on the other hand by the mutual magnetic repulse between the protons and electrons due to the equal magnetic spin of both of +1.

In this condition, the protons and the electrons are moving, each by itself, into ideal and totally endless mutually frictionless positions and condition comparable to 100% ideal ball bearings.

After the Little Bang, *all protons* released from the black hole atoms of the Little Bang black hole have a velocity of 0 mm/sec. So, the universe does not expand immediately. Before the Little Bang the electrons rotated with the speed of light around their atom cores. The electrons released split adjacent atom cores and accelerate the electrons in the atom core. After the Little Bang, all electrons move in their mono-layers at a speed of about 207.000 km/sec or 2/3th the speed of light *c*. Between these mono-layers of protons and electrons there is a magnetic spring tension energy. This energy starts the expansion of these universe consisting of mono-layers protons and electrons with a speed of 1/3th – 1/2th the speed of light. It takes about 500 – 750 years before a hollow area arises around the center C. From that moment, the universe transforms from a giant sphere (radius 500 – 750 lightyears) to a giant universe-sphere-shell of protons and electrons.

The fast-moving electrons contain a part of the kinetic energy of the previous universe. After the Little Bang, there are no atoms. So, the expansion of the universe starts at a 'temperature' comparable to 0° kelvin! This universe had a 'super' cold start!

Due to the almost 100% ideal ball bearing position the fast electrons incredibly slowly transfer their kinetic energy to the protons until during the future *5 – 10 billion of years* which causes these protons to move universally and uniformly from the point C of Little Bang. In time, the distance between the protons and electrons increase to that of the hydrogen atom. At that moment, the speed of the electrons has decreased from approx. 207,000 km/sec to about 1,600 km/sec and angular velocity of 'shell' electrons of hydrogen.

On one same moment, every proton in the universe catches its own 'shell' electron transferring into hydrogen. This moment of the hydrogen atom took place about 35 - 40 billion years ago. When capturing the electron, the same hydrogen atom universally develops, this is the first element of the *periodic table*.

With the forming of the neutral H atom this captured electron also immediately generates the covalent radical force (+R1ck) as well as the gravitation/ gravity radiation (+G1f) which immediately starts the unilateral deceleration of the expansion of the already existing universe. From then on, the expansion speed is converted into rotations and rotation speed and all kinds of sub rotations. This process of expansion speed into rotation speed of the stellar system is still running.

The forming of the H atom/ radical is followed quite quickly by the forming of the H₂ molecule and connected gravity (+G2f) and vanderWaals / London force (+W2f).

In this process, much bond heat is released resulting that the H₂ immediately becomes a gas by which the universe sphere shell of H₂ expands explosively inwardly as well as outwardly.

Cooling of the expanding H₂ gas in the meantime and the transformation of expanding velocity into angular velocity leads to all kinds of rotations and eventually to condensation of H₂ billions of years later. All of these rotations result about 10 – 15 billion years later in the forming of 4 – 20 billion super's largest rotating pure H₂ gas spheres. Every sphere contains the amount of H₂ matter in the size of one complete stellar system.

All super H₂ gas spheres are totally oversized and are become in time hotter and hotter. Sooner or later this ends up in nuclear fusion. In all billion spheres, this fusion starts at the same moment; **phase 16 G7 and figures G8**. As soon as this nuclear fusion starts it immediately ends up in an enormous H₂ supernova. In the process, exactly the same higher atoms and/or elements of the *periodic table* are formed and constructed according to the 92 stable elements/ isotopes of the *periodic table* and higher which will stabilize after this by nuclear fission and the emission of α particles (He cores), β particles (fast electrons) and γ particles (fast neutrons). (**document F1d**) These instable elements formed eventually collapse to the 92 stable elements and their stable isotopes. As on Earth these 92 elements universally also qualitatively and globally have quantitatively the same force system. (**document F1e**)

-) Black hole matter and anti-matter:

In the universe, black hole matter occurs encased in small, bigger and very big black holes. In principle, there is no antimatter in the universe in the form of anti-atoms/ elements. The author has deduced the complete force systems of *normal matter*, *black hole matter* as well as *anti-matter*: www.uitervijkwinkel.eu the documents **F1c, F1d and F1e**.

Regarding the biochemistry of *living matter* only normal matter in fact is relevant and then only the elements up to the element Fe.

Because of their size, mass and slight vibration speed of the atom the higher elements can generally not or badly be converted into a gas form. On Earth, the biochemistry of living matter mostly occurs within the group of the metalloids (C, H, O, N, S with P for the capture of energy) from the lighter elements up to Fe because only with molecules in a varying composition of C, H, O, N, S can gases be formed (+ ions and noproression molecules) with the help of some amphoteric metals (Fe, Co, Zn etc.) which assist in the semi radical reactions during which one electron is released.

2.2 TWO TOTALLY DIFFERENT TYPES OF REAL CHEMICAL BONDS:

Apart from the noble gasses all other atoms/ elements/ isotopes can enter chemical bonds in the form of electron pairs and so form molecules. All real chemical bonds between two atoms are distinguished by minimally one commonly shared electron pair. Based on such commonly shared electron pairs the author distinguishes two totally differing types of chemical bonds:

a) the chemically covalent radical bond (+R1cb) between two atoms:

This covalent radical bond is constructed from two unpaired electrons or radicals each atom or molecule supplying one unpaired electron and resulting in one electron pair. Both atoms will share this electron pair as a chemically covalent radical the bond. By forming an electron pair and a bond both electrons attain an energetically more favorable position which results in the simultaneous release of bond heat. This release is in principle irreversible and is the foundation for the driving force behind the chemical and radical reactions.

Radicals can sever existing bonds developing a new radical in the process. Such radical reactions directly occur in one or two steps without physical changes on the molecule.

However, all radical reactions complete quite arbitrarily. In a system of living matter such radical reactions can neither be controlled nor influenced. The chemically covalent radical bonds formed mostly consist of relatively rigid bonds between the atoms because in many cases the electron pair cannot shift except at molecules constructed from the C, H, O, N and S atoms.

This randomness, uncontrollability and rigidity of the bonds make covalent radical bonds (+R1cb) unsuitable for the completion of biochemical processes and reactions in living matter.

b) the chemically covalent charge bond (+L2cb):

The chemically covalent charge bond is also constructed from one electron pair although this bond has structurally totally different characteristics and cannot be compared to chemically covalent radical bonds (+R1cb). Normally the covalent charge bond is not constructed from two radicals.

With the chemically covalent charge bond (+L2cb) one of the atoms on both sides and prior to the forming of the bond did show a surplus of electrons and locally on the molecule a negative charge while the other atom of the bond displayed a shortage of electrons and because of this was locally positively charged.

The chemically covalent charge bond (+L2cb) the atom with a surplus of electrons offers one complete electron pair to attain a chemical bond in the form of one electron pair to be commonly shared. The other atom with a

shortage of electrons will use the offered electron pair by getting into a chemical bond. After forming the bond both atoms mutually share the electron pair.

It is confusing that the chemically covalent charge bond (+L2cb) can be split into two radicals which afterwards, however, will form a (+L2cb) bond and not a covalent radical bond (-R1cb).

By commonly sharing the electron pair of the bond both atoms mutually attain an ideal filling of the outer electron shell (normally 4 electron pairs) and with it an energetically more favorable position which per definition is expressed in:

- a) a more favorably energetically lower orbit and
- b) as a token that 'added' kinetic energy has been decreased and converted into heat by the release of chemical bond heat.

Releasing bond heat is irreversible and is the foundation for the driving force of the completion of the reaction. Because the electron pairs can shift between the elements such covalent charge bonds (+L2cb) are less rigid than the covalent radical bonds (+R1cb).

-) Essential difference covalent charge bond (+L2cb) and covalent radical bond:

Both kinds of chemical bonds consist of one commonly shared electron pair and appear exactly the same. But from a chemical point of view both chemically covalent bonds have a totally different origin and totally different characteristics resulting in totally different reactions of both bonds.

It concerns the following points:

1a) Both forming and severing radical bonds (+R1cb) is standardly completed without physical changes on the molecule!

1b) Both forming and severing chemically covalent charge bonds (+L2cb) is standardly accompanied by physical changes on the molecule.

Reactions with covalent charge bonds (+L2cb) never consist of one step but always of several physical and chemical reaction steps consecutively. Between each chemical step minimally one but mostly two physical steps and/or changes on the molecule occur.

For those physical changes is required:

- *) standardly *one reaction medium* in the form of a liquid and
- *) *catalysts and/or enzymes* to enable completion of these interim physical steps.

2) Because of the required interim physical changes, reactions with covalent charge bonds (+L2cb) can be controlled very accurately as opposed to the covalent radical bonds (+R1cb), which cannot be influenced in any way.

3) The difference between both chemical bonds (+R1cb) / (+L2cb) is so fundamental, essential and great that biochemical reactions in living matter structurally and for 100 % are based on reactions and/or attaining and severing of bonds based on chemically covalent charge bonds (+L2cb) and for 0 % on chemically covalent radical reactions.

4) In the literature, the author's distinction is not accepted so explicitly; let alone consistently carried out, hence this explanation.

Conclusion 1: Which of the two bonds occur on molecules needs to be considered, at which the covalent charge bond is the only one found amongst the elements C, H, O, N, S and P.

2.2.1 MAXIMAL 4 CHEMICALLY COVALENT BONDS PER ATOM:

In chemical bonds, standardly minimally 1 commonly shared electron pair occurs between two atoms or elements. In a number of the 92 elements of the *periodic table* there is for energetic reasons space for a tetrahedron in the outer electron shell in the form of maximally 4 electron pairs and so there is enough space for forming maximally 4 chemical bonds with other atoms. It concerns, amongst others, elements like C, Si, P, N, metalloid anions in bond with O.

Between two atoms maximally 3 electron pairs (N₂, CN) can be formed.

2.3 FINITE NUMBER OF MONO MOLECULES AND POLYMERS:

A large variety of mono molecules can be formed from lightning discharges in the atmosphere, chemical radical reactions, normal chemical reactions, physical chemical reactions and volcanism with the maximally 92 stable elements of the *periodic table* on Earth and the two types of chemical bonds. It concerns a finite number of mono molecules of an estimated 0.5 million including isomers and their stereo-isomers. Only a small part of those mono molecules can in their turn polymerize again.

By means of polymerization an estimated total of about 100-200 different monomeric and polymeric bonds out of those about 0.5 million mono molecules can be assembled. Most of those mono molecules occurred fairly shortly after the supernova explosions via covalent radical bonds (+R1cb) and covalent charge bonds (+L2cb) in the form of all kinds of inorganic bonds, minerals and organic bonds. Perhaps even organic polymers occurred during that period.

2.4 THEORETICALLY ABOUT 1 – 2 BILLION MOLECULES IN ALL PHYSICAL / CHEMICAL (phy/che) CONDITIONS:

Theoretically the *periodic table* results in an in principle finite accumulation of an estimated 1 – 2 billion molecules in all their possible physical and chemical (phy/che) qualities or conditions. (**Document F1f**)

-) **Theorem:**

- The total accumulation of about 1 - 2 billion different molecules in all their phy/che conditions is possible and may be found on Earth,
- This accumulation of the same 1–2 billion different molecules in their phy/che conditions in theory is valid in the complete universe for all other planets where sufficient liquid water is present and with an atmosphere with lightning discharges may be found.

-) **Conclusion:**

- This total accumulation of about 1–2 billion molecules in their phy/che conditions has led to a biochemical degree of organization of living matter on Earth.
- Immortal forms of life are not possible on Earth.
-) To compensate death all living organisms on Earth are able to reproduce sexually and/ or asexually.

-) **Expectation:**

- The outset of a biochemistry of living matter may be expected on all planets with sufficient liquid water and land which will eventually lead to the forming of living matter on such planets as on Earth,
- The most basic characteristic of all living matter all over the universe is that it can die and does die. The basic characteristic of reproduction on Earth will also be valid all over the total universe.

2.5 ANALYSIS MAIN LINES LIVING MATTER ON EARTH:

-) **On Earth only one basic biochemistry: Biochemical Pathways BP:**

On Earth the central biochemistry of living matter is built on *Biochemical Pathways* (BP) in connection with many sub systems linked to BP further designated as BP etc. Despite extensive biochemical research no second basic system comparable to BP has been found so far on Earth. This is at most a strong indication for the uniqueness of BP and BP etc. although it is not scientific evidence, let alone scientific absolute proof. Elsewhere in the universe living matter could have organized in a totally different biochemical way.

-) **Construction of molecules around the elements C, H, O, N and S with chemically covalent charge bonds (+L2cb):**

The greater part of that total accumulation of about 1–2 billion molecules is exclusively built around the 6 metalloid elements C, H, O, N, S (and P) which in the molecules are exclusively mutually connected with chemical (c) covalent charge (+L) bonds (b) in the form of an electron pair(2): (+L2cb). But these reactions are completed totally predictably and regulated due to the interim physical steps in contrast to the reactions with covalent radicals. With radical reactions no physical interim steps can be distinguished.

-) Semi radical and proton reactions:

Moreover semi radical reactions can be distinguished where an electron (= radical) is either used or released (for example at chlorophyll). Such semi radical reactions run via physical interim steps and thus also via totally predictable patterns but complete radical reactions however run totally unpredictable.

Proton reactions with the coupling / decoupling of protons (H^+) / (H_3O^+) also run via physical interim steps as such are also totally predictable;

-) In the biochemistry of living matter only reactions with totally predictable outcomes fit:

BP and BP, etc. are founded on 100% consistent reactions and totally predictable. Such as:

- 1) biochemical reactions with chemically covalent charge bonds (+L2cb) are completed by transferring always one electron pair supplemented by
- 2) semi radical reactions and
- 3) proton reactions.

-) Completion biochemical reactions are only possible in the reaction medium liquid water:

Reactions with charged atoms, particles, molecules can only proceed in the reaction medium liquid water. Water is the only liquid which can dissociate in H_3O^+ and OH^- and in which charged molecules can dissolve in ions.

-) Every reaction step in *Biochemical Pathways* and BP etc. led via a specific enzyme / co-enzyme:

With possibly all reaction steps a specific characteristic enzyme/ co-enzyme (dissolvable mono molecules) is needed to complete the reaction step according to a predetermined scheme.

Due to the use of specific enzymes per chemical reaction step such covalent 'charge reactions' are always completed step by step at which each step is always totally controlled and led because of the specific enzyme/ co-enzyme and only such chemical reaction can occur on the molecule which fits in the string of chemical reaction steps.

-) Every chemical reaction step is imbedded by physical changes:

In biochemical reactions two chemical reaction steps are never completed immediately one after another. Every chemical reaction step is standardly preceded by one or two physical changes by coupling the enzyme and is also concluded with minimally one physical change for decoupling the enzyme. In all cases it concerns a chemically covalent charge bond (+L2ck).

-) No radical reactions:

BP and / or living matter on earth and / or BP etc. never utilizes the totally unpredictable radical reactions.

