

The Christ-element in the Chemical-elements *by Rev. Michaël Merle (reported by John-Peter Gernaat)*

What are elements and what are substances?

Science understands light matter. This is matter that is visible when light illumines it, unlike dark matter that is not visible in light.

Matter is complex and made up of compounds that in turn are composed of building blocks that we call elements. The basic constituent of an element is the atom. The word atom is derived from Greek and means 'that which cannot be divided'. Yet we now know that the atom is made up of subatomic parts. At the core of every atom is its nucleus. The nucleus is made up of neutrons and protons. These neutrons and protons each have the same mass. The entire mass of an atom is in the nucleus. In the space around the nucleus there are electrons. Protons carry a positive charge while electrons, with negligible mass, have an equal but opposite charge: a negative charge. Atoms have a neutral charge by balancing their number of protons and electrons. If electrons are lost or gained the atom is referred to as an ion and carries a negative (gain of electrons) or positive (loss of electrons) charge.

Each element is distinct as a consequence of the number of protons in the nucleus. An atom with one proton in the nucleus is an atom of hydrogen. An atom with two protons in the nucleus is an atom of helium, and so forth. Certain elements may have varying numbers of neutrons in the nucleus of their atoms but they always have the same number of protons if they are atoms of the same element.

Carbon 12 or C^{12} has 6 neutrons and 6 protons in its nucleus, giving it the atomic mass of 12. It has 6 electrons to balance the protons. Carbon 12 is the standard for measuring atomic mass.

The Periodic Table contains about 116 to 120 elements although some new elements may still be added. Of these elements only 100 are stable. The others, and the new elements that we may discover are very unstable; they have very short lives, sometimes as short as a fraction of a second. They appear and as rapidly disappear. Everything in the entire universe, all light matter, is made up of these 100 elements. These elements are a material expression of the creation of the Divine.

In the past the word element had a different meaning. There were four elements or "roots" in the mindset of the ancient world. These were the element of earth, the element of water, the element of air and the element of fire.

Today we know that matter can exist in four phases: solid, liquid, gas and plasma. The substance does not change as it changes phase, it is the connection between the particles in the substance that changes.

What is communicated to us by the elements? If we are to develop an understanding of the Divine, we have two sources: the Bible and our Sacraments. Our Trinity Epistle provides us with a theology – an understanding of the Divine. From the Trinity Epistle we understand that the world of substance is a material manifestation of the spiritual and is provided by the very substance (nature) of the Father God.

Let us understand the meaning of the words we are using. 'Substance' consists of two words: 'sub' and 'stance'. Sub means that which is under or below while stance means to stand. Therefore, substance means to understand. It is that which stand under everything. We stand on the ground of the world. That which stands under us is the Father Substance.

This Earth Incarnation was created by the Beings of Form, the Elohim. The substance of which everything is created lives under the Form. Matter can change its outer appearance and be *transformed* but it can also change its inner appearance through *transubstantiation*. Transubstantiation is possible only through Christ; it is something "I" must do through the Christ who lives in the "I". No substance changes without the Christ. Substance fills out Form and carries Form. The outer appearance of things is its form – it is that which appears to us above the surface. The inner nature of things is its substance – that which is beneath the surface.

What is Form as a principle of the Divine? Form is movement come to rest. This understanding helps to explain the Vedic image of Shiva dancing creation. With every step that Shiva dances something disappears and something new appears. Shiva is both the dancer of the dance and the choreographer of what the dance creates. Therefore, substance is process come to rest. It is the interplay resting so that it becomes visible to see.

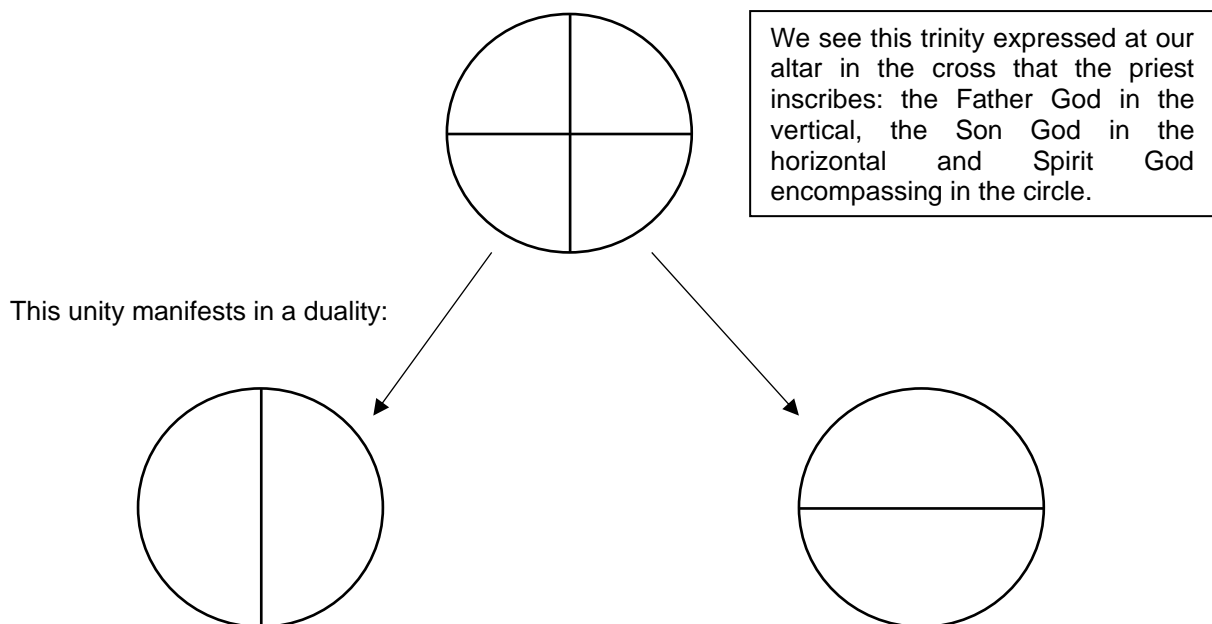
Two different processes will be considered. Firstly, the processes of fire, air, water and earth as expressed by the signs of the Zodiac. Processes come to rest are substances. The way in which the signs of the Zodiac express themselves through the processes of fire, air, water and earth manifest as substance. These processes are not the signs of fire, air, water and earth that are traditionally attributed to the signs of the Zodiac.

Secondly, the twelve substances that arise from the processes of the signs of the zodiac form three groups of four each. Each group forming a cross that is expressed in the relationship of the signs of the Zodiac. There is the cross of life that is expressed in the atmosphere, the cross of salt expressed in the oceans and of cross of the mineral substance expressed in the earth. There is an air cross, a water cross and an earth cross. There is no densification of fire to form a fire cross although fire processes are expressed in each of the crosses.

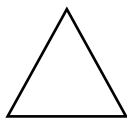
Paracelsus (c. 1493 – 24 September 1541), born Theophrastus von Hohenheim (full name Philippus Aureolus Theophrastus Bombastus von Hohenheim), was a Swiss physician, alchemist, lay theologian, and philosopher of the German Renaissance. He was a pioneer in several aspects of the "medical revolution" of the Renaissance, and he is credited as the "father of toxicology". He was interested in how the chemistry in medicines worked in the chemistry of the body. The word 'chemistry' is derived from the Greek meaning to cast together or to pour together. Paracelsus identified three primary processes that he said could dissolve into their separateness and then resolve in various combinations to carry their respective qualities of healing which he termed:

- A sulphur process meaning a burning or purifying process coming to ash.
- A mercury process meaning a quickening process of coming alive.
- A salt process meaning a preserving process of maintaining and holding structure.