*3) HYPOTHESIS:

-) Universal existence of matter/ atoms according to the *periodic table*:

- I) The higher atoms in the universe have been mainly formed from hydrogen (H₂) during the H₂ supernova's and solely constructed from protons and electrons. See www.uiterwijkwinkel.eu document F1d: simplified model of the atom nucleus with only protons and electrons.
- II) Because of the tetrahedron interim step with 4 electron pairs in the outer electron shell all formed atoms are constructed and ordered via the characteristic layers of 8 elements according to the classification in the *periodic table* in these nuclear fusion reactions.
- III) After these atoms and specially their atom cores have stabilized exactly the same system of 92 elements of the *periodic table* remains all over the universe as on Earth.
- IV) These about 90 stable elements qualitatively generate exactly the same system of physical and chemical forces and their bonds derived from this over the universe. **Document F1d.**

-) Universal prevention of the same accumulation of molecules:

- V) Based on the *periodic table* a similar accumulation of approximately 1 – 2 billion molecules can universally be formed especially on planets with sufficient liquid water and land, lightning discharges in the atmosphere and where (anaerobic) photosynthesis may develop.

-) Total accumulation of 1 – 2 billion molecules contains all biochemical systems:

- VI) In theory this total accumulation of molecules contains the complete biochemistry of all forms of living matter on Earth as rendered in *Biochemical Pathways* and BP etc. but it also contains *all* eventually possible biochemical systems of living matter possible elsewhere in the universe!
- VII) Living matter on Earth utilizes all biochemical opportunities the elements of the *periodic table* and molecules involved allow.
- VIII) In the universe the completion of biochemical reactions can only occur with mobile molecules and so with mono molecules dissolved in a reaction medium and specifically in water. Water is the only liquid which dissociates of itself in ions: H₃O⁺ and OH⁻.
- IX) From this total accumulation of mono and polymeric molecules the phenomenon 'life' organizes itself autonomously driven by the anaerobic photosynthesis and the glucose formed. Biochemically all forms of life are minimally organized around the biochemical schemas of *Biochemical Pathways*.

-) Transition dead matter --> living matter:

- X) From 'dead' matter the biochemistry of living matter can only develop autonomously if the *periodic table* of elements only allows *one biochemical system* as Biochemical Pathways.
- XI) When the *periodic table* allows *two or more different but similar biochemical systems as BP* these systems will obstruct each other during the tens of millions of years' developing phases with consecutive transitions from 'dead' to 'living' matter which finally results in no development of living matter.
- XII) Via computer simulation with 1 – 2 billion digitally made molecules in time it can be scientifically proved undeniably whether the *periodic table* structurally allows other biochemical basic forms than only Biochemical Pathways. It will then also become clear which biochemical niches have possibly not yet been utilized by the current life forms on Earth.
- XIII) The development of the biochemistry of living matter completes autonomously driven by the glucose formed by the photosynthesis and runs without any help from external 'fertilization' or supernatural influences

XIV) Transplanting life from elsewhere in the universe is not necessary because the biochemistry of the phenomenon 'Life' orders itself autonomously and similarly on billions of suitable planets with these 1–2 billion molecules. Each galaxy contains at least one planet with living matter. The development of living matter occurs spontaneously according to the same method and system as on Earth.

-) The cell forms a basic point of departure for living matter:

XV) Basic characteristic of living matter is the completion of biochemical reactions in the reaction medium water. The cell with its semi-permeable cell wall primarily holds this water in a small enclosed space and to prevent the reaction medium (water) from evaporation as well as uncontrolled mixing with other water. This way the cell form leaves sufficient space for a controlled import of useful substances and export of superfluous waste.

XVI) The cell form prevails all over the universe for all forms of living matter.

XVII) Within the cell life is biochemically shaped by means of a complex organization form and control (amongst it DNA/ RNA) with as its similar biochemical production possibilities of among others amino acids and proteins to be formed.

XVIII) Because of wear, cosmic radiation and internal pollution every active living cell has a certain lifespan. The end manifests itself without exception in the cell's or organism's decay and death and the total disintegration again of the organization structure into inorganic, strictly inanimate, molecules.

-) Living matter is minimally one cell capable of asexual reproduction:

XIX) To offset the mortality all forms of living matter need to have a system to reproduce sexually and/or asexually.

XX) Living matter occurs only when cells are minimally capable of propagating sexually or asexually.

-) Living matter is a universal phenomenon:

XXI) The phenomenon 'life' is a spontaneous phenomenon and common occurrence in the universe. It develops totally autonomously on many billions of planets with liquid water with a similar biochemistry of life forms on Earth and so is based on Biochemical Pathways (BP) and BP etc.

XXII) The biochemistry of life on Earth is standard for all forms of life in the whole universe.

*4) PRESENTATION OF THE QUESTIONS:

The author aims to answer the following questions:

I) Biochemistry of living matter:

- a) Why does all life on earth only rest on the carbon chemistry as in the biochemical schemas of *Biochemical Pathways* (BP) having water as the *only suitable* reaction medium? What is so specific about the elements C, H, O, N, S and P themselves and in bond with water as reaction medium?
- b) Are C, H, O, N, S and P and liquid water also valid as basic hypothesis for all living matter elsewhere in the universe?
- c) Why is there no living matter on Earth based on the elements belonging to a) the real metals, b) amphoteric metals, c) the halogens or d) based on silicon?
Why are the elements C, H, O, N, S and P of the *periodic table* the only 'life' elements and have the other elements (amphoteric metals) at most a supporting role as catalyst in reactions or as construction material in for example bone?
- d) What is so particular about the reaction medium liquid water? Why is there no living matter based on any other liquid reaction medium than liquid water: liquid NH₃, H₂S and/or other mixtures of liquids?
- e) Why is there no life on Earth in: gases, solid substances or an environment without liquid or liquid reaction medium?

II) More specifically for parts of Biochemical Pathways:

- f) Are other molecules than chlorophyll suitable for the physical release of light from electrons full of energy?
- g) Are other elements than P suitable for the chemical containment of energy which can serve as an alternative for ADP / ATP?
- h) Can alternative opportunities be constructed within the *periodic table* and its molecules as an alternative for the photosynthesis by forming a possible different mono saccharide than glucose?
- i) Are any other cycles possible than the citric acid cycle, the fatty acid cycle and the amino acid synthesis (the bio chips) based on the elements C, H, O, N, S and can any basically different biochemical systems than Biochemical Pathways be formed or is *Biochemical Pathways* the only conceivable biochemical opportunity for living matter over the universe?
- j) Are alternatives possible for the DNA / RNA construction for the containment of the biochemical functioning of the cell and the transfer of that information during asexual and sexual reproduction.

III) Development of living matter:

- k) Can the development of living matter be explained biochemically as a totally autonomous and spontaneous process without interference or control from outside?

Explanation of the question:

-1) Are the citric acid, fatty acid and amino acid cycles the only biochips?:

A crucial question is and will be the question whether Biochemical Pathways is the only possible basic bio processor and if so, why. In case alternative basic bio chips other than the citric acid, the fatty acid and the amino acid cycles are possible this will lead to completely different biochemical interpretations of living matter. On Earth we only see the citric acid cycle, the fatty acid cycle and the amino acid synthesis and no other cycles than BP. It must be possible to explain this.

-2) No living matter based on Si, liquid NH₃ or H₂S

On Earth there is no living matter based on Si, metals, amphoteric metals, halogen or reaction media other than liquid NH₃, H₂S or any other organic or inorganic liquid nor lifeforms based on solid matter or gases. It must be possible to explain this as well.

-3) On Earth there are only BP and BP etc. and liquid water as reaction medium:

On Earth everything points to the bond of Biochemical Pathways (BP) and BP etc. with:

- a) central in this the citric acid cycle and the fatty acid cycle,
- b) molecules solely constructed from the atoms C, H, O, N, S and P,
- c) the usage of a couple of thousand mono molecules that act as enzymes,
- d) the bond of chlorophyll with ADP / ATP for the containment of energy,
- e) the DNA / RNA for control in the cell and transfer of information during reproduction,
- f) with liquid water as the only and indispensable reaction medium.

Based on the situation on Earth the *periodic table* of elements only allows one system as BP!

-4) Is Biochemical Pathways unique?

If BP turns out to be singular and unique as the only central bio processor of living matter the biochemistry of all life forms elsewhere in the universe in contrast are standardly based on BP and BP etc.

All life forms elsewhere in the universe are in that case emphatically based on a biochemistry which is either almost or exactly similar to the biochemistry of living matter on Earth.

-5) The biochemical basic principles:

In that case the biochemical basic principles of living matter or the Laws of the biochemistry of living matter, in short the *Laws of biochemistry*, can be deduced from Biochemical Pathways and the reaction medium water.

*5) METHODOLOGY:

5.1 THERE IS NO LITERATURE ABOUT THE BIOCHEMISTRY OF EXTRATERRESTRIAL LIFEFORMS:

-1) Possible alien life on earth is a military and political top secret:

Because of the vulnerability of the DNA / RNA the movement speed of living matter in the universe is limited to about 300 – 400 km/sec in relation to their planet of departure or with merely about 1‰ of the speed of light.

The crossing of 1 light year takes about a millennium for anyone; all aliens to!

If there is extraterrestrial life on Earth or there is found a living alien this will be news which causes a lot of turmoil worldwide under the civilization. Certain extraterrestrial life would immediately be qualified as an absolute military and political top secret. The existence of it would be denied on all levels and in all possible ways. The press and science can then not publish freely about this subject.

So the scientific literature at most contains visions, several indicative biochemical tests on Mars though there is no concrete observations and research data about the structure of the biochemistry of extraterrestrial life forms.

So literature research does not help the author.

A pity;

-) it would immediately confirm the uniqueness of *Biochemical Pathways* and of BP and such as well as the necessity of liquid water for biochemical reactions.

-) or at least the possible existence of other biochemical alternatives than BP.

Now the author has no other choice than to fall back on:

- 1) common physical and chemical basic knowledge; the *periodic table* + 12 fundamental forces,

- 2) the results of *the own analysis of Biochemical Pathways* (**chapter 6**) and

- 3) the results of *the own deduction* based on an own system with present in it all about 1 – 2 million mono-molecules and 1 – 2 billion polymer molecules (**chapter 7**).

-2) On Earth *all biochemical systems of living matter* are possible:

On Earth all elements of the *periodic system* are present and in potency the total gathering of about 1 – 2 million mono-molecules and 1 -2 billion polymer molecules exist.

Theorem 1: On Earth physically as well as chemically there is possibility for the development of *all* other thinkable biochemical life forms in the universe!

Theorem 2: If on Earth there are theoretically other biochemical systems possible than Biochemical Pathways and BP and such then:

1) these biochemical systems are currently present on Earth and active in living matter,

2) these systems can be found somewhere on Earth in living matter and

3) these systems can systematically be deduced.

Up until now there has only been found one basic biochemical system on Earth: BP with around it BP and such. It turns out there are no alternatives possible for BP or such alternative biochemical systems haven't (yet) developed to the level of a living cell.

The author keeps into account the biochemical niches which can be coupled to BP which somewhere else in the universe has already filled in what life on Earth is not ready for yet.

5.2 BOND OF TOP – DOWN ANALYSIS OF BP AND BOTTOM – UP DEDUCTION:

In this document the author deduces the universal basic principles and/or the Laws the biochemistry which rests on all forms of living matter in the universe. This deducing of the Laws of biochemistry happens on one hand through:

a) the *top down analysis* of Biochemical Pathways (BP) of Gerhard Michal and co which biochemical system is seen in all forms of living matter on Earth.

In this analysis the fundament on which BP and BP and such are based on and with this the biochemical basic principles of living matter on earth. This *analysis* of Biochemical Pathways is executed in **chapter 6**. and on the other hand through:

b) the **bottom – up deduction** starting from all to estimation about 1 - 2 million mono-molecules and about 1 – 2 billion (10^9) possible polymer molecules in all thinkable physical conditions (**F1f**).

The same collection of molecules is found all over the total universe on all planets with enough (liquid) water, land and with lightning discharges in the atmosphere. The *bottom up deduction* follows in **chapter 7**.

This bottom up deduction in fact consists out of a *negative sieving technique* consisting out of 26 steps. Per sieve level there is motivated which elements, molecules, liquids and chemical bonds *do not* fit or can be used in the biochemistry of living matter. Step by step there is then left what can potentially still be used in the biochemistry of living matter and why. Through the *bottom up* systematic there can be deduced which elements, molecules, liquids and chemical bonds eventually fit in the biochemistry of living matter and which don't.

Out of this bottom up deduction no matter what BP has to follow but it also becomes clear if theoretically any other biochemical systems can possibly be constructed based on the *periodic table* or that BP is the only possibility. So the bottom up deduction is valid over the whole universe.

The *top down analysis* and the *bottom up deduction* are based on two totally different and contrary points of view. So from two different approaches demands are formulated which have to be posed to:

- a) the elements of the *periodic table* and the chemical bonds in the molecules suitable for the biochemistry of living matter,
- b) the physical and chemical side conditions those molecules have to meet,
- c) the reaction circumstances which are demanded for making biochemical processes take place in living matter.
- d) the energetic side conditions and circumstances,
- e) the demands set by the reaction medium.

5.3 ON THE CROSSING ARE THE 6 LAWS OF BIOCHEMISTRY:

The *top down analysis* as well as the *bottom up deduction* take place inside the elements of the *periodic table*. So both methods meet each other mutually on all five aspects mentioned above. This mutual crossing contains the *6 Laws of biochemistry of living matter* in short the *6 Laws of biochemistry*. Each Law of biochemistry is always constructed out of 3 – 4 sub-items (See **chapter 2**).

These Laws of biochemistry are in fact the boundary conditions in which the biochemistry of the phenomenon of living matter can develop and complete. The 6 Laws of biochemistry declare the biochemical, physical and chemical foundations of the phenomenon life on earth. These 6 Laws of biochemistry reduce the phenomenon life to a biochemically logical and mostly comprehensible phenomenon.

The biochemistry of living matter on Earth stripped from each form of supernatural mystics.

The Laws of biochemistry name the universal biochemical foundations of living matter on earth and with this all other life forms somewhere else in the universe.

5.4 THE BOTTOM UP METHOD GIVES ENOUGH EXPLANATION:

Through the *top down analysis* of BP (**chapter 6**) and the *bottom up deduction* (**chapter 7 document B1.2**) the author is working out a common method with which in potency all biochemical life forms in the universe can be deduced. The possibility of other biochemical systems than Biochemical Pathways or of currently unknown variables of BP and of BP and such are not excluded preceding **chapter 7**. If there are alternatives possible for biochemical systems for living matter other than BP follows directly from the results of the *bottom up deduction* in chapter 7

-) Research results 'extraterrestrial' life forms are convenient though not explicitly demanded:

So for the 'scientific' undeniable proof for the uniqueness of Biochemical Pathways it is not necessary for the author to have at his disposal:

- a) alien lifeforms or
- b) possibly present though not accessible research results about the biochemistry of alien lifeforms on Earth.

Based on the analysis of life on Earth, deduction looking at all the molecules the Laws of Biochemistry can be deduced and enough hard statements can be made.

The analysis of Biochemical Pathways itself turned out to be difficult though specially the deduction based on all thinkable molecules turned out to be complex and took years of work. The analysis of BP and the deduction are fundamentally standing on its own and are based on common physical and chemical knowledge, the system with 12 fundamental forces deduced by the author and mostly on logic.

5.5 THE AUTHOR FOLLOWS SYSTEMATICS WITH LOGIC AS STRICT GUIDELINE:

The *top down analysis* as well as the *bottom up deduction* turned out to be self-correcting of itself as well as mutually. Incorrect and/or illogical steps in the analysis/ deduction process invariably leads to the sooner or later getting stuck in the systematics and in the logic.