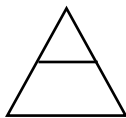
As a theologian he recognised that everything derives from the unity of the Divine which is a trinity in unity:



The Father Ground expression or Niterine process
In the Niterine process he identified two elements

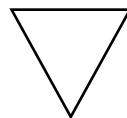


Fire

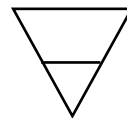


Air

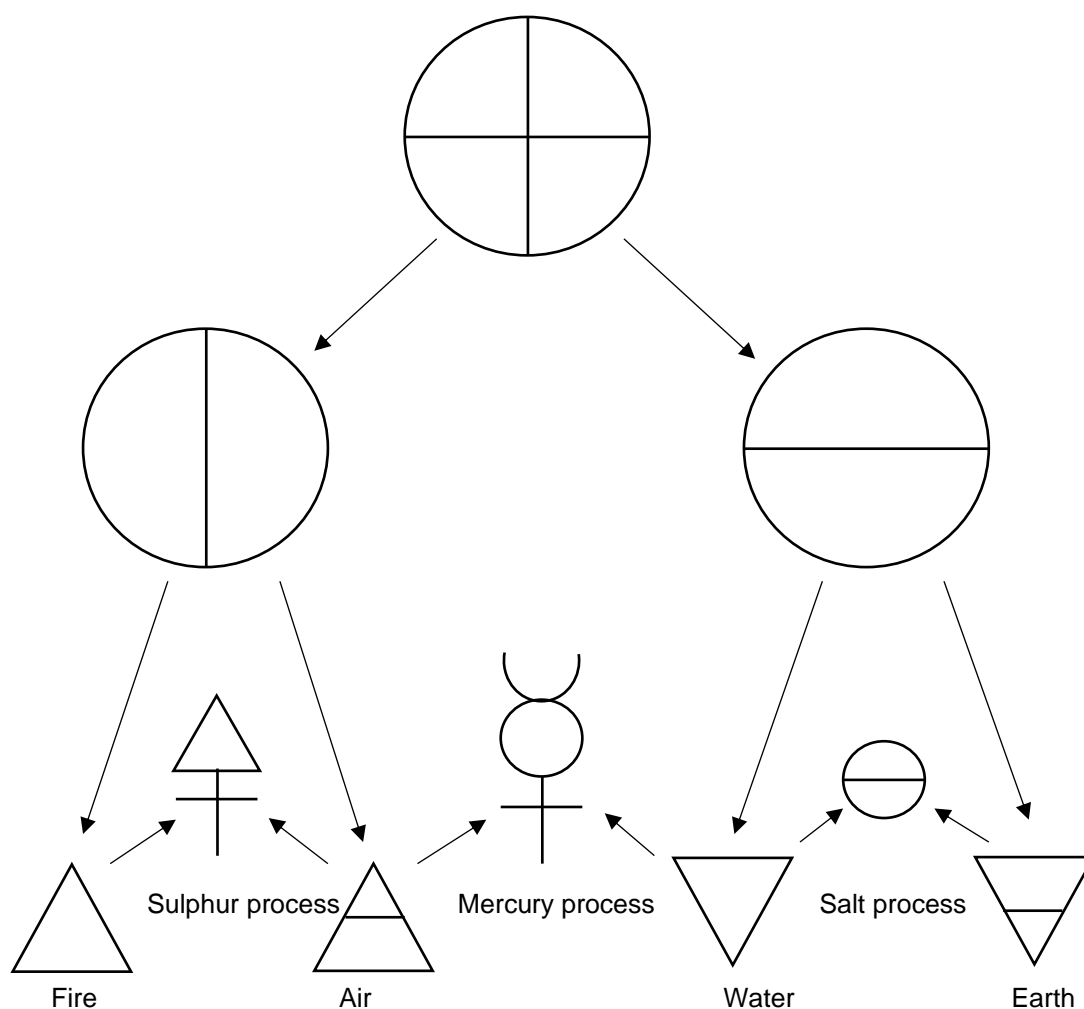
The Son expression or Saline process
and in the Saline process two elements.



Water



Earth



The combination of the fire and air element results in the sulphur process (the glyph of which is a fire-cross)

The combination of the air and water element results in the mercury process (the glyph of which is a whole-horned cross)

The combination of the water and earth element results in the salt process (the glyph of which is the encompassed Son-principle)

The Son God creating in us creates in the salt process.

Through the influence of Rudolf Steiner Dr Hauschka identified 12 elements that appear from the 12 signs of the Zodiac. Why those 12 of all the 100 elements that are operational in the Periodic Table? There are no metals present among these 12 elements – none of the 7 metals traditional to the ancient world. There is sense in this, as the metals were seen as having been gifted by the moving stars (planets), not the Zodiac. All 12 of the elements occur in the top 20 of the Periodic Table. These 12 are the 12 most common elements that can be found in the human body. There is one exception that will be pointed out in due course.

The place to begin reviewing the quality bestowed by the Zodiac to the substantiality of the element begins with the Fire Process and therefore begins in Leo. The direction follows the precession of the earth's axis through the Zodiac which is the reverse to the way the Sun and planets move through the Zodiac.

Fire Process	Leo	Leo in the Sumerian culture was a feminine power. Leo bestows the substantial experience of Old Saturn: <i>Warmth</i> . Warmth brings us <i>hydrogen</i> which represents nearly 76% of all matter in the universe.
	Cancer	For the Sumerians Cancer was the gateway sign and at the heart of Cancer are a group of stars known as the Manger.

(Therefore, placing the baby Jesus in the manger is a powerful symbol representing a great soul that is entering through the gateway.) Cancer bestows *Consciousness*. The substantiality of consciousness is *phosphorus*. Consciousness is a direct expression of warmth.

	Gemini	Gemini expresses an indirect expression of warmth which is <i>Expansion</i> , a burgeoning expansion of which the substantiality is <i>sulphur</i> .
Air Process	Taurus	The expression is <i>Movement</i> and the substantiality is <i>nitrogen</i> .
	Aries	The expression is <i>Shape</i> and the substantiality is <i>silicon</i> .
	Pisces	The expression is <i>Activity</i> and the substantiality are <i>the halogens: particularly chlorine and fluorine</i> .
Water Process	Aquarius	The expression is <i>Life</i> and the substantiality is <i>oxygen</i> .
	Capricorn	The expression is <i>Balance</i> and the substantiality is <i>aluminium</i> .
	Sagittarius	The expression is <i>Assimilation</i> and the substantiality is <i>magnesium</i> .
Earth Process	Scorpio	The expression is <i>Form</i> and the substantiality is <i>carbon</i> .
	Libra	The expression is <i>Stability</i> and the substantiality is <i>calcium</i> .
	Virgo	The expression is <i>Receptivity</i> and the substantiality are <i>the alkalis: particularly potassium and sodium</i> . Receptivity can be understood as carrying or bearing, as in bearing a child.

Here is the chemical composition by elemental mass within the human being:

Oxygen	61%
Carbon	23%
Hydrogen	10%
Nitrogen	2.6%
Calcium	1.4%
Phosphorus	1.1%
Sulphur	0.2
Potassium	0.2%
Sodium	0.14%
Chlorine	0.12%
Magnesium	0.027%
Silicon	0.026%
Iron	
Fluorine	

Aluminium is missing in the human body. In fact, aluminium is toxic to the human body. Balance is not achieved chemically in the human body. We must achieve balance through our own activity. The Christ forces have freed us from a chemical balance to find balance for ourselves.

The Christ-element in the Chemical-elements – the Sulphur Cross *by*

Rev. Michaël Merle, reported by John-Peter Gernaat

Substance is under form or within it. Matter fills out the form and carries it. The outer manifestation from the inner appearance is substance.

Paracelsus understood that all medicine needs to separate into a specific process and then recombine where needed. He identified three primal processes and these are active in the Act of Consecration of Man. The three substances brought together in the Communion: water, wine and bread in the correct proportions, are healing medicine. Paracelsus described the sulphur-process which is a burning process, coming to ash. Sulphur is recognised as being an aspect of the Divine: when a substance containing sulphur gains an additional sulphur atom (usually in place of an oxygen) it is called thio... (e.g. in sulphuric acid we have hydrogen ions and the sulphate ion (SO_4^{2-}) and when an oxygen in the sulphate ion is replaced by another sulphur it is then called thiosulphate, meaning divine sulphate). Paracelsus described the mercury-process which has the qualities of the god Mercury; it is a quickening process that is mobile and can carry something from one phase to another. The mercury process is most beautifully experienced in water which has a memory and can carry substances that can dissolve into it, and it then carries these dissolved substances. Finally, Paracelsus described the salt-process. Into the chalice at the altar the wine, or sulphur-process, is added followed by the water or mercury-process and finally a small piece of bread, or the salt-process, is added so that working together as a whole under the grace of transubstantiation they become a healing medicine.

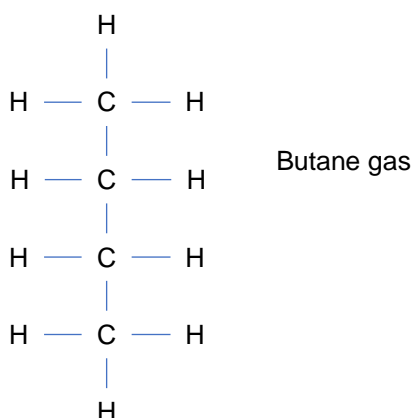
Having described the substantiality of the quality bestowed on the earth and into the human being by the Zodiac, the substances work together in very clear ways. In each case there are four elements that work together, where one element is a fire-process, another an air-process, a third a water-process and a fourth an earth-process. When the four signs of the Zodiac that gifted these elements are plotted they relate to each other as a cross.