More than once the author was forced to revise his vision and points of departure and was also forced to take new and sometimes deviating paths which turned out to be fundamentally different than the existing (scientific) insights in the year 2007 (amongst them visions relating to most elementary particles and origin of mass, electric charge, magnetic spin, space and time, gravity, structure of the atom core, two totally different chemical bonds consisting out of one electron pair, the structure of the proton/ electron/ neutron and so on).

5.6 TESTING OF DOCUMENTS TO THE LITERATURE:

The visions and documents of the author can now be tested for:

- a) the scientific insights and publications in the literature,
- b) opinions of others and be expressed through giving talks and lectures.

Now first follows *the analysis of Biochemical Pathways in **chapter 6*** and after this *the bottom-up deduction of living matter in **chapter 7***.

*6) TOP DOWN ANALYSIS OF BIOCHEMICAL PATHWAYS:

6.1 BIOCHEMICAL PATHWAYS PRESENT IN THE BIOCHEMISTRY IN ALL FORMS OF LIFE ON EARTH:

The biochemistry in all those living cells on Earth is totally based on the carbon chemistry and centrally structured around the lemon acid cycle, the fatty acid cycle and to a lesser extent the amino acid synthesis. Without exclusion liquid water forms an essential reaction medium for all life forms for letting the biochemical reactions happen.

In 1993 **Gerhard Michal and the group of scientists around him** published without a doubt Nobel prize winner worthy work with the last version of Biochemical Pathways (BP) and with this give insight in:

-) the two central biochips which are central in the biochemistry of living matter on Earth:
 - the *citric acid cycle* and the *fatty acid cycle*,
-) the biochemical reaction paths between these central bio chips with which these bio chips can be placed inside one integrated biochemical processor with a (bio)chemical 'wiring' consisting out of chemical reaction steps and physical changes on the molecule laying in between,
-) the position inside this of the amino acid synthesis,
-) that BP functions as the central biochemical bio chip/ processor in all forms of life on Earth and with this
-) on Earth Biochemical Pathways is central in the biochemistry of all living matter.

On Earth there is a motley diversity of organisms known with their own characteristics of biochemical processes which can all be coupled to *Biochemical Pathways (BP)*. The total of all (currently known) biochemical reactions in the different living organisms on earth are mentioned and defined in this document as *BP and such*.

For this reason Biochemical Pathways is known as the only option to be central in the *top down analysis* of the biochemistry of living matter on Earth.

Top down the question is which basal structure is the foundation to Biochemical Pathways and to BP and such. Which explanation can be given for the phenomenon that:

-) only molecules from C, H, O, N, S can be used with P,
-) the atoms C, H, O, N, S form the central 'life' elements with P, here and there filled up with several other elements like metal which at most fill in an (inferior) additional role,
-) only liquid water suitable as reaction medium for biochemical reactions.

Further there is found anorganic material in living matter. Certain anorganic material is almost exclusively made use of as construction material: anorganic polymeres in the form of bone- and tooth tissue (Ca phosphate), sillicon skelletons (Si) and lime skelletons (CaCO₃).

Several types of 'living' matter have a cell core based on only proteins in bond with DNA (amongst them viruses and bacteriophages). These organisms are strictly parasitical, do not have an own metabolism and also do not reproduce on their own. Strictly speaking certain parasitical organisms like viruses and bacteriophages are in between living and dead matter.

6.1.1 LIVING MATTER: TRANSFERS MONO MOLECULE <-> POLYMERE VICE VERSA:

The construction of all living organisms on earth is in essence constructed out of undissolved polymers which are then composed out of several mono-molecules which can be dissolved in water. These mono molecules can all be formed from glucose which is formed through the photosynthesis from inorganic H₂O and CO₂.

The most important mono molecules are:

- mono amino acids <--> poly amino acids and/or the proteins;
- mono saccharides <--> poly saccharides and/or the poly sugars;
- mono fatty acids <--> poly fatty acids;

mono molecules with reactions between an alcohol group and a fatty acid group □ acetal bond;

mono molecules with reactions between an aldehyde group and a fatty acid group □ half acetal bond.

In all living organisms there exists a balance between the syntheses of indissoluble polymers out of organic monomers which can dissolve in water versus the breaking down of polymers reversed in their dissoluble organic monomers. The construction/ breaking down of those mono molecules takes place through the routes to smaller inorganic molecules which can be dissolved in water described in BP.

Crucial: In living matter the formed polymers have to be able to be broken down again with water to their mono molecules from which these polymers are constructed. These mono-molecules released through hydrolysis have to be able to be dissolved in the reaction medium water. So the mono molecules which are formed cannot be too big because certain too big molecules cannot be dissolved in water. Although this also counts for all enzymes.

6.2 CHEMICAL BONDS INSIDE BIOCHEMICAL PATHWAYS (BP)

This 'easily' splitting up from a polymere of mono molecules and/or hydrolysis can only take place when in chemical bonds between the mono molecules in the polymere there is a matter of a covalent charge bond (+L2cb) or of a physical chemical charge bond (+L1b). In case of (+L2cb) bonds these can be broken through shifting one electron pair and with this through 'soft' hydrolysis without making use of strong acids or bases.

To make the further biochemical break down of the split up mono molecules and by this the energy extraction possible also all other chemical bonds of certain mono molecules need to be constructed from covalent charge bonds (+L2cb).

In all chemical steps inside Biochemical Pathways chemical binding energy is *irreversibly* turned over into heat. This transformation forms the driving force to force and spur the molecule through BP. To bridge these chemically steps there are physically steps in between.

6.2.1 CHEMICAL RADICAL BONDS OR RADICALS CANNOT BE UNITED WITH THE BIOCHEMISTRY OF LIVING MATTER:

This splitting up of monomeres cannot be realised biochemically when there is a matter of real covalent charge bonds (+R1cb) in the polymere between the mono molecules. Certain mono molecules can than only be split up in a purely chemical way by using strong acids or bases.

When there is a real covalent radical bond inside the mono molecule after all than this molecule also cannot be broken down biochemically to anorganic gaslike molecules. All covalent radical bonds (+R1cb) result in two radical atoms or molecules in splitting up. Certain radicals cannot be united with the biochemistry of living matter. So no single atom bond inside polymeres and inside the mono molecules may be characterised as chemical covalent radical bond (+R1cb).

So the construction and breaking down puts up the stringent demand that all chemical bonds inside the molecules have to be chemically covalent charge bonds (+L2cb) or need to be able to respond like that. This is indeed the case for Biochemical Pathways with in it the central part of the biochemistry of almost all living organisms grouped around amongst others the citric acid cycle (mono saccharides), the fatty acid cycle (fatty acids) and the amino acid synthesis and / or protein synthesis ↔ breaking down.

Further there is elaborated about the types of chemical bonds which are biochemically acceptable.

6.2.2 TYPES OF CHEMICAL BONDS:

Chemical and physical/ chemical bonds inside a molecule can consist out of:

a) The covalent radical bond between two atoms : (+R1cb),

This chemical bond between two atoms consists out of a commonly shared electron pair. This electron pair is constructed out of two unpaired electrons at which both sides of the atom the bond has brought up its own unpaired electron for the forming of the electron pair.

b) The total physical chemical charge bond between two atoms/ molecules: (+L1b);

This bond consists out of the physical chemical bond between two oppositely charged (organic/ anorganic) ions and only happens with salts dissolved in water. With this type of bond there is never a matter of a commonly shared electron pair and/or of a real covalent chemical bond.

c) The real covalent charge bond between two atoms: (+L2cb),

This bond consists out of a chemical bond between two atoms in the form of an electron pair though in foundation this bond isn't constructed out of two radicals (-R1cb) and does not respond like a real covalent radical bond.

The bond of both sides of the atom has a surplus of electrons and for this reason it makes a total electron pair up to 3 electron pairs available to atoms with a shortage of electrons for the forming of one bond or of more bonds between the two atoms in the form of a mutually shared electron pair.

Between two atoms there can be realised a maximum of 3 chemical bonds. In practise there is a matter of a mix of both chemical bond forms at which there is always minimally one bond which can respond conform a covalent charge bond (+L2cb) for example: N₂, CN, C₂H₂. The acetale and half radical bonds just as well belong to the covalent charge bonds (+L2cb).

Further the author establishes two special forms of chemical bonds:

d) The half radical bond: (+R1cb),

This bond consists out of the releasing or the combining of a loose individual electron (e⁻ = a radical) out of the outer electron shell of an existing atom. Reactions with the releasing or tying of loose electrons are named in this document as half radical reactions because merely one radical comes to be (the electron) while the other part of the atom/ molecule becomes +/- charged and in the process does not become radical in water but in practise it responds like an ion.

Half radical reaction: all chemical/ biochemical reactions in which there is a matter of connecting or decoupling of one loose individual electron.

e) The proton bond: (+L2cb).

This chemical charge bond sets in at a limited number of bonds: amongst others COOH, COH, NH₂, CSH, H₂S, H₂O though also comes to be in a bond between hydrogen to a metal. The (weak) proton reaction consists out of the untying of a loose individual proton (proton = bare H⁺ ion, in water H₃O⁺ ion) from an existing molecule amongst others COOH, H₂S etc or out of the attaching of a proton/ H₃O⁺ to a negative organic ion to an O, S and N atom through a (L2cb) bond.

Proton reaction: all chemical and biochemical reactions at which there is a matter of the attaching or decoupling of a loose H⁺ /H₃O⁺ atom/proton.

The half radical reactions and proton reactions are seen a lot in Biochemical Pathways.

6.2.2.1 sub a) THE REAL COVALENT RADICAL BOND BETWEEN TWO ATOMS (+R1cb):

This are chemical covalent bonds *between two atoms* which respond by splitting up the commonly shared electron into two radicals or only through reactions with strong acids or bases to hydrolysis.

Confusing is that all covalent radical bonds (+R1cb) as well as all covalent charge bonds (+L2cb) can be split up into two radicals each with one unpaired electron/ radical. The combining of the two radicals of a (L2cb) bond then results in a covalent charge bond (+L2cb) and not in a covalent radical bond (-R1cb)!

Radical reactions are important in the preparatory phase of dead to living matter because of the forming of a large diversity of organic molecules formed by accident with in the process the forming of all kinds of covalent radical bonds (+R1cb) but besides this also the forming of all kinds of covalent charge bonds (+L2cb) out of two radicals. This is mostly the case with radicals constructed out of the elements C, H, O, N, S.

Once living matter has come to be it turns out that the radicals can totally not be used anymore in the biochemistry of living organisms. In an environment with many other molecules and bonds (like in a living cell) the outcomes of radical reactions are totally by coincidence and unpredictable. Radical reactions cannot be controlled in any way by a living cell let alone can be gotten under control. Because of this radical reactions are principally unuseable inside the regulated systems of biochemical reactions like found in cells of living matter and in all cases they form a direct threat for the functioning of a living cell. Cells have developed mechanisms to eliminate radicals formed by among other things cosmic radiation as quickly as possible (among other things through vitamine E).

Because of this uncontrolableness biochemical systems like Biochemical Pathways and the biochemistry of living matter on earth rest on BP and such *nowhere* on total radical reactions. (Radical reactions are used in a possitive way in medicine)

Conclusion 1: The bonds in molecules involved in the biochemistry of living matter may nowhere exist of totally covalent radical bonds (-R1cb) between two atoms.

Conclusion 2: In the biochemistry of living matter only chemical bonds consisting out of the following are acceptable:

- b) physical chemical charge bonds (+L1b).
- c) covalent charge bonds (+L2cb),
- d) half radical bonds (+R1cb); the releasing/attaching of one individual electron,
- 4) proton bonds (+L2cb); the releasing/attaching of an H^+/H_3O^+ ion.

These biochemically acceptable bonds are now worked out further:

6.2.2.2 Sub b) THE PHYSICAL CHEMICAL TOTAL CHARGE BONDS (+L1b):

Chemical charge bonds (+L1b) exclusively happen in the form of:

- 1) un-dissolved though un-dissociated mono molecular salts,
- 2) ions which are directly connected to an adsorption complex (for example clays) and are not connected in the double layer.

Metals, amphoteric metals and halogens can get into such chemical charge bonds. In biochemical reactions only the charge bonds constructed out of the elements C, H, O, N, S and P are acceptable.

6.2.2.3 Sub d) THE HALF RADICAL BONDS: (+R1cb):

Electron pairs in the electron shells around the atom core can also be considered as covalent radical bonds (+R1cb)! With several atoms (amongst them metals) it is possible to temporarily release a singular electron (e^- = radical) out of one of the electron pairs in the outer electron shell which can get into a reaction. At this splitting up of the pure radical bond of the electron pair there comes to be: 1) a metal radical which manifests itself as an ion in water and 2) a free electron which can be considered a radical.

Certain half radical oxidation/ reduction reactions fundamentally turn out to be well controllable and because of this usable in the biochemistry of living matter amongst them the autotrophy organisms.

With the organic bonds such a splitting up of one free electron from an electron pair is mostly not really possible. Then the organic molecule gets an unpaired electron which shall respond more similar to a *radical* though and less like an *ion*. Such radical reactions cannot be made controllable anymore. For half radical reactions amphoteric metals (Fe, Zn, Co etc.) are the most appropriate and because of this unmissable for a number of reactions.

For this reason in a number of biochemical reactions metals/ metal ions are made use of as electron donor/ acceptor. It concerns amphoteric (surplus) metals which can take on different valence's (+1 / +2) or (+2 / +3) and because of this depending on the situation can supply an electron or take one in resulting that overall there is a matter of a total controllable half radical reaction after all (chlorophyll, hemoglobin).

Reaction steps through half radical reactions in cooperation with metals are totally predictable and so controllable. Through half radical reactions a number of amphoteric metals are playing an essential part in oxidation / reduction reactions like donor / acceptor of electrons which because of this fit in the biochemistry of living matter.

6.2.2.4 Sub e) THE PROTON BONDS / REACTIONS:

Opposite to the electron in the bond of a proton or of a bare H^+ atom without electron shell(s). H^+ manifests itself as an H_3O^+ ion in water and can be bound to amongst other things a COO^- group (carbon acid) or to a C – O, C – S or N – H group (alcohol, thionol, amine). This type of reactions concerns the combining or the decoupling of a proton and/or a bare H^+ atom/ H_3O^+ ion through combining to one of the free electron pairs of O, S, N under the forming/ breaking of a covalent charge bond (+L2cb).

Bare atom cores are only possible in: a) the simplest elements of the *periodic table*: the H atom and results in a proton and b) α radiation in the form of a bare He atom core.

sub a) The splitting up/ attaching of a proton (= bare H^+ atom) is considered a proton reaction. Certain proton reactions are also happening totally predictable and structured. Proton reactions are usable in the biochemistry of living matter and are abundantly found in the biochemistry of living matter.

sub b) Under natural circumstances the only other known bare atom core is the bare He $2+$ charged atom core in the form of the alpha particle. This particle manifests itself primarily as *radiation* and just as well not like an *ion*! This alpha particle/ bare He atom responds similar to the proton! The damaging aspect of alpha radiation is amongst in its $2+$ charge of the bare He atom resulting that the He^{++} can start to form two bonds between for example two fatty acid molecules which because of this become indissoluble, something which does not happen with H^+ H_3O^+ !

6.2.2.5 sub c) THE COVALENT CHARGE BONDS (+L2cb):

This are chemical/ biochemical reactions with getting into or breaking of one covalent charge bond (+L2cb) and happens through moving *one electron pair*(2) as a whole:

= 1) All reactions through (L2cb) are always preceded by a physical negative charge forming (+L2ck -) on one molecule and a positive charge forming (+L2ck+) on the other atom/ molecule!

The getting into a covalent bond happens the other way around through the supply of *one electron pair* of an atom of the one molecule to the positively charged part of another atom or molecule. Through that supplied electron pair there is formed a covalent charge bond (+L2cb) and the chemical reaction is made.

= 2) The breaking of a covalent bond happens by the shifting of one *electron pair*(2) of the original charge bond to one of the atoms/ elements on both sides of the bond. Through this charged condition the molecule can break its bond, hydrolyse it or respond with another molecule.

= 3) This partly being charged or totally being charged of the atom/ molecule in the form of an ion can only exist in a reaction medium and in the presence of liquid water. After all water is the only liquid which dissociates in the ions H_3O^+ and OH^- by itself. Only liquid water creates the space inside the liquid for placing and/or the dissolving of charged particles. These charged particles are being placed between the water molecules in the form of ions and provided with a shell with water molecules (= hydration).

= 4) The splitting up of the half radical and proton bonds can only be completed in the presence of liquid water as reaction medium because of the charged ion.

= 5) In the turning around of an existing covalent charge bond (+L2cb) in a new covalent charge bond normally the bond energy is turned around into heat *irreversibly*. (In the photosynthesis the opposite takes place). This energy decay through the turning around of chemical bond energy into heat forms the driving force behind certain reactions/ reaction steps and forms the most important driving force behind the biochemistry of living matter.

= 6) In all thinkable molecules which can be formed from the *periodic table* such shiftings of a totally new electron pair can easily take place on molecules constructed out of the metalloids C, H, O, N, S with P for the energy capturing/storage.

= 7) This shifting of certain electron pairs(2) can take place in a large physical range:

-) pH: <1 $\text{pH} < 13$,

-) temperatures: $-20\text{ C} < \text{temp} < 150 - 200\text{ C}$,

-) hydrostatic pressures up to hundreds of bar,

-) in the biochemistry high temperature is always paired with high (hydrostatic) pressure,

-) high salt concentrations.

On Earth there are found living organisms under extreme circumstances.

= 8) The completion of the biochemistry in living cells is possible under extreme circumstances as long as there is matter of the presence of *liquid water* inside those cells for the completion of biochemical reactions in the cell, the cell can take in its nutrients and can give of its waste matter to its environment.

= 9) In the chemical reactions through covalent charge bonds (L2cb) there is needed a catalyst for each separate chemical reaction step.

= 10) All biochemical reactions take place through the getting into or breaking of covalent charge bonds (+L2cb). For each chemical reaction step the presence of a specific for this chemical step appropriate enzyme is demanded. In the mean time there are several thousands of certain mono molecular enzymes/ co enzymes known which can dissolve well in water.

6.2.2.5.1 ALL MOLECULES INSIDE BP CONSTRUCTED OUT OF C, H, O, N, S (AND P) WITH IN BETWEEN COVALENT CHARGE BONDS:

All mono molecules inside BP consist out of the atoms C, H, O, N, S (and P) with in between exclusively chemical covalent charge bonds (+L2cb), proton bonds (+L2cb), half radical bonds and electron pairs (+R1cb) and charge bonds (+L1b). All molecules of BP are constructed with only the 5 metalloids C, O, N, S and (P) mentioned above in connection with the H atom and earlier mentioned bonds.

All chemical reaction steps inside BP always result in physical changes on the molecule. This is the common characteristic of all chemical reactions involved in the biochemistry.

Biochemical reactions turn out to be inextricably standardly coupled to physical changes on the responding molecules. Physical changes are a must! In **chapter 6.3** the reaction medium and **6.4** the physical aspects these physical changes and side conditions are worked out further.

Like stated earlier BP never rests on radical bonds of total radical reactions during which two radicals are released! That is because certain total radical reactions do not lead to physical changes on the molecule.

In Biochemical Pathways and BP and such there are found other (metal) atoms though then exclusively in the form of an ion dissolved in water. This ion then hangs inside ring like parts of certain molecules though exclusively through a physical chemical charge bond (+Lb) and never through a covalent chemical charge bond (-L2cb) or even through a covalent radical bond (-R1cb).

Certain metal ions (Fe, Co, Zn) fill in an important task for temporarily taking on or emitting of an electron (= half radical reaction). With half radical reactions in foundation amphoteric metals/ metal ions are involved. The COOH, CSH, COH and NH₂ groups can give of a bare H core and/or proton and the COO⁻, CS⁻, CO⁻ and NH⁻ take on a proton in the form of a proton reaction.

6.2.2.5.2 BETWEEN WHICH ELEMENTS COVALENT CHARGE BONDS ARE POSSIBLE AS WELL AS HALF RADICAL, PROTON REACTIONS AND CHARGE BONDS:

Covalent charge bonds (+L2cb) play a central part in the biochemistry of living matter filled up with half radical reactions and proton reactions.

Now the question is:

- a) Between which types of elements such covalent charge bonds (+L2cb) are possible?
- b) Which elements/ molecules can get into half radical reactions and proton reactions?

Scheme 6 – 1: ELEMENTS, COVALENT CHARGE-BONDS, HALF RADICAL REACTIONS AND PROTON REACTIONS:

The about 90 stable elements of the periodical system can globally be divided into 6 groups:

1) the noble gasses. 2) the real, non-amphoteric metals, metals, 3) the amphoteric metals, 4) the halogens, 5) the metalloids, and 6) the H atom. See Document F1d in relation to the construction of the periodical table:

Sub 1) The noble gasses:

Noble gasses already own an ideal filling of their outer electron shell. All noble gasses can because of this be considered totally inactive looking at it chemically. Under normal circumstances noble gasses cannot make any chemical bonds, are chemically totally inert and for this reason they stay totally out of consideration in relation to the biochemistry of living matter.

Sub 2/3) The metals and the amphoteric metals:

-) Between metals and amphoteric metals amongst each other there cannot be formed any direct covalent charge bonds (-L2cb) nor covalent radical bonds (-R1cb). Only physical van der Waals/ London bonds (+W2b) and physical charge bonds (+L1b) are possible. With this metals and amphoteric metals qualify themselves to be totally inappropriate as basic building bricks for living matter.

-) Metals/ amphoteric metals can give of one electron or more electrons or take one on as dissolved ion. Because of this an amphoteric metal can play a limited though very important role at the half radical reactions like the case with the chlorophyll and with hemoglobin and the biochemical oxidation reactions of the autotroph organisms.

-) A few metals (Ca^{++}) can be found in bone material.

-) Metals are in foundation positively charged as ion and (luckily) cannot combine a positively charged proton as metal ion. Metal ions are because of this in principle unsuitable in biochemical reactions. As opposed to this solid metals can attach to a proton and so they are suitable as catalyst for many chemical reactions.

-) Metals and amphoteric metals can form all kinds of physical charge bonds (+L1b) with amongst them halogens and metalloids in the form of an ion bond and/or an un-dissociated salt.

-) In a purely chemical way metals and amphoteric metals can form covalent charge bonds (+L2cb) with metalloids though no covalent radical bonds (-R1cb). But certain covalent charge bonds metal / amphoteric metals - metalloids (+L2cb) can hardly not be gotten reactive with enzymes or to be hydrolyzed and so they do not fit in biochemical systems. Covalent charge bonds of metals with metalloids block the completion of biochemical reactions and are normally toxic.

Such covalent charge bonds do respond in a more aggressive environment in the presence of strong(er) acids or bases.

Sub 4) The halogens:

-) Halogens form bonds with metals and amphoteric metals in the form of salts and physical chemical charge bonds (+L1b).

-) Together with metalloids the halogens mostly form covalent radical bonds (+R1cb) consisting out of merely one common covalent electron pair. Looking at the filling of the outer electron shell of the halogen there cannot be formed a (temporary) second bond between the metalloid and halogens with an electron pair or only very difficultly.

Because of this the bond metalloid – halogen is acting primarily as a radical bond (+R1cb) and can hardly be transformed to a covalent charge bond (-L2cb). The metalloid – halogen bonds are because of this biochemically difficult or hard to break biochemically. The halogen – metalloid bonds are mostly because of this in foundation toxic.

-) The metalloid – halogen bond further has a low energy content which also makes the breaking of the bond difficult. The breaking of the halogen bond takes more energy than there is released in bond heat. So with chlorinated bonds it is hard to generate a driving force.

-) It turns out that only specialized bacteria adapted to halogens in ground, mud and spoil are capable of breaking such organic halogenated bonds and breaking down these quite persistent molecules very slowly. For normal cells this process is going way too slowly and this breaking down takes way too long. Organic halogen bonds act as covalent radical bonds and are toxic because of this.

-) So halogens cannot be a part of the biochemistry of living matter.

Conclusion 3: Then there are only left molecules constructed out of the metalloids and the H atom for the biochemistry of living matter.

Sub 5) The metalloids:

-) Covalent charge bonds (+L2cb) are only possible between the different metalloids amongst each other. If such a bond comes to be from two radicals constructed out of C, H, O, N and S the formed covalent radical bond (+R1b) shall after this start responding like a covalent charge bond (+L2cb) after all. This is only reserved for radicals of the metalloids.

-) Between two metalloid atoms mutually there are one to maximally three chemical bonds/ electron pairs possible at which always minimally one bond can be characterized as covalent charge bond (+L2cb). During (bio)-chemical reactions with C, O, N, S and P the other bonds can always be turned around through covalent charge bonds.

-) Many 1/2 and 2/3 charged metals dissolved in water as an ion can give of or take on an electron. By this certain metals play a part in the half radical reactions inside biochemical reactions (amongst others in chlorophyll, hemoglobin and autotroph organisms).

Sub 6) The H atom:

-) In H_2 the H atom is bound through an in foundation covalent radical bond (+R1cb) though because of the proton reaction this covalent radical bond can also respond like a covalent charge bond (+L2cb) very well because of the fact that the split up H atom is a bare proton and not an atom with other electron shells. Because of this that H^+ / bare proton can easily be attached to one of the electron pairs of O, N, S. Because of its tiny size the H^+ atom/ bare proton is a perfect filling up of all organic molecules. This counts only and exclusively for H^+ .

-) The bond between H and metalloid can biochemically be broken down well as covalent charge bond through a proton reaction. With the oxidation of an H – metalloid bond a lot of energy/ heat is released.

-) H^+ is the only atom of the *periodical table/ system* suitable for the getting into proton reactions. It concerns the molecules/ molecule groups like COOH, COH, NH, NH_2 , SH, H_2S , OH, H_2O which are capable of attaching a proton as well as giving of a proton. Proton reactions play an important role in biochemical reactions in living matter.

6.2.3 CHEMICAL ANALYSIS OF BIOCHEMICAL PATHWAYS:

With analysis of BP and of all those other biochemical schemes (BP and such.) one can notice:

-) No polymers in Biochemical Pathways:

In the central part BP does not contain any form of polymer molecules though it contains exclusively singular mono molecules which are constructed out of the elements C, H, O, N and S with between these elements exclusively chemical covalent charge bonds (+L2cb) and reactions between these bonds filled up with half radical reactions (e^-) and proton reactions (H^+).

The metalloid atoms: C, O, N, S and P are normally surrounded by 4 electron pairs and show between 1 – 4 chemical bonds with other elements; the H atom standardly knows only one connection which is the perfect filling for organic molecules.

-) **No metals, amphoteric metals or halogens in Biochemical Pathways:**

BP contains no metals or amphoteric metals as chemical covalent charge bond (+L2cb) nor as covalent radical bond (+R1cb). Amphoteric metals do arise (Fe, Co, Zn etc) though exclusively in the ring like parts of an organic molecule (amongst them chlorophyll and hemoglobin) and only in the form of physical charge bonds (+L1b). BP nowhere contains a covalent charge bond between one of the metalloids and a halogen.

-) **No radical reactions in Biochemical Pathways:**

In BP all reaction steps happen through the transfer of one electron pair and as covalent charge bonds (+L2cb) and nowhere through radicals.

-) **Half radical proton reactions:**

Further inside Biochemical Pathways there are found the half radical reactions (releasing/ binding of one electron) and proton reactions (releasing or binding of a proton/ H^+ / H_3O^+).

These half radical reactions mostly take place in the amphotere 1/ 2 and 2/ 3 worthy metals which are dissolved as an ion in water at which these metal ions function as electron donor/ acceptor.

Proton reactions mostly take place in bond with the metalloids O, N, S and the molecule groups (COOH, COH, NH_2 , NH, SH, H_2S , OH, H_2O).

-) **Covalent charge bonds only between metalloids mutually and H:**

Biochemical accessible covalent charge bonds (+L2cb) are exclusively found between the metalloids C, O, N and S (with P) mutually and this in bond with the H atom.

The forced demand of covalent charge bonds (+L2cb) is explained in the Law IIIa) and IIIc) of biochemistry.

-) **No central role for P inside Biochemical Pathways; exclusively two very specific roles for P inside BP:**

P does not fulfill a general role inside BP though merely a strictly local and essential role in the energy capturing / storage in ATP/ ADP and in the control of a cell through the hereditary material: the DNA/ RNA,

The limited role of P is the consequence of physical characteristics of P still to be explained because there cannot be formed *any gasses* around the element P.

-) **Not any central role for silicon (Si) inside BP:**

Around the element Si also *no gasses* can be formed. That why Si doesn't play any central role in biochemistry!

6.3 THE REACTION MEDIUM:

6.3.1 REACTIONS WITH COVALENT CHARGE BONDS (+L2cb) CAN ONLY BE CONTROLLED THROUGH DISSOLVED MOLECULES:

For making biochemical reactions possible the responding molecules need to be able to collide with each other literally. So responding molecules most favourably need to both be manoeuvrable and at least minimally one of both!

Atoms/ molecules have such a manoeuvrability and enough speed to respond exclusively in the condition of a loose atom or mono molecule. That situation only happens with the physical condition form of:

- 1) a atom or molecule as a free gas (+W2gf) or
- 2) a atom or mono molecule dissolved in a liquid (+W2Db).

So chemical and biochemical reactions are only possible under circumstances with:

- a) minimally one of the atoms/ mono molecules in the gas form (+W2gf) and
- b) minimally one of the atoms/ mono molecules dissolved in a real liquid (+W2Db)

These opportunities are being considered further. In the biochemistry, except H^+ and the electron, loose atoms do not play a part and everything is about reactions on mono molecules.

sub a1) Reactions between molecules as free gas (+W2gf):

With reactions between two gas like mono-molecules or of one gas forming came to be absorbed with another mono molecule be it again two or more gasses or through polymerization to solids or viscous liquids. Gas like molecules have a relatively great speed. With reactions in gasses reaction heat being released cannot be taken away fast resulting that these reactions are almost always happening at high(er) temperature(s); mostly explosive and through plasma forming resulting that the chance of radical reactions increases greatly.