We begin with the four elements that make up the greatest mass of the human being: oxygen, carbon, hydrogen and nitrogen. They are gifted by a water-process (biogen), an earth-process (geogen), a fire-process (pyrogen) and an air-process (aerogen) respectively: Aquarius, Scorpio, Leo and Taurus. Together these substances are known as the Sulphur Cross or the Life Cross or the Atmospheric Cross.

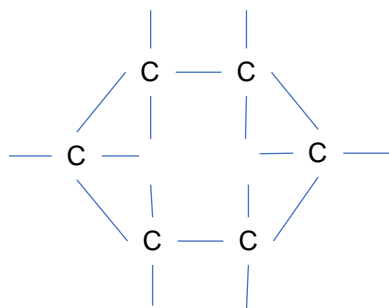
Carbon is the element that gives structure; it is form-giving. Everything that forms and is able to carry life must be formed from carbon. Therefore carbon can be seen as earth-forming or 'geogen' – geo for earth and gen for forming. It is misnamed as the word is derived for the old Latin word for charcoal. But charcoal is not pure carbon. When pure carbon burns the bonds between the carbon atoms are loosened and it combines with oxygen to form carbon dioxide and leaves no residue, no ash. This is what happens when a diamond is heated or burnt sufficiently, it vanishes into air. When charcoal is burned the carbon in charcoal also combines with oxygen and goes into the atmosphere leaving an ash of other substances in the charcoal that were the other components of the wood. Carbon and oxygen are thus clearly involved in a fiery process or a sulphur-process making up the Sulphur Cross. Oxygen is required for anything to burn.

Carbon mimics the bonding aspects of silicon. Silicon gave a sense of form on earth (through its relational capacity – especially to Oxygen) before carbon became active. But once carbon became active it perfected the form that silicon attempted to develop.

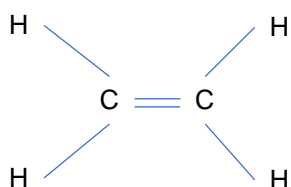
Carbon can form four equally angled bonds. It can form these bonds with other elements, e.g. with hydrogen to form CH_4 or methane gas which is a very stable gas and occurs freely in the atmosphere. Methane is the primary expression of carbon. Carbon can bond with itself to form chains. The other bonds in these chains can be with hydrogen giving us ethane, propane, butane, pentane, hexane, heptane, octane, etc. as the number of carbon atoms increases.



Carbon can form rings



Carbon can form double and even triple bonds with itself



ethene



ethyne

The nature of carbon occurs to give form and to give structure.

Where does carbon come from? It is created in dying stars. A star consists mostly of hydrogen. In a star two atoms of hydrogen are bonded to form helium. This atomic fusion process emits light and energy. Eventually all the hydrogen is used up and in the process of dying the atoms of helium undergo atomic reaction to form other elements of the periodic table. Carbon is thus created within a dying star and expelled into the universe. Carbon is thus the corpse of a star but on earth it becomes the body for life. Most of the Carbon on earth originates from the star CW Leonis or IRC +10216 at 310 light years away in the constellation of Leo. Our atmosphere contains about 724 billion tonnes of carbon while the oceans contain about 39 000 billion tonnes of carbon and about 100 million billion tonnes of carbon in the rocks of the earth of which the crust of the earth contains the majority of carbon-bearing rock. There are about 375 000 billion tonnes of carbon trapped in the earth's crust derived from organic sources and these are: coal, oil and gas. There are about 40 billion tonnes of carbon in living things in the oceans and about 2000 billion tonnes of carbon in the living things on land. Carbon is most abundant in the rock of the earth and therefore should be named 'geogen'.

In pure form, carbon can bond as diamond forming the hardest substance on earth but it can also bond differently to form graphite which is very soft and forms a perfect lubricant as the plates from which it is formed easily slide over each other.

The tiny town of Nördlingen in Swabia, Bavaria is built inside of the impact crater of a meteorite that struck about 15 million years ago. The impact of the meteorite created microscopic diamonds and the town is built of the rock containing these diamonds; the town is literally built of diamonds.



Nördlingen, Bavaria

Carbon dioxide is the heaviest component in air. Carbon with oxygen is beginning to give air a taste towards life-substance, matter. It is the gas that most wishes to become engaged in a solid.

Hydrogen is the gift of Leo. The name hydrogen means water-forming. This is what occurs when hydrogen gas burns. However, hydrogen gas is formed in a burning process. It should therefore rightly be called 'pyrogen' or fire-forming. Hydrogen is the most abundant element in the universe making up 76% or more of all elemental matter.

Hydrogen occurs in our blood which is made up of 85% water or H_2O . This results in 9.4% of our blood by mass being hydrogen – it is very light compared to the oxygen.

Hydrogen has a capacity to create a very special inter-particle force between other elements of the Periodic Table, called a hydrogen bond. The most important hydrogen bond in the human body is in the DNA as it is the hydrogen bond that holds the two strands of the DNA together.

Hydrogen prefers to exist as a gas, H_2 . When it therefore bonds with heavier elements to form particles it transforms the particles to a gas. Examples are hydrogen bonding to carbon forming methane gas, when hydrogen bonds with phosphorus it forms phosphene gas and when hydrogen bonds with sulphur it forms hydrogen sulphide, which is a gas. It is only H_2O that condenses to a liquid in its natural state at the earth's surface. Water defies the principle of hydrogen to lift heavier elements into a gas. This is the gift of Scorpio and Aquarius working together to provide the miracle of water.

Oxygen is at home in the human blood although it is most predominant in the atmosphere. Oxygen is carried by the blood to every cell in the body. At the cell respiration occurs. Respiration is a sulphur-process, a burning process. Without respiration, life dies. Oxygen is required for respiration and therefore for life to exist. The correct name for oxygen should therefore be 'biogen', life-forming. This is a water-process.

Oxygen enlivens every earthly element. It is the carrier of life. This is the standard understanding of oxygen by science. This provides us with the understanding of why water is an essential element added to the wine in the chalice at the altar. An alchemical process takes place when the water is added to the wine. The mercury-process and the sulphur-process are held and to this is added the salt-process in the form a small piece of bread. The three healing processes are combined in the chalice.

Oxygen means acid-forming and was given this name because alkaline substances that are excessively oxidised become acidic. It derives its name from a process and not from a characteristic inherent in itself.

The earth's atmosphere consists of 20% oxygen for which we have cyanobacteria to thank. These were the first organisms to extract oxygen from carbon dioxide, using the carbon and expelling the oxygen back into the atmosphere. Cyanobacteria have helped to create the atmosphere that enables life to exist. Only Mars and Venus contain any oxygen in their atmospheres but in very small quantities: Mars has 0.15% oxygen and on Venus it is negligible.

Oxygen occurs in two stable forms: oxygen gas, O_2 and Ozone, O_3 . Ozone is poisonous but forms a barrier to the ultraviolet radiation from the sun at between 20km and 40km above the surface of the earth. Oxygen also has a protective quality as well as a life-giving quality.

The earth-forming, geogen, fire-forming, pyrogen, and life-forming, biogen, elements combine to form a carbohydrate. All three are involved in the sulphur-process or burning process: without oxygen nothing burns, hydrogen is fire-forming (formed out of the fire of the "big bang"). These substances that form the Sulphur Cross and form the atmosphere – the cross of the Zodiac that gives us an atmosphere – are mediated gifts of the first Hierarchy: the Seraphim, the burning ones, the Cherubim, the winged eagle, the winged lion, the winged bull and winged man – Scorpio, Leo, Taurus and Aquarius – the four signs of the Zodiac that gifted these elements, and the Thrones, thunder, lightning (which helps to form ozone). These elemental expressions are so much more than just chemical bonds. They carry a true understanding of Spirit into matter, a true substantiality.

Carbohydrates express as starch, sugar or cellulose. When carbon (geogen) is most active (the characteristic of carbon is active, not the atoms of carbon) the carbohydrate manifests as cellulose, giving form. When oxygen (biogen) is most active the carbohydrate manifests as starch, that abundance and life of the plant world. When hydrogen (pyrogen) is most active the hydrocarbon manifests as sugar and burns to give us energy.

Nitrogen makes up about 78% of our atmosphere. Together with oxygen, hydrogen and carbon these are the four active elements in our atmosphere. The other elements that occur in the atmosphere do not participate in any processes e.g. four of the noble gases, argon, neon, helium and krypton are more abundant than hydrogen, in the order presented. Carbon was more prevalent in the atmosphere at CO₂ until plants began to extract it providing O₂ that makes life possible. The carbon becomes stored energy in plants. Carbohydrates burn to give energy when the carbon to hydrogen bond breaks and the elements are released as carbon dioxide and hydrogen gas.