Only small molecules come to be in the condition of gas (+W2gf). Big molecules and complex molecules aren't possible as gas. This also counts for the enzymes which are also too big to appear as a free gas. For this reason in gasses no regulated reactions by enzymes can be completed and so no biochemical reactions.

With polymerization reactions of gasses there arise bigger and more complex molecules which cannot come to be as a gas anymore looking at it physically. Certain bigger molecules always come to be in the physical condition of a viscous liquid (non-Newtonian liquid) or in the condition of a solid substance.

Further gasses cannot dissolve in such viscous liquids/ solid substances. Physical as well as chemically both come to be totally loose from each other without any form of mutual interaction.

Conclusion 4: Around mono molecules in the real gas form (+W2gf) with gas pressure there is no biochemical system of living matter to erect so it is possible.

sub a2) Reactions between a free gas and an absorbed gas/ non gas:

With reactions of a gas with an absorbed gas molecule / non gas like absorbed molecule there also come to be solid or viscous liquid substances/ connections. Now the reaction heat can directly be given of to the absorption means with which the chance of radical reactions decreases.

Conclusion 5: Although around mono molecules in the gas form (+W2gf) and absorbed mono molecules there also cannot be erected a biochemical system of living matter.

sub b) Reactions between mono molecules dissolved in a liquid (+Db):

All real liquids come to be exclusively through cooling and the condensation of a gas connected to this. In all real liquids there can dissolve:

- a) all types of gasses with gas pressure (+W2gf) which are also uncharged as a gas (-Lk),
- b) all kinds of types of smaller loose molecules in the physical condition of: non gas like (-W2gf) and non charged (-Lk): the so called *nopression* molecules.

These *nopression* molecules are of such a large size that they have lost their gas form but can still dissolve in a liquid.

All thinkable liquids which come to be through condensation of a gas can dissolve beside each other;

- 1) gas like molecules and 2) nopression mono molecules and both to a certain maximum concentration.
- Dissolved in a liquid both can or cannot respond with each other.

Because of being dissolved and the lower temperatures dissolved mono molecules display an agility at lower speeds than it is the case with free gasses. The dissolved mono molecules do still have enough speed to be able to respond. The reaction heat being released at chemical/ biochemical reactions can directly be gotten rid of to the reaction medium resulting that during the reaction the temperature cannot increase too far. The reaction medium literally also functions as cooling means. The way lower temperature thoroughly reduces the chance for radical reactions.

-) Dissolving of loaded particles / ions only in water:

Although not in a single of the real liquids *loaded particles/ ions* can be dissolved with only one exception: *liquid water*. Water is the only liquid which dissociates spontaneous partly by itself in H_3O^+ and OH^- ions. Because of this charged particles/ ions can only dissolve in water and certain particles are always surrounded in a cloak of water molecules (hydration).

-) The 3 physical types of molecules only dissolve in water:

Liquid water is the only liquid which offers the maximum physical opportunities for the dissolving of the three possible physical types of mono molecules: 1) gasses, 2) ions, 3) nonpolar molecules. By this one can also dissolve all types of charged or not charged enzymes/ co enzymes in water which are needed in the biochemistry of living matter to let the hundreds of thousands of different reaction steps take place and be completed in exactly the right sequence.

Conclusion 6: only around mono molecules dissolved in a liquid biochemical systems of living matter are possible. This is explained in the Law IV a) of biochemistry.

Preceding the factual reaction the reaction medium water forces the molecules involved in the biochemical reaction to be dissolved and that after the reaction step all formed molecules need to be able to dissolve in water. In the case of dissolving (+W2Db) the liquid stays clear though it can get coloured in physical aspect. In the case of not really dissolving (-W2Db), like a sol or mycel, the liquid becomes turbid.

-) So the reaction medium has its own demands:

If this dissolving is not possible physically the reaction step might be possible chemically but it cannot be completed physically. With this the reaction medium water forces its own specific physical side conditions to chemical and biochemical reactions.

Each chemical reaction(step) in itself and with this the total biochemical reaction can only be completed if after every chemical reaction step all formed atoms/ mono molecules can be dissolved in the reaction medium again. The reaction medium/ dissolve medium fills in an essential, crucial though specially forcing role during all thinkable types of chemical/ biochemical reactions. With all biochemical reaction steps of Biochemical Pathways it turns out that all formed molecules, enzymes and other particles (electron/ proton) before as well as after the reaction steps can always be dissolved in water.

6.3.2 REQUIREMENT OF LOWEST ENERGY LEVEL FOR THE REACTION MEDIUM:

In the light of recycling of the atoms/ molecules there are not allowed to be any dissolved molecules with bonds with a physical or chemical energy content lower than that of the reaction medium itself. Cause certain molecules/bonds would be elusive physically and/or chemically through Biochemical Pathways and so be energetically elusive for control from the cell. Certain physical and / or chemical 'energetic' elusive atoms/ molecules would lead to pilling up in the cell and hinder the working of it and eventually block it.

Over the universe the O - H of liquid water has the lowest chemical energy content of all thinkable covalent bonds. Also in physical aspect liquid water has the lowest energy content compared to all other liquids.

Conclusion 7: In energetic aspect exclusively liquid water meets both criteria:

a) the chemically lowest energy content of both bonds,

b) the physically lowest energy content in relation to all other thinkable liquids.

These criteria are explained in the Law IV b) of biochemistry.

Conclusion 8: In energetic aspect liquid water is the only reaction medium over the universe suitable for the completion of the biochemistry of living matter.

See Law IV c) of biochemistry.

6.4 PHYSICAL ASPECTS OF BIOCHEMICAL PATHWAYS:

Inside Biochemical Pathways the molecules are not only undergoing chemical changes though they are also undergoing physical changes almost at the same time. Nowhere inside BP there are taking place two chemical steps directly after each other. This counts generally for all chemical reactions with exclusion of the radical reactions.

Because of this two consecutive chemical steps in the biochemistry are always separated from each other by minimally one though normally by two physical steps on the molecule. Those physical changes follow from the reaction itself and also these physical requirements are being enforced from the reaction medium. So from two sides there are being enforced physical demands to the completion of biochemical reactions.

6.4.1 PROBLEMS WITH ATOMS WHICH CANNOT FORM A GAS OR ION AS A MOLECULE:

During the completion of all biochemical chains/ cycles of biochemical breaking down reactions there standardly comes to be a) small loaded *ions* as well as b) at the end of all breaking down chains of organic molecules or small inorganic uncharged and *gas like* mono molecules are formed (amongst them CO_2 , CO , CH_4 , NH_3 , NO_x , H_2S , SO_2 , H_2O). (With the photosynthesis there happens the reversed and the part which can be dissolved and is none charged or gas like glucose molecule is formed from the gasses CO_2 and H_2O).

This being released of certain charged molecules (ions) and gas like inorganic molecules happens during the going through of the chains/ cycles as well as at the end of each breaking down chain.

After each chemical reaction step the molecule is decoupled again from the enzyme and all formed reaction products need to be placed back and need to be able to dissolve in the reaction medium (water). If the formed reaction products cannot be dissolved in the reaction medium water the reaction step concerning cannot be completed in physical aspect and because of this the completion of the total reaction is blocked.

6.4.2 PHYSICAL MAIN TYPES WITH THE DISSOLVED MOLECULES (+Db):

6.4.2.1 PHYSICAL CONDITION OF DISSOLVED SUBSTANCES (+Db):

With atoms/ molecules dissolved in a liquid the following physical forces are relevant:

Scheme 6 – 2: PHYSICAL FORCES AND BONDS OF DISSOLVED MOLECULES:

- 1) the van der Waals / London force (+W2f) / van der Waals / London bond (+W2b),
- 2) the gas force (+W2gf); in that case there is no matter of a gas bond (-W2gb),
- 3) the charge force (+Lk) / the charge bond (+L1b),
- 4) the absorption force (+W2Af) / the absorption bond (+W2Ab).

Explanation scheme 6 - 2:

sub 1) Only atoms/ molecules with minimally one electron pair show the van der Waals force (+W2f) with which van der Waals bonds (+W2b) can be formed with. In the dissolved condition (+W2Db) certain atoms/ molecules cannot form a van der Waals bond (-W2b) at the same time. For dissolved molecules van der Waals force is no physical variable.

Conclusion 9: All dissolved molecules are standardly in a physical condition of a van der Waals / London bond (+W2Db).

sub 2) A dissolved atom/ molecule comes to be in the form of a dissolved gas (+W2gf) or a non-dissolved gas (-W2gf). The gas force is related to temperature and the gas bond does not exist like that (-W2gb). If a gas is connected to a solid substance or to liquids this always happens through an absorption bond (+W2Ab) or through a dissolve bond (+W2Db) though never through a gas bond (-W2gb). For dissolved molecules the gas force is a physical variable.

Conclusion 10: All dissolved molecules arise be it as a dissolved gas (+W2gf) or as a molecule without the phenomenon of a dissolved gas (-W2gf).

sub 3) A dissolved atom/ molecule comes to be in the condition of be it a positively charged ion (+Lk+) or negatively charged ion (+Lk-) or is in a condition of not being charged (-Lk). If two charged dissolved particles get into a total charge bond (+L1b) with this they form a dissolved and not dissociated molecule which is as a total uncharged (-Lk). For dissolved atoms/ molecules the charge-(force) is a physical variable.

Conclusion 11: *So a dissolved atom/ molecule is be it charged (+Lk +/-) and/or an ion or uncharged (-Lk).*

sub 4) Absorption always takes place through an absorption bond and is always related to a solid substance. With the being dissolved of the atom/ molecule in a liquid there is a matter of an absorption bond (-Ab). For dissolved molecules absorption is no physical variable.

Conclusion 12: *All dissolved molecules are standardly displaying their absorption force (+W2Af) and cannot at the same time own an absorption bond (-W2Ab) or get into one.*

So out of scheme 6 – 2 there follows that for all dissolved atoms/ molecules and (+W2Db) the number of physical variables/ freedom degrees is in fact limited to merely two:

- 1) the gas force present in (+W2gf) or absent present in (-W2gf) and
- 2) the charge force present in (+Lk) or absent as (-Lk)!

Scheme 6 - 3: PHYSICAL CONDITIONS DISSOLVED (+W2Db) ATOMS AND MONO – MOLECULES:

This results in scheme 6 – 3 in the following physical bonds of dissolved molecules.

	Dissolved	Not absorbed	gas / no gas		charged / not charged
a)	(+W2Db)	(+W2Af)/ (-W2Ab)	(+W2gf) = gas	and	(-Lk) = not charged
b)	(+W2Db)	(+W2Af)/ (-W2Ab)	(-W2gf) = no gas	and	(+Lk) = charged
c)	(+W2Db)	(+W2Af)/ (-W2Ab)	(-W2gf) = no gas	and	(-Lk) = not charged.
d)	(+W2Db)	(+W2Ak)/ (-W2Ab)	(+W2gf) = gas	and	(+Lk) = charged

Explanation Scheme 7 - 3:

1) On an atom/ mono molecule the combination of physical characteristics of: 1) dissolved (+W2Db), 2) the gas force (+W2gf) and 3) the being charged (+Lk+) cannot occur simultaneously on one atom / molecule. On a dissolved molecule the bond under d) of a gas form (+W2gf) and charged (+Lk) cannot be realized at the same time! So possibility d) has to be removed. Remain only 3 physically possibilities for all molecules!

2) Eventually there are only 3 bonds of free degrees left and so only 3 different types of being dissolved (+Db) of atoms/ mono molecules in a liquid!:

=a) gas like (+W2gf), not charged (-Lk):

All dissolved gasses are by definition dissolved *flexible* (+W2Db–f), because such molecules can detach from the liquid as a free gas.

=b) non gas like (-W2gf), charged (+Lk + or -):

The ions, including the temporary releasing electron (e-) and the proton (H+), which cannot evade the liquid as a gas like the charged particles. So all ions are dissolved *fixated* (+W2Db +f),

=c) non gas like (-W2gf), not charged (-Lk):

These so called *nopression atoms/ molecules* like un-dissociated amino acids, fatty acids and the mono saccharides etc. also cannot evade as a gas and so they are also dissolved *fixated*: (+W2Db +f).

3) These stringent physical characteristics of the reaction medium water puts up tight requirements to all chemical or biochemical reactions. All present and all formed particles/ atoms/ mono molecules which are released always need to have one of these three physical bonds of forces mentioned under a), b) or c) else these molecules cannot be dissolved in the reaction medium water. Then the completion of the reaction is totally blocked!

4) The reaction medium demands from all types of chemical and biochemical reactions that in each reaction step they result in physically correct = reaction products which can be dissolved of which only 3 physical possibilities, the bonds a), b) and c) are possible.

Conclusion 13: *The reaction medium water puts up these physical requirements unrelentingly with only 3 bonds to the responding atoms/ molecules itself as well as to all formed and/or reaction products still to be formed. This is expressed in the Law IVa) of biochemistry.*

6.4.2.2 DISSOLVING OF CHARGED PARTICLES IS ONLY POSSIBLE IN LIQUID WATER; DISSOCIATION OF WATER:

Charged particles/ ions can only dissolve sufficiently in liquid water: Liquid water contains tiny dissolved gas like mono H₂O molecules which are moving fast and beside this large polymer water molecules which are standing almost totally still looking at it on the molecular side consisting out of loose H₂O molecules which are mutually connected to each other through hydrogen bridges (+L1b).

The dissolved mono H₂O gas molecules which are moving relatively fast collide with the end of the polymer water molecules emit an H atom through a 'proton' reaction under the forming of an H₃O⁺ ion. After this the negatively charged polymer water molecule brings itself back in balance again chemically through the repelling of an OH⁻ ion followed by the attaching of another gas like dissolved H₂O molecule resulting that the polymer length/ structure eventually stays exactly the same.

Eventually the whole process results overall in a temperature independent balance situation with in pure water a constant concentration of H₃O⁺ and OH⁻ ions of 10⁻⁷.

Exclusively the liquid water dissociates enough of itself in H₃O⁺ and OH⁻. In purely liquid H₂S there is in foundation the same possible but because of the bigger H₂S mono molecule this results in (almost) non measurable concentrations of H₃S⁺ and SH⁻

With the forming of charged H₃O⁺ and OH⁻ ions in liquid water this liquid water is the only liquid that creates its own charged condition and 'charge space'. As derivative and consequence of this the liquid water also accepts other charged particles though just like H₃O⁺ and OH⁻ up to a certain maximal concentration. Certain dissolved charged particles are always surrounded by a shell of water molecules (= hydration) as a mono atom/ molecule. With the dissolving of charged particles (amongst them salts, lower fatty acids, amino acids) the liquid stays clear. In that case there is a matter of real physical dissolving (+Db). The unique dissociation of water in H₃O⁺ and OH⁻ leads to it that *exclusively* in the reaction medium liquid water all three physical conditions displayed in **scheme 6 - 1** arise next to each other.

Conclusion 14: Exclusively in water atoms/ molecules can come to be next to each other in dissolved form or dissolve and get into biochemical reactions. This is explained in the **Law IVa of biochemistry**.

All chemical and biochemical reaction steps, at which a charged step in between comes to be, can only be completed near liquid water as reaction medium. This counts for a lot of inorganic and organic reaction steps and for all biochemical reaction steps.