The human being is unable to take in nitrogen in the way that plants can. Plants take in nitrogen from the world around them, from the soil. One can rightly say that the cosmos rays into the plant to create it. Animals and humans take in spiritual source into themselves and create themselves from within.

Nitrogen provides movement. It is required in the plant within the seed because the seed must be released and must 'move' away from the parent plant. The seed is the only part of the plant that contains protein, plant protein.

Nitrogen is the gift of Taurus and has the quality of movement. Nitrogen moves independently in our atmosphere as N₂ gas. While carbon bonds with oxygen or hydrogen to form carbon dioxide or methane, Some oxygen and hydrogen combine as water vapour. Nitrogen does not form bonds with other elements in the atmosphere.

Nitrogen is named because it forms nitre or saltpetre or potassium nitrate, so it was called nitre/nitron-forming. The splitting of the Divine Principle into a Niterine Principle and a Saline Principle as understood by Paracelsus, he recognised that nitrogen is part of the burning and moving principle. Its correct name should be 'aerogen' or air forming. Nitrogen endows animals with an airy, astral movement.

In the human body nitrogen forms nitric oxide and protein. Nitric oxide, NO, is the messenger to the muscles to relax. Without nitric oxide our muscles would contract and remain rigid following the carbon principle. Animals are able to move only because the muscles can relax. It is nitrogen that provides movement to animals. The cardiovascular system relies on nitric oxide for the blood vessels to dilate and constrict. The flexibility is given by nitrogen. Nitric oxide is required for the immune system to function. Nitric oxide is required for the peripheral and central nervous systems to function. Nitric oxide is manufactured in the brain by nitric oxide synthase. We make nitric oxide ourselves in one of our organs. Our organic work manufactures it, we do not take it in from the environment as food. It is not the cosmos raying into us, but rather the cosmos that exists within us that rays out. There is a connection between nitrogen and ensouling. The soul cannot enter into a being without the presence of nitrogen.

Nitrogen occurs in nature in ammonia, NH₃. Ammonia received its name in Egypt where it was first recognised in a deposit of ammonium chloride near the Temple of Ammon and named after the god Ammon as the salt of Ammon.

When ammonia combines with a hydrogen ion, NH₃ + H⁺ to form NH₄⁺. The essence is that a proton without an electron (H⁺) combines with a molecule of ammonia through what is called a protolytic reaction. NH₄⁺ is known as ammonium which can now bond with chlorine to form ammonium chloride.

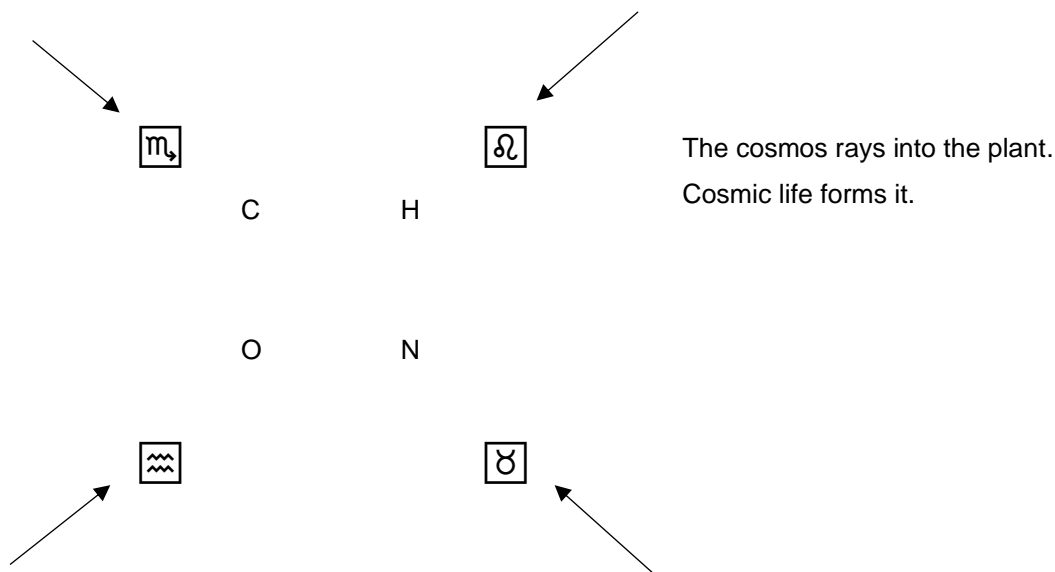
Nitric oxide is very important to the functioning of the body and when we receive an infection the brain manufactures nitric oxide in response to the infection in order to boost our immune functioning. But when the infection is severe, and the brain is over-stimulated to produce nitric oxide, we are poisoned by the excess nitric oxide and die of septic shock. The excess nitric oxide reduces our blood pressure by over-relaxing the blood vessels to the point where we die. We need oxygen to provide energy to fight the infection and not the excess of nitric oxide. We could regulate our reaction to infection by breathing. Rudolf Steiner describes how the capacities of soul are supported physiologically, we feel in our soul

when we breath – stop breathing and we stop feeling. We think because of the physiological functioning of the nervous system. We can take action because of the physiological functioning of the metabolic system. Our soul can only express in our body because it has the physiological support for that function of soul. When we panic, the body follows the path of the soul and reacts to the panic, the body does not react to the thing causing the panic. Thus, staying calm allows us to deal with the threat physiologically.

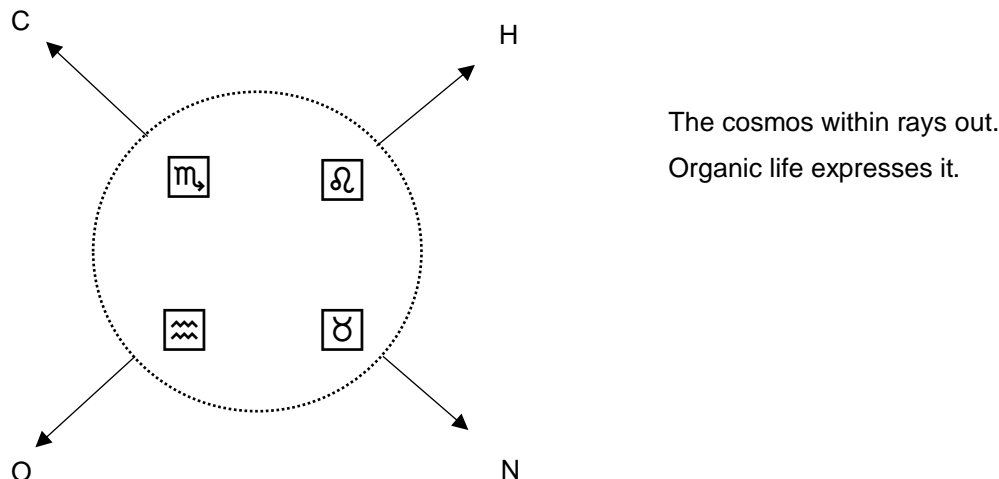
Nitric oxide brings a fluidity to our cardiovascular system and our nervous system and to our immune system that is vital for their correct functioning, but its primary function is in our muscles where it relaxes them so that they can contract to give us movement.

When nitrogen bonds with oxygen, hydrogen and carbon to form a protein, the characteristic of nitrogen dominates. The other three elements lose the possibility to dominate as they do in carbohydrates giving rise to three different forms of carbohydrate. The dominance of nitrogen changes the carbohydrate potential to a protein. Proteins are composed of amino acids. An amino acid is NH_2 combined with CO_2 that has combined with a hydrogen – an amino group, NH_2 , and an acidic carboxyl group, COOH , with a side chain that makes it a specific amino acid. The nitrogen in the protein activates something to give a capacity that a carbohydrate does not have. One outstanding capacity is the independence of movement. Therefore, a seed needs nitrogen to be able to leave the parent plant through an independence of movement and then activate the germination process which requires independent movement. The gift of Taurus is extraordinary.

The plant takes in everything from the atmosphere:

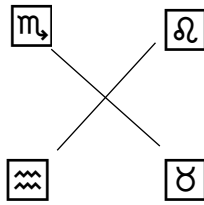


An ensouled animal takes in cosmic forces and produces the elements in its organs through organic activity.



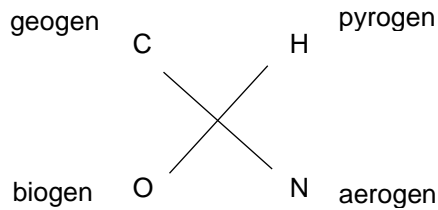
We can now consider which protein is healthier for us to take into our bodies; the protein from plants which is formed from cosmic life or the protein from animals which is an expression of organic life.

We see in the images above as a cross.



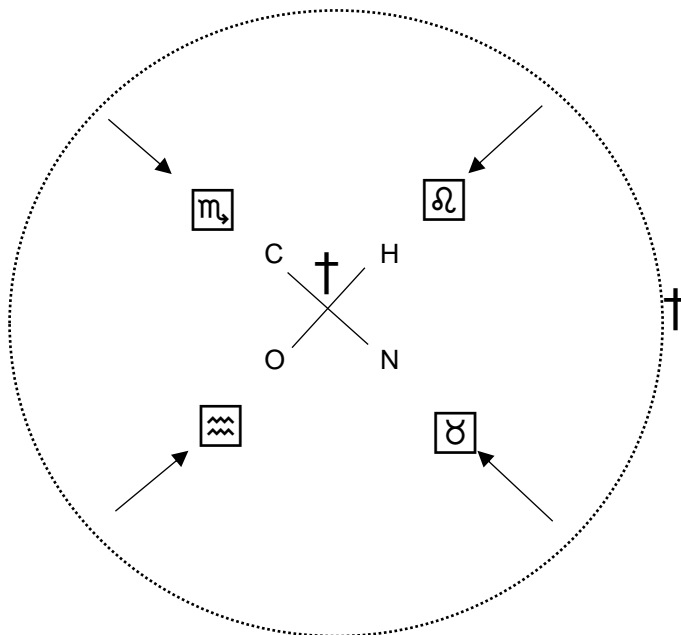
This is the Sulphur Cross because it has to do with the capacity of the burn, the capacity to burn and release energy. Carbohydrates and proteins release energy when consumed. These elements are found making up the bulk of our atmosphere, they envelope around the earth. Thus, we can also call it the Atmospheric Cross. The atmosphere makes life possible on earth and so it is also the Life Cross. The elements also express life therefore the name Life Cross is appropriate.

When given their proper name these elements are: pyrogen, aerogen, biogen and geogen.



These four elements work together in partnership with each other to express life in plants and animals. In the atmosphere they do not work together, where they express their nature of burning. They are not found in combination in the mineral world (with a few aberrant exceptions). Rocks do not contain nitrogen because they lack the requirement to move. Nitrogen is a key component in explosives, the component to move it.

Christ is in the centre of this cross and in the periphery of the cross.



The activity of Christ is to create a centre. Christ works from the periphery to the centre in plants. Christ works from the inside out in the human being, but only when the human being can express it; otherwise the Christ-in-me remains invisible. We express the Christ-in-me. The cosmos radiates in, and the plant expresses it. We do not express the Christ unless it is expressed from within.

The Christ-element in the Chemical-elements – the Mercury Cross *by*

Rev. Michaël Merle, reported by John-Peter Gernaat

What is this series of talks attempting to achieve?

We are considering the Christ-element in chemical elements. This means that we are gaining an understanding of how the spirit manifests in these material, chemical substances. So, what does this material substance express of the spirit? When we considered the Sulphur Cross we realised that when the spirit wishes to express itself in physical material movement, nitrogen must be present. This is a physical manifestation of a spiritual principle. Nitrogen operates most effectively in combination with its three partner elements, oxygen, hydrogen and carbon. Each element brings a different principle that we see most clearly in the carbohydrates where each of the three elements brings a different characteristic to the carbohydrate when its principle dominates the other two elements. We look around us and carefully observe what we are seeing, when we can truly look at nature, then are the Divine forces manifesting in nature around us.

Going back to the introductory lecture, when we observed the four processes expressed by the Zodiac, we discovered that the first sign of the Zodiac to express the specific process – fire, water, air, earth – expresses the reality of the process and the next two signs express opposite aspects of the same reality. In the case of the aerogen-process Taurus expresses movement while Aries expresses shape and Pisces expresses activity. Movement rests in shape while movement is expressed in the activity of moving. The Sulphur Cross expresses the pure reality of the four processes. As we now begin to explore the next set of elements in the four processes and discover the aspect they express, we discover a different expression of life on earth.

We are observing the Mercury Cross – that which quickens – also known as the Oceanic Cross, and we shall quickly discover why. We are studying the expression of the signs of Gemini, Pisces, Sagittarius and Virgo.

When we observe water which, chemically is expressed as H_2O , we find that it is not a substance that remains as stable molecules. Instead, water is constantly separating into two ions, a positively charged hydrogen ion, H^+ , (in other words, it leaves behind an electron to become a nucleus of one proton), and a negative charged hydroxyl ion, OH^- , and then recombining into an H_2O atom again. We observe hydrogen and oxygen in combination as fire-forming and life-forming, and we observe a process of manifestation and of non-manifestation, of creation and dissolution. It is in constant balance so that water looks stable, yet it is constantly in activity, in motion, in life. It is Lord Shiva dancing the dance of creation and destruction. Water constantly destroys itself and reforms itself.

In our oceans there are two ions that are most abundant and give the oceans the distinct salty taste. These ions are sodium ions, Na^+ , and chloride, Cl^- . When sea water is evaporated the ions combine to form crystalline salt or $NaCl$, but in their natural environment they occur as ions. Chlorine prefers, always, to exist as an ion of chloride.

The manifestation of the characteristic of Virgo are the alkalis of which sodium and potassium occur in the top ten elements within the human being and of Pisces it is the halogens, of which chlorine and fluorine are the ones occurring in the human being. The characteristic of Virgo is receptivity, to the extent that the word alkali derives from the Arabic meaning 'burn to ash', and of Pisces it is activity, and in some cases reactivity, sometimes quite volatile reactivity.

Chlorine is named because of its yellow-green colour: *chloros* in Greek. Halogen means salt forming and a halide is a salt ion.

Chlorine is toxic to organic life and will react with organic life to form chloride, its stable non-reactive, but receptive form. Therefore, chlorine is used to purify water of harmful organic life-forms: meningitis, cholera, typhoid.

Fluorine also is dangerous, and it is stable as fluoride, which is used in toothpaste. Fluoride is an essential element in tooth, ivory and bone. The reactivity of fluorine becomes active engagement in fluoride.

When chloride combines with sodium it forms common salt, but when fluoride combines with sodium to form sodium fluoride, it is poisonous and was used as a poison to kill cockroaches, but has, disastrously, been mistaken for sodium chloride and placed in the salt dispenser, resulting in deaths.

What is the activity that we recognise in chloride and fluoride? They partner with sodium and potassium. Once partnered an important action can occur.

The sodium and potassium ions are the receptive element. They carry the chloride and fluoride in order that they can do their work.

Within our body there are four principal places where liquid occurs:

- the blood as blood plasma,
- within the cell as cytoplasm (or neuroplasm in nerve cells),
- around the cells as tissue fluid,
- in the lymph – blood carries those things to the cells that give life. The cell respire – burn – and the waste products are carried away through the lymphatic system.

95% of potassium exist inside of the cells of the body in the cytoplasm.

95% of sodium ions exist outside of cells in the tissue fluid.

When these ions move into or out of cells they create a potential difference. Sodium ions move across the cell membrane into the cell 200 times per second. As quickly as these ions enter the cell they are expelled by what is known as the 'sodium pump' within our cells. 40% of the energy we use daily is used by the sodium pump system in our cells expelling sodium from the cells. Potassium is a 'passenger' that is passively carried out of and into the cells. The potential difference created by sodium and potassium in our nervous system creates a wave that looks electrical. It is along this wave that nerve messages move. We do not send electrical impulses along our nerves. This process that created the possibility for neural activity is not efficient, it is driven by the relationships between the elements. The human functioning is driven by relationships, not by efficiency. The potential difference that manifests as a wave creates the potential for activity. It is not the activity itself. It creates the possibility that bears the responsibility for activity. One can say that it is being completely virginal, to the extent that the process was recognised as burning to ash and gave to it the name alkali (from the Arabic). It gives up everything for something to happen. Virgo as an earth-process in this case becomes an ash process, it is that receptive, that freely giving. It is the last element in the process from fire to ash (earth) – Fire-Process, Air-Process, Water-Process, Earth-Process. Virgo is sacrificial so as to lay down a foundation on which activity can occur.

The activity is airy, it moves. These are the chloride and fluoride activities. Because together sodium and chloride form salt this is an oceanic-process.

When we consider what is dissolved in the oceans the percentages are:

- 58% is chloride (Cl^-)
- 32% is sodium (Na^+)
- 4% is magnesium
- 3% is sulphur
- 3% is calcium, potassium, bromine, carbon, strontium, and boron in smaller fractions

The top four forms the Oceanic Cross.