With all biochemical reaction steps minimally one of both molecules gets charged and the charged phase(s) in between are only possible in liquid water as reaction medium. All biochemical reaction steps of living matter on earth and the universe can exclusively be completed in the presence of liquid water. Only in liquid water as reaction medium those several charged reaction steps can come to be next to each other and after each other. Only liquid water is physically suitable as reaction medium for the completion of the biochemical reactions.

Conclusion 15: Liquid water is the only suitable reaction medium for biochemical reactions. This does not only count on earth but all over the universe and for all thinkable forms of living matter. This is explained in the **Law IVc of biochemistry**.

The bio chips of BP and of BP and such can looking at it reaction technically only function in the presence of liquid water as reaction medium.

Scheme 6 - 4: THE 3 PHYSICAL CONDITIONS OF BEING DISSOLVED OF MONO-MOLECULEN:

This results in scheme 6 – 4 in the following *three* physical bonds of dissolved molecules.

	Dissolved	Not absorbed	gas / no gas		charged / not charged
a)	(+W2Db-fi)	(+W2Af)/ (-W2Ab)	(+W2gf) = gas	and	(-Lk) = not charged
b)	(+W2Db+fi)	(+W2Af)/ (-W2Ab)	(-W2gf) = no gas	and	(+Lk) = charged
c)	(+W2Db+fi)	(+W2Af)/ (-W2Ab)	(-W2gf) = no gas	and	(-Lk) = not charged

Explanation Scheme 6 – 4:

1) In dissolved condition the 3 required bonds of physical characteristics exclusively come to be in liquid water. Because of this liquid water is the only suitable reaction medium for the completion of biochemical reactions.

2) Looking at it chemically there are many ten to a hundred million different configurations possible based on the elements C, H, O, N and S while for the physical steps in between these chemical steps there are only 3 physical conditions of dissolved conditions possible!

3) This number of 3 bonds is exactly enough for the strict completion of all biochemical reactions inside Biochemical Pathways past which the molecule is physically fit in strictly and is lead from one chemical reaction step to the next chemical reaction step through a 'physical wiring' without the molecule being able to get of track physically during the time in between.

4) The chemical driving force in bond/ cooperation with this physical guiding/ wiring make the BP chip to one controllable whole which can be compared with a biochemical chip construction. This also goes for BP and such.

5) With one arbitrarily physical or chemical force extra and in the case of 4 in stead of 3 physical bonds this strict physical guidance cannot be realized anymore inside Biochemical Pathways. This is explained in Law VI d) of biochemistry.

6) In both cases the molecules of Biochemical Pathways would either keep getting 'of track' physically or be 'blocked' during the physical completion which takes place between two chemical reaction steps. All kinds of biochemical reaction steps can be completed in itself though Biochemical Pathways not as complex scheme and integral processor of biochemical reactions of living matter. BP cannot function as the 'biochemical processor' of living matter anymore.

7) With all other liquids like pure H_2S and NH_3 there are only two bonds possible: (+W2gf) and (-Lk) as well as (-W2gf) and (-Lk) available. This brings in too little bonds for the physical completion of biochemical reactions and for the completion of biochemical schemes BP.

8) With the dissolving of uncharged non-gas like noprision molecules (-Lk) and (-W2gf) it concerns a large group of all kinds of non-dissociated mono molecules: all mono sugars, mono fatty acids, mono amino acids, enzymes etc. These non-charged and non-gas like (noprision) molecules are in foundation able to dissolve in all Newtonian liquids/ condensed gasses.

9) Break down/ oxidation of molecules leads to a heaping up of all kinds of little inorganic reaction products in the reaction medium which arise during and at the end of the breaking down chain. This leads to a heaping up in the reaction medium water, unless these inorganic molecules can leave the reaction medium again. In foundation this is only possible with molecules which come to be in the condition of a dissolved gas which are bound flexible to the liquid as the only of the molecules and can evade as a free gas when crossing the vapor pressure.

Conclusion 16: This forming of gas like end products also puts up a strict requirement to biochemical reactions and to the elements out of which the molecules have been composed.

10) Biochemical breaking down reactions (of sugars, fatty acids and amino acids) can only be completed if the break down products which are released in the process manifest itself and are released in the form of:

- a) small uncharged inorganic molecules (C, H, O, N, S) and which are also
- b) released in the form of a gas (which can be dissolved in the reaction medium)!

All small (inorganic) molecules being released with biochemical reactions like H_2O , CH_4 , CO , CO_2 , N_2 , NO_x , SO_2 , NH_3 , H_2S etc indeed turn out to be released like 1) uncharged inorganic molecule (-Lk) and 2) also as a dissolved gas (+W2Db).

11) With Si (for example SiO_2), the metal oxides and with P (for example PO_x) there cannot be formed any gasses. Around SiO_2 , metals/ amphoteric metals but also around P there cannot be erected any basal biochemistry for living matter.

Conclusion 17: What counts in a forced way for Biochemical Pathways also counts for all mono molecules to be formed with randomly any other biochemical system of living matter somewhere else in the universe.

6.4.2.3 WHICH MONO MOLECULES CAN DISSOLVE CONFORM THOSE THREE PHYSICAL TYPES (1) a gas, 2) non charged and 3) non gaslike and non charged):

=) metals and amphoteric metals:

Molecules with metals/ amphoteric metals in a covalent bond are in the biochemical area to about a condition of 150 °C impossible to get into a condition of a gas or of a dissolved gas (-W2gf). The most important reason why no biochemistry of living matter is possible or can exist based on metals/ amphoteric metals. Metals do come to be as ion (only in water) and as uncharged and non-gas like nonpression atom/ molecule. Some atomair metals (for example Hg) can form gasses, though they are extremely hard to dissolve in water as mono molecule or almost impossible to dissolve and for this reason cannot be applied and very toxic also because of this.

=) silicon:

With Si there cannot be formed a gas as an atom as well as with a molecule (-W2gf) except SiF₆. In contrary to CO₂ the SiO₂ does not manifest as a gas. This inability forms the most important physical blockage for biochemical life forms based on Si. Si can only be dissolved as ion and not as a gas like non charged substance (nonpression molecule). Diatoms and other organisms are only using SiO₂ for the construction of the pebble skeleton. Here and there Si is used as catalyst.

=) halogens:

The halogens can bring in all three physical conditions in bond with metalloids. Looking at it physically halogens fit quite well into living matter. As opposed to this halogen form merely one covalent charge bond with metalloids and contrary to the metalloids C, O, N, S and P cannot form two or more chemical covalent charge bonds.

Chemical bonds between metalloids and halogens primarily respond as a chemical covalent radical bond (+R1cb) and these bonds can biochemically hardly be turned around and/or broken with the help of enzymes. Because of this halogen are totally useless in the biochemistry of living matter.

=) noble gasses

The noble gasses can hardly get into chemical reactions. These only arise as an atom and as uncharged gas.

=) phosphor:

With phosphor, there also cannot be formed any gasses which can be dissolved as well. The reason why P isn't a part of the central biochemistry. The element P is because of this biochemically loose from the other 'life elements' C, H, O, N and S.

Because of this exclusively P of the metalloids can fulfill this essential role of energy container and carrier of energy which is not possible with Si, the halogens and metals.

The presence of P prevents the forming of gasses and this protects the ADP/ ATP as well as the DNA/ RNA against breaking down inside the cell.

=) metalloids C, H, O, N, S:

The metalloids C, H, O, N, S can come to be as a molecule in all kinds of mutual bonds and molecules. The elements C, N, O, S can mutually form respectively 4, 3, 2 bonds or 1 bond and because of this get into all possible reactions through the breaking/ forming of covalent charge bonds (+L2cb).

Molecules out of C, H, O, N and S can take on one of the three physical forms every time:

- gas like (+W2gf) and non-charged (-Lk),
- non-gas like (-W2gf) and charged (+Lk),
- non-gas like (-W2gf) and non-charged (-Lk).

Conclusion 18: For purely physical characteristics the biochemistry of all forms of living matter in the universe needs to primarily be constructed around mono molecules constructed out of the elements C, H, O, N and S with P for the energy recording (ADP/ ATP) and the stability of DNA / RNA.

6.4.3 THE REACTION MEDIUM CAN ONLY BE KEPT TOGETHER THROUGH A CELL:

For all living matter the completion of the biochemistry can only take place in liquid water. To keep this water together, to prevent unwanted evaporation and pollution of the reaction medium all living cells are standardly surrounded by a semi-permeable cell wall. Through that cell wall nutrients and other necessary substances are allowed in and the waste products are being emitted to the environment again.

Conclusion 19: The cell wall and the cell form is so essential for living matter that it is recorded in the Law Ia of biochemistry.

6.5 TURNING AROUND OF COVALENT CHARGE BOND ENERGY IN HEAT = DRIVING FORCE BEHIND ALMOST ANY CHEMICAL REACTION STEP:

All forms of life are organized around mono cells (bacteria, yeast, algae) or complexes of certain mono cells (all higher plantlike and beastly organisms). With each random cell in living matter a driving force can be acknowledged which preserves the progress in the biochemistry in that cell and/or the 'life' in the cell. This driving force has to be generated in each cell in itself and for this there is needed an energy source. The generating of a driving force cannot take place through physical processes or from chemical balance reactions which are in foundation totally irreversible then there cannot be realized a driving force.

The needed driving force can only be realized if there is a matter of a one-sided decreasing process which is fundamentally irreversible *energetically* as well as in *time*. This counts for all chemical reactions at which bond heat is irreversibly turned around into bond heat.

For the biochemistry of living matter is the only energy source / driving force for irreversibly turning around the bond energy of the covalent charge bonds (+L2cb) into heat. For almost all biochemical reactions the level of bond energy is a little lower after every chemical reaction-step than before the reaction step concerning. The difference in bond energy before and after the reaction is released in the form of heat and in some cases in the form of radiation (light).

Conclusion 20: This decline in energy on chemical covalent charge bonds (+L2cb) with turning around into heat forms the fundamental driving force of living matter.

This is expressed in the Law II a) of biochemistry.

Over the total universe this is valid for all forms of life and even for all cells which have an own photosynthesis of itself and for all autotroph organisms.

Conclusion 21: The biochemistry of a living cell cannot directly receive its energy in one step from: light, heat, potential and kinetic energy, chemical radicals, to physical and chemical charge bonds or through oxidation of a metal:

For this see the Law II c) of biochemistry.

Because of the necessary turning around of bond energy into heat the cell always needs to receive new energy or form/ fill this in itself through photosynthesis. The released heat needs to be taken away fast enough to prevent overheating of the cell. The reaction medium water plays an essential role as cooling-water.

The completion of a molecule of the BP chip through a series of 1 - 2 and 2 - 1 physical and chemical reactions only takes place when there is a matter of chemical irreversible reaction steps which are either functioning as driving force. The chemical steps are driving the molecule forward through the physical 'wiring' by the BP chip from one chemical reaction step to the next chemical reaction step and the molecule is lead through the in fact preconditioned chip construction BP.

With the generating of the driving force in living matter and for the completion of molecules in the chains and the three basic cycles of living matter is always the case of be it:

-) Steps with the turning around of covalent charge bond energy into heat and counts for all non-autotroph organisms,
-) The turning around of an uncharged metal into a covalent metal oxide bond + heat (autotroph organisms). The metal goes over from the uncharged form to a metal - O bond; a covalent charge bond. The autotroph organisms can make use of this oxidation to covalent bond for their energy supply because heat is released during the forming.
-) The further oxidation of a metal ion at which an electron (e-) is released as oxidator through a half radical.
-) The bond of a proton H⁺ to an electron-pair of the OH⁻ group under forming of a gas like H₂O.

The driving force behind life activities in all cases consist out of the turning around of covalent charge bond energy into heat, the forming of covalent bonds with a lower energy content, and oxidation of organic material through the making free from an electron and so oxidation of metals. All these forms are found in several forms of life on earth. Over the universe there are no varieties thinkable to this.

All plantlike organisms, which have chlorophyll available shall first turn around CO₂ and H₂O into glucose through covalent charge bonds. No single living organism can directly make use of the physical energy of the sunlight. This always happens indirectly and minimally through the forming of glucoses.

6.5.1 THE IRREVERSIBILITY OF TIME:

In the universe time is primarily coupled to the irreversible completion of the universe cycle. The universe clock time completes one-sided with a constant speed.

For all biochemical reactions in living matter the turning around of chemical bond energy into heat is also irreversible in time.

Conclusion 22: The irreversibility of each (bio)-chemical reaction step in itself means that each form of living matter as a whole is by definition being spurred on in time and that looking at it physically living matter cannot go back in the universe clock time nor go ahead in this time.

See Law II b) of biochemistry.

The above-mentioned side conditions count for any other biochemical system that is based on living matter somewhere else in the universe.

Conclusion 23: Here the author establishes a fundamental conflict with the Theory of Relativity of Einstein.

This theory does allow the going back of living matter in time on theoretical grounds; see the side document related to $E = mc^2$ and the adjusting of the Theory of Relativity.

6.6 CHEMICAL ASPECTS OF BIOCHEMICAL PATHWAYS (BP):

Inside biochemical reactions the chemical reaction steps can only be completed if the after every chemical reaction step formed mono molecules can be dissolved in the reaction medium water. Conform scheme 6 – 4 exclusively mono molecules are allowed with the physical characteristics of:

- 1) gas like (+W2gf) and uncharged (-Lk)
- 2) non gas like (-W2gf) and charged (+Lk +) or (+Lk -) and
- 3) non-gas like (-W2gf) and non-charged (-Lk).

Other physical bonds / positions aren't possible!

6.6.1 Si FAILS TO FORM A GAS: NO Si IN BP:

The element C is together with Si the only element of the periodical system which can form 4 covalent charge bonds in *uncharged* condition. Both atoms C and Si can get into all kinds of chemical bonds with H, O, N, S and P. Looking at it purely chemically forms of biochemical life could be possible with Si though for physical reasons this is not the case.

The essential difference between C and Si:

-) All simple inorganic mono molecules (with H, O, S, N) to be realized around C are gas like and so can very well be dissolved in amongst them water.

-) As opposed to this all inorganic mono molecule (with H, O, S, N) to be formed around Si aren't gas like. Si molecules can dissolve as nonpression molecule or as ion though not as a gas! An exclusion to this forms silica fluoride which directly hydrolyses dissolved in water.

The physical inability of Si to form gasses which can't dissolve in water with H, O, S and N forms a fundamental physical limitation for the fitting in of Si in the biochemistry of living matter. This limitation counts over the total universe.

Organic molecules which contain Si can be made chemical though are hard to break down biochemically.

A number, especially tropical, plants and trees have succeeded in giving Si a place in the wood fibers. Some algae's use Si in the armor layer surrounding them and use Si as construction material.

Further Si is used in living matter as so-called spur element and catalyst in some biochemical reactions. Overall Si only fulfills a role at the side line and Si does not play a single central role in the biochemistry of living matter like the C atom.

6.6.2 REAL AND AMPHOTERE METALS CAN NEITHER FORM A GAS:

Incidentally here and there an amphoteric metal comes to be in BP though always in the form of a physical charge combination or possibly in a COO⁻ metal bond (through a charge bond) but never in a real covalent charge bond (-L2cb) or through a radical bond (-R1cb).

In organic bonds of C, H, O, N and S with metals/ amphoteric metals there also cannot be formed gas like metal bonds and no gas which can dissolve. This results in a bad opportunity to breaking down of organic metal bonds. As opposed to this there can be formed ions which can dissolve in water with metals though not from an organic bond.