The manifestation of spirit in what has been discussed thus far in the regard to the oceanic cross is: no activity without sacrifice.

Pisces was associated with the feet or activity while Virgo establishes the path for Pisces to walk. Virgo is that which can bear. Here are the Christ qualities of bearing and ordering (the life of the world – from the Act of Consecration of Man: "You who bear and order the life of the world"). Where there is order there is direction, there is a path.

There is a lot of chemistry represented in the Act of Consecration of Man including the bringing together of the three healing processes: the sulphur-process, the mercury-process and the salt-process in the chalice. These are the substances that we consume as the wine, the water and the bread (the tiny $1/10^{\text{th}}$ of the host added to the chalice) added in the order of the sulphur-process, wine, the mercury-process, water, and the salt-process, bread. There are real, active chemical processes that happen in the chalice. Each single healing process is brought in the correct combination because the Act of Consecration of Man is the healing sacrament.

The relationship between the earth-process and the air-process of the Mercury (Oceanic) Cross is clear in that wherever the sodium and potassium ions occur there is always chloride and fluoride close by.

Sodium and potassium are vital in the human body and it they that give us the physiological possibility to think because they are the pathway for our nervous system. Rudolf Steiner makes it clear that our nervous system is a physiological expression of our capacity to think. Thinking is connected to the Mercury Cross. Feeling belongs to the activity of the Sulphur (Life) Cross because we breathe in oxygen and have the nitrogenous capacity to move. Our feelings are expressed as movement. It is the cardiovascular system that is physiological expression of our capacity to feel. The Salt (Mineral) Cross is connected with our capacity to carry out our will. The Mercury Cross is also connected to will activity in the metabolic processes in the human being. Thinking and Willing are combined in the Oceanic Cross. There is a connection between our thinking and our willing.

Next we shall look at the fire-process of Gemini that expresses as expansion and manifests as sulphur and the water-process of Sagittarius that expresses as assimilation and manifests as magnesium.

Magnesium is the central element of chlorophyll, and it is chlorophyll that extracts carbon from the air, from the carbon dioxide (CO₂) to release oxygen into the atmosphere that makes animal life on earth possible. Magnesium assimilates making the various processes possible.

The second and third most abundant elements in the oceans are magnesium and sulphur which occur, like sodium and chlorine, as a salt. Magnesium and sulphur form magnesium sulphate (Epsom Salts) (MgSO₄) that also dissociate or dissolve in water to form the magnesium ion (Mg⁺) and the sulphate ion (SO₄²⁻).

Magnesium has a connection to our digestion, our digestive-metabolic system. Both Milk of Magnesia (Mg(OH)₂) and Epsom Salts (MgSO₄) are taken for digestive issues. Our digestive-metabolic system takes thought into action. Magnesium and sulphate are vital to the process of extracting nutrients from the food we take in. These elements provide the expansion and assimilation required for nutrient intake.

The four elements of sodium, chlorine (as chloride), magnesium and sulphur (as sulphate) for the salts of the ocean and therefore very much connected to a watery process, the quickening healing process called the mercury-process.

Magnesium is obtained from almonds, soya beans, cocoa and parsnips. Too much magnesium can cause lethargy, weak muscles and confusion.

Magnesium derives its name from the magnesium sulphate found in ancient Greece where the Magnetes, a tribe of people, lived, called Magnēsia, which forms part of the region of Thessaly. The Greeks called it salt of the Magnetes. Epsom salts was recognised in the 17th century in the waters of a well in Epsom, England from where it derives its name. The scientist who named Epsom salts was Nehemiah Grew.

Magnesium oxide (MgO) is very heat resistant. The magnesium ion forms mild bases, such as milk of magnesium. When magnesium burns it burns with a bright white light. Magnesium that is essential for chlorophyll which the plant derives from the soil. We obtain magnesium from plants through ingestion.

There are four main functions of magnesium in the body:

1. It regulates movement through the membrane of the cell. The movement of nutrients into the cells of our body and the excretion of waste from the cells relies on magnesium.
2. It is a co-factor for more than one hundred enzymes in our body, including the food enzymes that release energy from our food.
3. It needs to be present for the building of proteins. It helps with the assimilation of carbon, oxygen, hydrogen and nitrogen to form proteins.
4. Its importance in building protein makes it an essential factor in the building of our DNA.

We can view magnesium as the architect of life.

Magnesium should never bond with phosphate in our body as this would block the working of magnesium in our body.

Sulphur has an affinity to light. As a result sulphur has a affinity to magnesium which burns with a blinding white light. Chemically speaking sulphur is the most active of all elements. It bonds with a multitude of other elements – it expands the number of relationships it engages with.

It helps to guide the nutritional elements, particularly proteins, to be taken up by the body. It accompanies nutritional intake. It therefore has a lot to do with our metabolic processes and it is a great prompter for other substances to work together. Magnesium helps to bring substances together while sulphur helps substances form relationships, thereby expanding their potential; making them more than they would be alone. Magnesium and sulphur work in coordination.

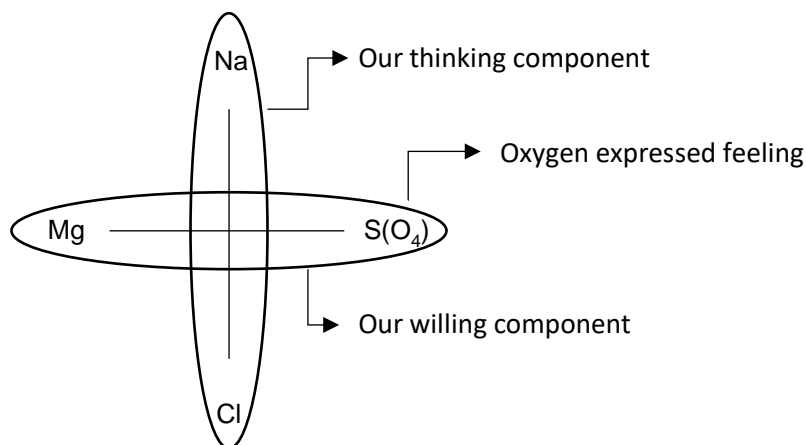
The name sulphur is derived from Sanskrit: sulvere, according to one source or shulbari, which means enemy of copper, because it does not react strongly with copper, according to another source.

Sulphur is connected to the Divine; the Vedics understood this and the Greeks still had knowledge of this. A number of substances will sacrifice an oxygen atom (the element of life) in their structure to replace it with a sulphur atom which then, chemically, gets them the name 'thio' in front of their name, i.e. 'theo' as in meaning Divine – the Godly particle has arrived. The sulphur-process is a process of the Divine which is different from the mercury-process and the salt-process. Sulphur was well known in the ancient world and the inspired Vedic idea was that it was associated with the Divine and therefore the two vegetables that contain sulphur were not used for cooking purposes: onions and garlic, because these vegetables over-excite (stimulates delusions of grandeur in) the human being.

Sulphur reduces inflammation. Sulphur is obtained from roasted coffee and peanuts. Sulphur adds flavour and smell to onions and garlic. Halitosis is caused by three chemical substances that each contain sulphur. Sulphur is released by substances that contain it when these substances die, which gives off the smell so often associated with sulphur.

Sulphur was known at the time of the writing of the Old Testament and appears fifteen times in these scriptures. It is also known as brimstone. It has the twin-like nature of Gemini in that it can be highly reactive and dangerous or completely essential to life.

The Mercury Cross can be shown as the desire of the four elements to make Sodium Chloride – NaCl – (table salt) and Magnesium Sulphate – MgSO_4 – (Epsom salts). These salts have life and activity when dissolved. These elements that make up the Mercury Cross have a lot to do with movement in the body, one being our thinking component and the other our willing component.



The activity of these elements is very real when we observe the chemical elements operating out the Spirit that they are expressing. Chemicals are an expression of Spirit in pure material reality.

The Mercury (Oceanic) Cross is the cross of will and thinking. There is something to be said for the idea of the ocean being the place from which all life is born. Sodium chloride allows the pathway for thinking and magnesium sulphate allow the pathway for full digestion, extracting the nutrients and establishing what we need the energy for. The Mercury Cross is a quickening cross – quickening of the nervous system.