A number of metals manifest itself at a higher temperature as damp/ gas amongst them atomic Hg and Cd. Through biochemical reactions there cannot be formed any gas like and atomic Hg / Cd atoms. Inorganic molecules with Hg / Cd, especially the sulfides, are not to transform into gas like molecules and turn out to be extremely hard to dissolve in water as ion. These double physical characteristics make Hg and Cd extremely toxic to living cells.

Metals/ amphoteric metals cannot be a part of the basic biochemistry of living matter because of their limited physical characteristics. All covalent metal bonds are more or less toxic.

Metals/ amphoteric also cannot perform as biochemical equivalent of P in equivalent bonds which can be compared to ADP/ ATP .

6.6.3 HALOGENS NEITHER USABLE INSIDE BP:

Halogens cannot be used inside BP because the halogen bonds manifest itself as one chemical bond which in reality means a *pure covalent radical bond* (+R1cb) and which can hardly function as a chemical covalent charge bond (-L2cb). This makes organic molecules with a halogen bond unusable and toxic in the biochemistry of living matter.

6.6.4 CARBON AS THE ONLY BASIC BIOCHEMISTRY OF LIVING MATTER: C CENTRAL IN BP:

All small organic and inorganic mono molecules between C, H, O, N, S manifest itself in bond with H as well dissolving: 1) *gasses*, 2) *ions* and 3) *nopression* molecules. These molecules always meet the physical requirements of being able to dissolve in water under almost every circumstance.

Only C has 4 electron pairs available in uncharged condition for the getting into chemical covalent charge bonds (+L2cb) with other atoms and especially with the other metalloid elements O, N, S and H.

Of all elements in the Periodical System there can only be formed a number of complex molecules with covalent charge bonds centrally around C and around chains of C. Certain molecules can in foundation totally be broken down biochemically to small inorganic gas like mono molecules: CO₂, CH₄, CO, CS₂, NO, NO₂, NO₃, NH₃, SO₂, H₂S etc. because of the covalent molecules.

6.6.5 BP ONLY POSSIBLE AROUND MOLECULES CONSTRUCTED OUT OF THE 'LIFE' ELEMENTS: C, H, O, N, S WITH P FOR THE ENERGY CONTAINMENT:

Based on the exclusion of: a) the noble gasses, b) the metals, c) the amphoteric metals, d) the elements Si and P and e) the halogens, of all elements/isotopes of the Periodical System, only the metalloid 'life' elements C, H, N, O, S can be used as building bricks for the central biochemistry of living matter.

Around the basic atom C filled up with H, N, O and S there can be constructed a huge number of small and bigger mono molecules. With a number of those monomers there can be constructed big and complex polymers. The bonds inside certain polymer molecules are always based on covalent charge bonds (+L2cb). Those polymers can be split up again into their monomers through hydrolysis.

All small mono molecules of C, H, O, N and S formed through hydrolysis are first released as *nopression* molecules which can be dissolved well in water and when broken down further (oxidation/reduction) result in inorganic gasses which can dissolve well. During (almost) all chemical reaction steps covalent charge bond energy is turned around into heat with which the driving force behind each reaction step is generated.

In foundation with the element P there cannot be formed any dissolved gasses. Because of this P cannot fulfill a central role inside BP. Inside BP the molecules are because of this only constructed out of the metalloids C, O, N

and S that are left in bond with the proton (H atom/ H⁺) with here and there a dissolved amphoteric metal ion inside a ring like molecule.

P fills in an essential role in the energy containment for ADP/ ATP.

Only based on these 6 'life' elements (C, H, O, N, S and P) and the covalent charge bonds amongst each other there can take place a total control in biochemical reactions in living matter conform BP. Although this also counts uncurtail for all thinkable forms of living matter somewhere else in the universe.

Conclusion 24: In all forms of life on earth (but also somewhere else in the universe) the biochemistry is based forced on a carbon chemistry around the elements C, H, O, N, S (with P for the energy containment through the ATP) and heritable characteristics through the DNA/ RNA).

This is explained in the Law III c) of biochemistry.

6.6.6 THE FUNCTION AND POSITION OF P:

There cannot be formed any gasses with P. Because of this P cannot play an essential role in the biochemistry of living matter. Separated from C, H, O, N and S it is P that does play an essential role in the photosynthesis and the protection of DNA against spontaneous hydrolyses.

The function of P does exist almost exclusively out of the energy containment in energy abundant bonds ADP --> ATP through the forming of poly phosphates and the transfer of energy (ATP → ADP) on CO₂ and H₂O with the forming of glucose during the photosynthesis. On Earth, there has up until now not been found another system of energy transfer/containment through the other metalloids C, H, O, N and S or through the other elements of the *periodic table*.

P functions almost totally separate from the other 'life' atoms C, H, O, N and S. That side role of P flows from the fact that the metalloid P cannot manifest as dissolved gas. In de form of bone tissue the hard to dissolve Ca phosphate fills in the function of construction material of living matter in the form of bones and tooth.

6.6.6.1 THE PHOTOSYNTHESIS AND THE CHLOROFYL:

A planet with living matter and enough free oxygen in term results in an environment with exclusively inorganic breaking down products CO₂, NO₂, SO₂, H₂O and metal oxides/ salts. If there is no free O₂ present the breaking down process ends anaerobic with CH₄, H₂, CO, CO₂, H₂S, NH₃ and H₂O etc.

No matter what the planet will at a certain moment end up in its lowest energy condition for all elements C, H, O, N, S. Then there is not a single form of living matter possible anymore.

Of all molecules H₂O and CO₂ have the lowest energy content of all covalent charge bonds between C, H, O, N, S and P. To keep living matter preserved the bonds with the lowest energy content, the C - O and H - O bond need to be generated somewhere inside the system to a C - H bond rich in energy no matter what. At least as important is the simultaneous upgrading of combined oxygen to free gas like oxygen O₂.

This happens through the process of the photosynthesis with chlorophyll with centrally in the chlorophyll molecule present in water the dissolved amphoteric 1 / 2 or 2 / 3 worthy metal ion which can function as electron donor. On Earth, the different forms of the chlorophyll molecule in the leaf green are capable of combining the energy from several frequencies areas of the visible light and with this releasing an electron from the metal ion (= half radical reaction) without directly turning this electron into heat again.

That energy of light consisting out of the photons is transferred to the ADP through the electron under the forming of an ATP molecule. With this the physical energy has been turned around into chemical combined energy of the ATP.

With the energy which is released with the transfer of ATP → ADP exclusively the mono glucose molecule can be formed from CO₂ and H₂O; a *nopression* mono sugar which can be well dissolved. On Earth aerobe and anaerobe photosynthesis is the only known biochemical system of upgrading of CO₂ and H₂O to a C-H bond and free O₂. On Earth, there has not been found another form of photo synthesis.

Conclusion 25: It is almost unthinkable that looking at it biochemically living matter still has other forms of containment of light energy/ energy extraction at its disposal than has up until now been found on earth in the form of photosynthesis.

If this would be the case there is formed another mono sugar out of H₂O and CO₂: for example, fructose or something similar.

The only suitable form of physical energy is light in the form of photons, a low energetic and relatively innocent form of radiation which is universally present in the universe. Usable light is radiated by almost all of the stars in the universe in the form of visible light. For all planets, this energy comes from outside in the form of light. Bond of light through the photosynthesis in chemical bonds means an increase of bond energy which generates the driving force of living matter by converting into heat.

Conclusion 26: In case alternative systems of photosynthesis are possible based on the periodical table than based on chlorophyll these shall certainly also be found somewhere on earth.

Up until now this isn't the case. The essential role of chlorophyll in the photosynthesis has been explained in the **Law Va) of biochemistry.**

6.6.6.2 THE ADP/ ATP:

Further it has to be possible to form minimally one molecule which can be dissolved out of the elements C, H, N, O, S and P which can take over that 'light' energy in the form of a free electron and turn it around into chemical bond energy and can then transfer this energy onto H₂O and CO₂ molecules to turn this around into a H - C - O - H bond of glucose with this. The only molecule on earth known that is capable of this is the ATP molecule (adenosine tri phosphate).

The chlorophyll and the ADP/ ATP together form the photosynthesis for the generating of CO₂ and H₂O molecules into glucose. On earth, there are no other bonds of molecules known which can do the same. This makes the molecule ADP/ ATP alone as well as in bond with the chlorophyll unique in its kind. Chlorophyll as well as ATP/ ADP consist totally out of C, H, O, N, S and P and can both be dissolved in water. If a second system is possible this has to be present somewhere on earth.

Conclusion 27: It may be assumed that over the universe all forms of life also function through the photosynthesis known on Earth as bond of chlorophyll with ADP/ ATP.

The uniqueness of the bond chlorophyll and ATP/ADP is explained in the **Law V b) of biochemistry.**

In time, there can be displayed/ proven that the bond chlorophyll + ADP/ ATP is unique and that over the universe it is the only possibility of photosynthesis.

6.6.6.3 THE CHEMICAL CONTROL AND INFORMATION TRANSFER THROUGH DNA/ RNA:

On Earth, the total information and blueprint of plantlike or animal organisms can be found in the construction as well as in the biochemical functioning of the cell which is determined through the relatively simple and ingenious construction of the DNA/ RNA and the categorization of this in the form of chromosomes.

Through the breaking of the hydrogen bridges the double helix structure of the DNA can be split up and recombined. Because of that this information can be passed on through non-sexual reproduction as well as sexual reproduction to a following generation. DNA consists totally out of merely 5 atoms: C, H, O, N and P: adenine (A), thiamine (T), guanine (G) and cytosine (C) which are always bound in the bond A - T and C - G in the DNA. In the case there is a matter of the sugar ribose or when there is a case of RNA in the deoxyribose there is a matter of DNA.

Conclusion 28: It is unimaginable that based on C, H, O, N and P there is another alternative system possible with a working which can be compared to that of the DNA/ RNA.

According to the author there are plantlike and animal life forms in the universe which are based on RNA/ DNA in the functioning of the living cell as for the information transfer to following generations. See **Law Vc) of biochemistry.**

6.7 THE ROLE OF THE ENZYMES IN BP:

With organic molecules, the C-H bonds have about the same energy content and so these should more or less at the same time and in varying consequence get into a reaction. This would result in an amount of unusable reaction products which can be compared to that of the radical reactions.

To let break down and construction reactions complete categorized and prevent chaos in the cell it makes use of cell enzymes. With the help of these, by chemical reaction step which are mostly specific, enzymes there can for all molecules noted in BP and BP and such only be pointed out one bond on the molecule where a following reaction can take place (for example oxidation/ reduction/ hydrolysis, there temporarily blocking out an electron/ proton etc.) and chemical reactions are blocked on all other bonds of the molecule.

Through the reaction step specific enzymes/ co-enzymes all reaction steps are being completed totally predictable, in their right order and as a well ordered and fluently completing whole. At some places inside BP there is always a matter of the same chemical reaction step. The enzyme belonging to this can then be used in several positions (NAD).

For letting all those thousands of different covalent reaction steps of BP and BP and such be completed there a currently known two to three thousand of enzymes and co-enzymes. In all cases it concerns organic mono molecules which can dissolve and do not occur in the gas form though only as ion which can dissolve (+Lk) or as *nopression* molecule which can dissolve (-W2gf) and (-Lk).

6.7.1 FUNCTION OF ENZYMES/ CO ENZYMES:

Enzymes are mono molecules with a not very complicated molecular structure in foundation constructed out of the elements C, H, O, N, S (and P) with the common characteristic that they can be dissolved (well) in water but this in the interface fatty acid/ water.

-) Preceding to all chemical reaction steps the molecule becomes charged through internal shifting of electrons inside the molecule. Then the dissolved mono molecule gets into a physical absorption bond (+W2Ab +f) with the for this reaction step specific, also dissolved enzyme. As a consequence of this physical absorption bond there just as well comes to be such a big molecule that both molecules together cannot be dissolved together in water and in a physical condition of being undissolved (-W2Db). With this the enzyme also transforms the mono molecule into a relatively unmovable form. This getting into an undissolved state forms an essential step for all chemical reaction steps in the biochemistry.

-) The enzyme further clasps the molecule temporarily in such a special way that large parts of the molecule are protected charge technical resulting that only that chemical reaction step which fits inside the string can take place and all other reaction opportunities on the molecule concerning are protected and are being closed out for as long as that reaction step takes. All other covalent bonds on the mono molecule can be considered 'fixated' and non-responsive for as long as the reaction step concerned takes.

-) After the chemical reaction step the molecule which is changed chemically on one position and the enzyme are decoupled again (-W2Ab) to two loose molecules. Although the absorption bond with the enzyme can only be broken if both molecules can dissolve again in water!

-) Then the molecule attaches to the following specific enzyme which fits in the string after which the following chemical reaction step follows. To be able to let the covalent charge bonds respond structurally to several mono molecules there is in foundation needed a specific enzyme for each reaction step in the form of mono molecules which can dissolve. The matrixes of the enzymes are partly set in the DNA/ RNA.

-) Through the chemical reaction there in a couple of cases also take place changes on the enzyme. To be able to get this enzyme in its original form there is made use of co-enzymes.

-) By the structured succesion of the enzymes and the spatial form of the enzyme the molecule recieves or keeps the right spatial structure during and after each reaction step.

-) The total of enzymes takes care that at the breaking down or construction processes all reaction steps inside Biochemical Pathways and BP and such take place in exactly the right consequence and sequence after each other. This can be understood well in the citric acid cycle and the fatty acid cycle.

-) In all chemical reaction steps bond energy is irreversibly turned around into heat This forms the driving force to complete the 2 physical steps and to bridge them. This forms the driving force behind the breaking down reactions in the biochemistry of living matter. The construction of inorganic molecules takes place through the usage of ATP.

-) All chemical reaction steps of BP are in foundation separated from each other by 2 repeating physical changes on the responding molecules and are inextricably paired with physical changes on the molecules. There never take place two chemical reaction steps directly after each other. This only happens with radical reactions.

Conclusion 29: All chemical reaction steps without physical changes can be defined as radical reactions and they cannot be used in the biochemistry of living matter.

Conclusion 30: Biochemical reactions in living matter exclusively rest on covalent charge bonds (+L2cb, half radical and proton reactions together with physical changes.

This is based on the **Law III a) of biochemistry.**

6.8 THE BASIC STRUCTURE OF THE TRANSFERS INSIDE THE BIO CHIP BP: THE PHYSICALLY AND CHEMICALLY MINIMALLY 1 FOUNDATION:

BP and BP and such are characterized by an absolute unequivocal physical and chemical structure of categorization. This completion of time and time again the exact same steps inside Biochemical Pathways is not possible like with any other molecule of BP:

=) exactly at the same time two or more physical changes can take place,

=) exactly at the same time two or more chemical changes can take place or

=) exactly at the same time one or more physical **and** one or more chemical changes can take place.

The above counts for any other reaction step inside BP or inside BP and such Biochemical chip constructions as Biochemical Pathways and BP and such are with this displaying an absolute categorization and sequence of physical and chemical reaction steps coupled to an exact predictable chemical and physical change on the molecule.

This time and time exact completion of the citric acid cycle of the fatty acid cycle and of the biochemical chip of Biochemical Pathways turns out to be able to be deduced to a chain of one step changes which are consecutive to each other at which each step in itself consists out of minimally one and at the same time also maximally one physical or one chemical change.

6.8.1 THE MINIMAL AND MAXIMAL ONE PRINCIPLE (min/max 1)

Theoretically this categorization is also only possible when on any mono molecule of BP there can take place one and only one physical or chemical change during the completion of the biochip at any other moment exactly at the same time:

For this the author formulates: *The physical and chemical minimal and maximal 1 principle.*

The physical and chemical minimal and maximal one principle deduced by the author does not only fits for Biochemical Pathways but in nature for all physical, chemical and nuclear reactions.

Although min/max 1 forms one of the most fundamental principles in nature this has not been named this earlier in the physical or chemical literature. Min/max 1 is the foundation for the absolute categorization in nature up to the molecular level, the productiveness of physical changes and of chemical reactions.

Conclusion 31: Min/ max 1 forms the common ground and point of departure of the total: physics, chemistry, nuclear chemistry, nuclear physics and physics/chemistry of elementary particles.

6.8.2 MIN/MAX 1 PRICIPLE EXCLUDES EACH FORM OF CHAOS:

Min/ max 1 excludes the notion chaos on all levels of matter: elementary particles, unbound atoms, mono molecules and polymer molecules to 3 mono-molecules. Chaos is theoretically impossible.

Thanks to min/max 1 the biochemistry of the phenomenon life takes place under totally regulated and controllable circumstances. The phenomenon 'chaos' and the biochemistry of 'living matter' are absolutely incompatible to each other.

Thanks to min/max 1 a molecule stays inside totally predictable and categorized physical and chemical path of the biochip BP and the molecules are completing an in advance totally set pattern of varying physical and chemical changes like a biochemical processor and specially because of the fact that the physical changes knows only 3 bonds. Resulting that there is a matter of a real processor with a truly functioning physical wiring. This physical wiring guides the molecule tight and immediately to the following enzyme that fits next in the string and the following chemical reaction step. Looking at it physically the mono molecules inside Biochemical Pathways cannot get off the right track and so cannot 'get lost' inside the biochip BP or BP and such.

Conclusion 32: The functioning of the biochip BP and BP and such and with this of the phenomenon life is a direct expression of the absolute categorization up to the atomic and mono molecular level and the direct and tangible evidence of the absolute lacking of 'chaos' up to the mono molecular level.

6.8.3 MIN/MAX 1 AND POLYMERES:

On bigger polymer molecules, there can take place two chemical reactions at exactly the same time. Min/max 1 does not count for polymer molecules as a total but it does over all parts at the size of 2 - 3 mono molecules separately inside certain polymers. With this the min/max 1 foundation as such does stay valid and keeps standing.

The system of forces and bonds on an atom/ mono molecule/ parts of the polymer allows merely one change at exactly the same time. This side condition also does not leave any room for any form of 'chaos' whatsoever on the polymer level.

Conclusion 33: Chaos is a humane notion which does not know a single physical or chemical interpretation!

6.9 UNIQUENESS OF BP, THE ENZYMES/ CO-ENZYMES; NAD etc.:

The for the biochemistry on earth unique and specific enzymes can be formed over the universe from C, H, O, S and N on all planets with the periodical table / system and the presence of enough liquid water and land. Somewhere else in the universe the biochemistry of living matter can only complete conform the basic principles on earth which are displayed in the Biochemical Pathways and all systems which can be coupled to BP like meant to be under BP and such.

Conclusion 34: The top down analysis already displays to a large extent that there are no other opportunities open for mono molecules with the elements C, H, O, N, S and P in bond with liquid water.

Conclusion 35: The biochemistry on Earth looks like it is unique though it is also the universe standard for the biochemistry of all forms of life in the universe.

This is explained in the **Laws VI a) and VI b) of Biochemistry.**

The elements of the periodical table and the molecules to be formed from this leave only one biochemical platitude as Biochemical Pathways possible based on the elements C, H, O, N, S and P, liquid water and several thousands of mono-molecular enzymes/ co-enzymes.

Conclusion 36: The periodical table and the 1 - 2 billion molecules to be constructed with this has only got space for one of such biochemical platitude as Biochemical Pathways resulting that living matter can develop totally spontaneous out of living matter.

This is recorded in **Law VI c) of biochemistry.**

The BP chip can function exclusively and precise with 6 of the 12 fundamental forces on the elements of the periodical table:

-) the 3 forces / bonds of electrons(1), electron pairs(2) and the outer electron shell of the atom:
- 1) the physical van der Waals force (+W2f) / bond (+W2b),
- 1a) the physical dissolve force (+W2Df) / bond (+W2Db),
- 1b) the physical absorption force (+W2Af) / bond (+W2Ab),
- 2) the physical chemical charge force (+Lf) / bond (+Lb),
- 3) the chemical covalent charge force (+Lcf) / bond (+Lcb); the biochemical bond.

-) the 3 forces related to temperature:
 - 4) the physical gas force (+W2gf),
 - 5) the light force (photons) (+Q1f) and
 - 6) the infrared force (photons) (+Qirf).

If the elements of the periodical table had resulted in be it one concrete measurable physical or chemical force more or one force less than the earlier mentioned 6 forces of the 12 fundamental forces then the tight physical framing of biochemical reactions would not have been possible anymore.

Conclusion 37: With one force, more or one force less the chip of Biochemical Pathways cannot function as a chip anymore. Then there is no biochemical system for living matter available anymore and each form of living matter is impossible.

This is explained in the **Law VI d) of biochemistry.**

6.9.1 NO ALTERNATIVE BASIC CHIPS FOR BP:

In foundation, all about 1 – 2 million mono-molecules and 1 – 2 billion polymer-molecules exist on Earth and with this in potency all possible biochemical systems. On Earth only BP is known as the only possible system. BP contains the three central bio chips; one for the carbohydrates (citric acid cycle), one for the fatty acids (fatty acid cycle) and one for the amino acid synthesis (amino acids). All three are coupled to one biochemical whole inside BP.

Biochemical Pathways and BP and such are completed according the solid patterns and templates around the lemon acid cycle, fatty acid cycle and amino acid synthesis central in BP which can be considered like the 2 - 3 biochemical basic processors in the bio chip BP of life on earth.

Special is the unique bilateral completion of these bio processors/ chips at which the construction (through ATP) as well as the breaking down of the mono molecules runs through these bio processors/chips. There can be coupled a lot of chains to BP which as a whole lead to BP and such and/or the total biochemistry systems of all living matter on earth.

The biochemistry of any other form of living matter on earth and other places in the universe, means minimally one equal biochemical chip structure for the completion of:

-) the *carbohydrates*,
-) the *fatty acids* and
-) the *amino acids*.

Fundamentally different forms of biochemistry and/or life in the universe are only possible if there are alternative biochips possible for:

-) the *citric acid cycle* (construction / decay carbohydrates),
-) the *fatty acid cycle* and
-) the *amino acid synthesis*.

On Earth, certain alternatives haven't been found up until now.

Conclusion 38: Looking at the complexity of the lemon acid cycle, the fatty acid cycle and the amino acid synthesis as well as the bilateral completion and the necessary combining to one whole one also cannot expect any other alternatives for the citric acid and fatty acid cycle.

Conclusion 39: If such alternative cycles had been possible chemically and physically then these alternatives would have developed somewhere on earth and could currently be seen in one of the biochemical systems of life forms on earth. This isn't the case.

The uniqueness of the citric acid cycle, fatty acid cycle and amino acid synthesis and with this the uniqueness of BP has been explained in the **Law VI a) and VI b) of biochemistry.**

6.10 SIDE CONDITIONS COMING FROM THE TOP DOWN ANALYSIS:

Bio chips like BP and BP and such are only possible under following side conditions:

- 1) Molecules have to be constructed with covalent charge bonds (+L2cb) with the help of an enzyme. During the completion of the cycle always one of the covalent charge bonds is reactive. This type of bonds can only be found in mono molecules constructed out of the elements C, H, O, N, S and P.

2) During the reactions there standardly come to be charged positions on the molecule forms. Charged molecules can only be dissolved in the reaction medium liquid water; biochemical reactions can because of this only be completed in liquid water.

3) Biochemical Pathways totally consist out of 1-2 or out of 2-1 physical and chemical reaction steps. To be able to complete certain chains of 1-2 and 2-1 reactions like displayed in BP molecules involved in biochemical cycles need to be able to form one of the three physical conditions:

- a) gas like and non-charged,
- b) non-gas and charged and
- c) non-gas and non-charged (see Scheme 6 – 2).

Exclusively mono molecules constructed out of the elements C, H, O, N, S can take on one of the three physical dissolved conditions.

4) Water (H and O) is the only liquid in which the 3 physical molecule forms can dissolve:

- a) gas like and non-charged molecules,
- b) charged and non-gas like molecules and
- c) non-charged and non-gas like, *nopression*, molecules.

5) The O-H bond also contains the demanded lowest thinkable energy position of all thinkable covalent bonds. In physical aspect water has this lowest energy position.

6) Liquid water is the only suitable reaction medium when it comes to the ability to dissolve as well as energetic side conditions.

7) The driving force behind the biochemistry of living matter *cannot* be generated by:

- a) physical equilibrium reactions,
- b) physical balance reactions,
- c) chemical balance reactions.

Though exclusively through chemically one-sided and energetically irreversible reactions.

Which are:

- =) reactions on covalent charge bonds with the turning around of bond energy into heat,
- =) biochemical reactions with metals during which one electron is released (half radical reaction) for oxidation of organic material (autotroph organisms),
- =) oxidation of H atoms.

8) The driving force of plantlike (and of all other eco systems) rests on the photosynthesis at which light in the bond with chlorophyll and ADP/ ATP leads to the forming of glucose. From glucose, all other organic molecules can be formed.

9) Living matter is constructed out of mono and polymer molecules with a covalent charge bond between the atoms C, H, O, N, S and P with water as reaction medium.

10) Out of C, H, O, N, S and P there can be constructed:

- =) one basic type fatty acid - COOH, which can polymerize, the fatty acids are coupled to the fatty acid cycle,
- =) one basic type sugar (H – C - OH), which can polymerize the sugars are coupled to the citric acid cycle,
- =) one basic type amino acid (NH₂ + COOH group on one mono molecule) which can polymerize, the amino acids are already coupled to the amino acid synthesis.

In basic there is absolutely no place for other types of mono molecules as foundation for other biochemical systems than BP. These universal molecular basic building bricks of living matter which are one of a kind can already be found in BP and BP and such.

11) The only thinkable alternative opportunity lays in a biochemical structure based on right turning Biochemical Pathways and BP and such resting on the same molecules but then in the form of other stereo-isomers. Looking at it spatially there cannot be completed exactly the same reactions in that stereo BP like in the BP know to us

and the spacious forms of the molecules belonging to this. But the right turning stereo BP isn't possible and so it does not exist.

12) Out of the *periodical table* there can only be formed one system as *Biochemical Pathway*; BP as the only bio chip for all forms of life in the universe.

6.11 MATHEMATICAL EVIDENCE NEEDED:

The undeniable mathematical evidence of the uniqueness of the lemon acid cycle, the fatty acid cycle and with this BP can be given. The author has described the 12 fundamental forces and their bonds. Biochemical Pathways can be presented as mathematical model. All (bio)-chemical reactions can be followed digitally based on min/max 1 digitally and can with this be made process able by computer.

In line with min/max 1 the energy balance of each thinkable physical or chemical reaction step can be made discrete and it can be calculated very accurately. In term, this leads to a discrete thermodynamics.

6.12 CONSEQUENCES 6 LAWS OF BIOCHEMISTRY:

Based on the elements of the Periodical System it for now turns out that the lemon acid cycle and the fatty acid cycle are the only possible bio chips which can be constructed out of this with thorough consequences! The Periodical System of elements allows:

- 1) No other biochemical system than BP. The citric acid cycle, the fatty acid cycle and the amino acid synthesis/breaking down form the only universal biochemical foundation for all living matter in the universe. All life forms in other places in the universe are resting on BP and BP and such in a forced manner.
- 2) Totally loose from each other all life forms in the universe rest on exactly the same biochemical foundations like present somewhere in life forms on earth, (the carbon chemistry: proteins, carbon hydrates, fatty acids, chlorophyll, ATP/ADP, NAD, DNA, RNA, enzymes, co-enzymes; thousands of the same enzymes/co-enzymes with liquid water and/or interface liquid water/ fatty acid as foundation reaction medium for the completion of all those thousands exactly the same biochemical reaction steps etc.,
- 3) Out of BP the universal basic principles of living matter and/or the definitive Laws of biochemistry can be deduced,
- 4) On all planets with enough liquid water, an atmosphere and dry land there will in several tens of millions of years totally spontaneous and totally autonomous step by step develop an organic soup with a 'dead' biochemistry around: the lemon acid cycle, the fatty acid cycle, the amino acid synthesis, the photosynthesis and with the formed glucose as driving force. This total in term grows out to BP, BP and such and the organic polymers,
- 5) Through polymerisation there shall automatically start to develop a controlling in the form of RNA/DNA and from there eventually living matter,
- 6) On planets with enough liquid water there shall develop living matter in a period of about 50 – 100 million years, with as most basic characteristic that it is a biochemical system in the form of a living cell, totally automatically without any interfering/ engrafting from the outside. By definition all cells are mortal because of wear, tear and pollution.
- 7) There is only a question of real living matter in cell structures with the ability to asexual or sexual reproduction,
- 8) Life on Earth with its biochemical varieties and ways of reproduction is biochemically unique though at the same time the standard for all life forms in the total universe,
- 9) In the whole universe currently billions of planets with living matter can be expected. At least one per galaxy. Planets with living matter are mutually at many tens to hundreds of light years separated from each other by a vacuum, space without gravity and intense cosmic radiation. This makes 'live' hopping between star systems impossible.
- 10) The hydrogen in the DNA / RNA of living creatures are relatively fragile and sensitive for speed in the universe. This vulnerability of the DNA / RNA demands a maximum speed in the universe in relation to the

earth which amounts about 300 – 400 km/sec or 1‰ of the light speed.

11) So it takes a human about a millennium to cross the distance of just 1 light year. Travelling to other stars can be considered a total utopia for biological reasons not only for mankind on Earth and all aliens elsewhere in the universe.

6.13 CONCLUSION TOP-DOWN ANALYSIS:

Chapter 6 indicates that all living matter is based at exactly the same biochemistry as found on planet Earth. The author proves that *Biochemical Pathways* works as the biochemical processor in all forms of living matter.

With the composing of *Biochemical Pathways* **Gerhard Michal** and co have made one of the biggest thinkable scientific achievements given this opportunity by their sponsor **Boehringer**.

The team have clearly mapped the very complex structures, the cycles and the mutual paths of living matter. This deserves the highest possible praise and honor.

The team has specially looked at the chemical changes on the molecules. Which is complicated enough in itself. The author makes Biochemical Pathways more complete through by taking in account the relatively simple, but essentially, physical changes on the molecules in BP. Those physical changes standardly take place between two chemical reaction steps and are present in all thinkable (bio)-chemical reactions. s in the universe which are based on RNA/ DNA in the functioning of the living cell as for the information transfer to following generations. See **Law Vc) of biochemistry**.

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