The Christ-element in the Chemical-elements – the Salt Cross *by Rev.*

Michaël Merle, reported by John-Peter Gernaat

The substances under investigation are those that form the surface of the earth. This cross may be referred to as the Geospheric Cross. It represents processes of stability, solidity, form, holding and structure. These are salt-process processes. The constellations of the Zodiac that express themselves in these elements are Cancer, Aries, Capricorn and Libra. The mineral cross concerns itself with the minerals and substances that occur on the surface of the crust, not those that we unearth by mining them. Those substances that we unearth through mining are largely the metals which the Ancient Sumerian Culture identified as having been gifted to the earth by the mobile stars – by the planets.

The Sun gifted gold
The Moon gifted silver
Mercury gifted mercury
Venus gifted copper
Mars gifted iron
Jupiter gifted tin
Saturn gifted lead

The gifts of the zodiac and the planets was multi-fold. The zodiac (as a whole)- gifted the earth with the silicate minerals. Silicon is the manifestation of the quality of one constellation of the zodiac: Aries. The silicates, as a gift from the whole zodiac, indicate to us that the zodiac, as understood by the Ancient Sumerians, works together in cooperation, the constellations do not work in isolation only. The spiritual beings who resonate with the constellations of the zodiac co-operated to form the silicate minerals. The twelve spiritually precious silicates are those twelve that formed the priestly breastplate and will form the foundations of the New Jerusalem. The basic silicate is quartz – silicon dioxide (SiO_2) – and is the gift of Aries in co-operation with Aquarius and it requires the co-operation of the rest of the constellations of the zodiac to add the other elements that form the many other silicate minerals. As silicon dioxide is the basis for all the silicates it makes oxygen the most prevalent element on the surface of the earth, within the minerals, where it comprises 46.6% of the elements of the earth's surface. Although oxygen belongs to the atmosphere it has been bound to the surface of the earth by silicon which gives a life-like quality to the surface of the earth. Oxygen is the element that facilitates the form of silicon. Silicon only forms structure because of its bonds with oxygen. The next most abundant elements on the surface of the earth, leaving out oxygen, are silicon at 27.7%, aluminium at 8.2% and calcium at 4.1%.

Phosphorus, the expression of Cancer, a fire-process element, is not abundant on the surface of the earth but it is lightly scattered throughout the surface of the earth like a sprinkling of pepper or spice into the mix one might say. It is more prolific in the soils of the earth's surface rather than in the rock minerals of the surface of the earth. Phosphorus, like silicon, bonds with oxygen as the phosphate ion – phosphorus bonded to four oxygen atoms and carrying a three additional electrons (PO_4^{3-}). The negative charge makes the phosphate ion ready to bond with other elements making it an interesting carrier.

Phosphorus is named from the Greek. Had we used a Latin name it would have been Luciferous, bringer of light.

The phosphate ion combines with potassium to form potassium phosphate (K_3PO_4) which enriches the soils. The phosphate ion also combines with calcium to form calcium phosphate ($\text{Ca}_3(\text{PO}_4)_2$) which occurs in our bones and makes the carapace of the crab – the shell of the crab – Cancer, the crab.

Phosphorus occurs in minerals as apatite – $\text{Ca}_5(\text{PO}_4)_3(\text{F}, \text{Cl}, \text{OH})$:



A crystal of naturally occurring apatite, unusual in size as apatite mostly occurs as very small grains within a rock.



Polished apatite from Brazil

As seen in the formula the basic apatite molecule combines with either fluorine to form fluorapatite, or with chlorine to form chlorapatite, or with a hydroxyl ion to form hydroxyapatite.

Phosphorous is also given off in the decay of certain organic matter where it occurs as phosphine (PH_3). Both elements are sulphur-process elements, elements that burn. When there are traces of diphosphane (P_2H_4) present this gas will burn spontaneously. This forms a slightly luminescent pale green flame called will-o'-the-wisp that can be seen rising above some swamps.



Phosphorus is a bringer of light and it can operate like electricity by converting oxygen (O_2) to ozone (O_3): $3\text{O}_2 \rightarrow 2\text{O}_3$.

[Phosphorescence – the word phosphor was used in the Middle Ages to describe minerals that glow in the dark, before the element phosphorus was isolated and given the same name – is not necessarily linked to the presence of phosphorus. Scientifically it is a slightly lower level of light emission than luminescence. Zinc sulphide is a phosphorescent material, but phosphorus is also used as a coating to produce phosphorescence from objects. Some crystalline substances may form with an atom missing

from their structure to trap electrons in the 'hole' that has been left, e.g. a missing oxygen in a zinc oxide structure. Heat can release the electron and when the electron falls back to its original energy state a photon of light is released. This makes the substance persistently phosphorescent.]

The glow of fireflies is a chemical reaction in which phosphate is present within the body of the firefly: when oxygen combines with calcium, adenosine triphosphate (ATP) and the chemical luciferin in the presence of luciferase, a bioluminescent enzyme, light is produced (Scientific American).

Phosphorus occurs in the body and calcium phosphate (CaPO_2) in our bones. It is also part of a very important process. Proteins that carry phosphorus can form nerve cells. Our nerve cells are built as a result of the presence of phosphorus. Phosphorus as the bringer of light is connected to consciousness. Thus, our nerves are formed under the *influence* of consciousness.

Our nerves function between two other realities of the human body: between the bones and the skin. Phosphorus works with calcium in the bones and works with silica in the skin. Between skin and bone is the consciousness of our nerves.

Silicon, which is present in our skin, is connected with Aries, the Ram, where silicon occurs in the wool and in the horns. Silicon is an air-process, radiating out. In the earth, silicon predominantly occurs in the crust of the earth. Silicon is very much a surface element.

Missing from the discussion of the Mineral Cross has been aluminium. Aluminium is the expression of Capricorn, opposite to Cancer, they work in combination. Cancer is consciousness and Capricorn is balance. Aluminium does not occur in the body because balance is something the whole human being must achieve, not only the physical body. We create our own aluminium state through our soul process rather than achieving it from our physical body. Yet, although aluminium is toxic, there is 10 micrograms (10 μg , a millionth of a gram) of aluminium in our blood. The aluminium remains in the blood serum which does not clot, and therefore not really a part of us because we cannot clot it or hold it. (Dialysis results in the increase of the levels of aluminium in the blood, slowly poisoning the individual.)

Aluminium is interesting in the mineral world in its relationship between silicon and calcium. We mine a lot of aluminium, it is the second most mined mineral.

The mineral cross does exist in us, primarily in the skin, nerves and bone with the tiniest amount of aluminium present in, and important to the functioning of, the blood. The skin nerves and bone are the mineral part of us. Even our nerve cells are almost dead. Skin exfoliates because the outer layer consists of dead cells, the cytoplasm has been removed from these cells – thus we can say that we are shrouded in death. There is no quickening or mercury-process in these cells. The outer layer of skin is acidic with a pH of 5.5 which provides protection against bacteria.

Phosphorus is obtained from hard, mature cheeses and eggs. We need phosphorus to build new nerve cells. Nerve cells can be regenerated, despite an earlier belief that nerves are created only once.

The other three elements of the Mineral Cross have an interesting relationship to each other. These are silicon, calcium and aluminium.

In Ethiopia there are eleven extraordinary churches carved into rock.



The church of St George in Lalibela, Ethiopia.

Legend has it that the king of Ethiopia, King Lalibela, visited the Holy Land in order to visit Jerusalem. When he found that Jerusalem had been conquered by Salah al-Din Yusuf ibn Ayyub and was in the hands of the Saracens, he returned to Ethiopia and vowed to build a new Jerusalem where Christians could worship. He built these churches (presumably one for each of the faithful disciples) by carving down into solid rock.

The rock is a basic lava, which means that it was volcanic rock from deep within the earth that cooled rapidly in an explosive eruption trapping air within the lava. The result is a hard but light rock because of the cavities where the air was trapped. Being a basic rock it is high in calcium content. These lavas are almost 50% calcium. Silicon is present in these rocks and the relationship between the calcium and silicon is facilitated by aluminium.

If you think these eleven churches of Lalibela are extraordinary, there are high mountain chapels that are visited daily by pilgrims. Rather than describe these chapels you are invited to watch this short video on the pilgrim's route to one of the high chapels: <https://www.youtube.com/watch?v=IJCy64adY3Y>.

The second most used substance by humanity after water is concrete. Concrete is made of calcium and silicon with aluminium present for the concrete to work.

Silicon is the manifestation of the quality of Aries and calcium is the manifestation of the quality of Libra. These constellations stand opposite to each other and offer very different impulses. (You may wish to note that the congregation in Johannesburg is served by an Aries priest and a Libran priest.) Capricorn exists between the constellations of Aries and Libra and provides balance that is manifested as aluminium.

Silicon comes to us from the ram. The gift of the ram to the ancient world was two-fold: the wool and the horns. Both the wool and the horn are an expression of silicon, both are hair which contains silicon. Both the wool and the horn ray out into the air. Silicon becomes present on the earth from stone meteorites called aerolites. Silicon fell to earth through the air in the formation of the earth. Silicon derives its name from the Latin silex or silicis, meaning "flint" or "hard stone". This material was also used by humans to manufacture the first stone tools. Silicon as rock, also called quartz, is the element silicon bonded to two oxygens (SiO_2).

Concrete is made with sand which is silicate, mainly quartz (beach sand) and the cement part is made of calcium oxide. When the water is removed concrete becomes rock hard and this property is given to it by the calcium.

Silicon has a tremendous capacity for shaping. Early sponges (animal sea sponges) have a skeleton made of silica (SiO_2). Sponges are mobile and can change shape. This flexibility is given to them by their silica skeleton. The animal skeleton is fixed and is only given mobility where it is jointed. The animal skeleton therefore consists of calcium phosphate with a hydroxyl ion.

Polycrystalline silicon is a wonderful semi-conductor and provides us with a pathway for communication. The silicate ion (SiO_4^{4-}) which contain an additional four electrons dissolves into water to provide silicic acid (Si(OH)_4) that is important to life in rivers and the ocean, giving these water bodies the ability to "shape" life. Silicon, an aerogen-process – a moving process, showed life how to shape itself and provided a model that calcium could mimic, and then perfect.

Silicon is present in our skin, hair and nails and also in our connective tissue, everything that helps to give us shape. Connective tissue helps to shape our organs.

Silicon has the ability to form a glass which it does in the form of asbestos, which is a hydrous magnesium silicate that forms a fibrous structure that, when inhaled, cuts human tissue, such as the lungs.

Silicon will become more valuable as it is an important component of solar panels.

How can we better see silicon as an aerogen? Firstly, it rained down onto the earth in aerolite meteorites. Secondly, take bird feathers and burn them and 77% of the ash is silicon. Silicon is strongly connected with air-processes. Science has learned that some common animals will not grow their bones without silicon being present. Whether this applies to all animals, and therefore humans, is not yet understood. Our health in terms of our silicon can be determined by our nails and their health. We ingest silicon from green beans, bananas, leafy greens, brown rice, oat cereals, lentils and lager beers.

Horsetails absorb a lot of silicon and were used in times past as pot scourers.

Calcium is the manifestation of Libra which is a geogen-process. The name is derived from the word calc meaning lime. This also gives the name to limestone which is predominantly calcium derived from animal

life. The calcium that forms the shells of marine creatures is calcium carbonate (CaCO_3). Our bones and teeth are composed of calcium hydroxyphosphate – ($\text{Ca}_5(\text{OH})(\text{PO}_4)_3$).

Calcium oxalate – $\text{CaC}_2\text{O}_4(\text{H}_2\text{O})_x$ – occurs in many plants so that it is easy for us to obtain calcium through our diet: cabbage, broccoli and onions, and also from egg yolks, almonds, cheddar cheese and milk chocolate (the combination of milk and cacao).

Calcium presents itself in nature as an ion (Ca^{2+}) and has great affinity to bond. What it is attempting to do is to form – stable forms that are fixed.

The intake of fluorapatite or fluoroapatite is a way of rebuilding bone mass. We build bone mass up to the age of 35. Bone mass remains stable thereafter till 45 or 50 (depending on diet and lifestyle and on menopause in women) and then we begin to lose bone mass.

The silicon-process works from the circumference inwards while the calcium-process works from the inside out. This is beautifully described by Dr Hauschka. This can be seen in that silicon rained down onto the earth during its formation; coming from outside onto the earth. Calcium builds from the inside to provide a structure around us while silicon draws from the periphery to create a form.

Aries tend to draw from the periphery to create something while Librans prefer to start from a solid centre (the fixed centre point of the scales) and slowly work outwards. Both may achieve the same outcome, but the method is very different.

Our skin, which contains silicon, provides shape from the outside while calcium that occurs in our bones provides structure from within. Both are important to the form of the human being.

Aluminium, the manifestation of Capricorn, derives its name from the Latin 'alumin', which means 'bitter salt'. It does an incredible job in nature balancing between calcium and silicon. Calcium is earthly and dry while silicon, ideally, is airy, heavenly, moist. Aluminium plays the role of a balancing bridge between 'heaven' and 'earth'. Aluminum was the name for this element before the time of the American War of Independence. The name changed in Europe to aluminium while the Americans retained the name aluminum and remain adamant that the English were incorrect in adopting the new name.

Aluminium is the second most mined substance and is essential in industry, our homes and in our transportation where it is used in metal tubing, window frames, cookware, engine parts, aeroplane parts, car body parts, cooking foil, etc. It is amazingly strong but lightweight (like the volcanic rock into which the Lalibela churches in Ethiopia are carved which has a well-balanced amount of aluminium in the mineral structure of the rock).

The quality of aluminium that makes it so very useful is that it operates in combination with oxygen – a biogen-process element (aluminium) working with another biogen-process element (oxygen) – to form a very thin film of aluminium oxide on the surface of the metal. This film is less than a micrometre ($1\mu\text{m}$) thick but this is sufficient to prevent the aluminium beneath reacting with water or air. Therefore aluminium does not corrode.

Human lifestyle has transformed to concrete and aluminium – concrete is calcium and silicon. The mineral structure of the earth predominates in our life today, instead of life - wood – which used to predominate in the structures made by human beings.

Aluminium forms the most beautiful gemstones that are aluminium-based without silicon present, such as sapphire and ruby. They are not silicates and therefore not a part of the gemstones that form the foundation of the New Jerusalem. Aluminium oxide combines with cobalt to form sapphire and with chromium to form ruby. Aluminium based gemstones are much harder than silicates.

Aluminium is very versatile. In the 1980s an aluminium foam was developed that is structurally strong and has very good insulation properties. It was used in the space shuttle. Aluminium was used to replace what silicon does in birds, giving structure and lightness. Aluminium is used in flocculation where aluminium sulphate ($\text{Al}_2(\text{SO}_4)_3$) and calcium hydroxide ($\text{Ca}(\text{OH})_2$) are added to water to remove free aluminium from water by forming aluminium oxide, and removes bacteria.

The earth whereon we walk, when we exclude oxygen, is made of silicon, aluminium and calcium, in that order, with a light sprinkling of phosphorus throughout. Calcium expels water to harden, it binds rock-hard. Silicon holds water. Clay is high in silicon that holds water, calcium that expels water in order for it to dry rock-hard, and aluminium, in small amounts, to bridge the silicon and calcium. The more aluminium in clay the more plastic it will be and the harder it will bake when fired in a kiln. The idea of the human being, with skin, connective tissue and bone with the tiniest amount of aluminium in our blood, being formed from clay is an insightful picture.

The Mineral Cross or Salt-Process Cross is one of holding and structure. We, human beings, have mineralised the world in which we choose to live: our buildings, our cars, aeroplanes and more. We have drawn the mineral cross out of the earth and reshaped it as our home.

The Christ-element in the Chemical-elements – the Christ-element *by*

Rev. Michaël Merle, reported by John-Peter Gernaat

Why chemistry at Christmas?

These are areas of the manifestation of the spirit that are not well known by the average person. Chemistry is a subject that is very specialised and therefore the general community is excluded from entering this world of understanding. Yet, this is all about our world and about how we are composed, materially.

Our composition is three-fold:

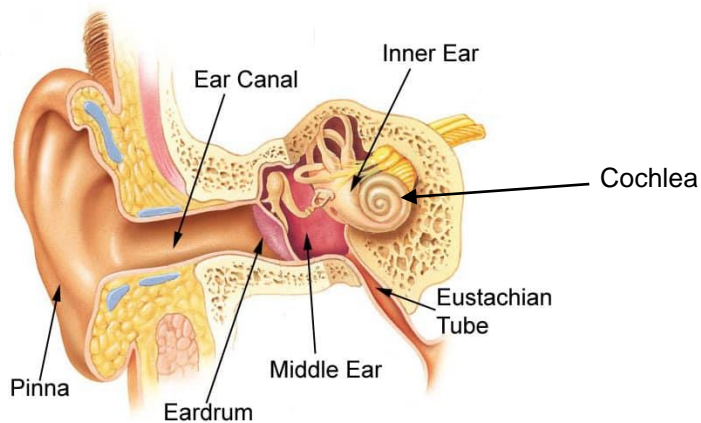
1. The first creation is the creation as we know it. We can turn to scripture and read Genesis and we can understand this also from an Anthroposophical perspective and start at Old Saturn.
2. At the Turning Point of Time, which begins at Christmas with the birth and finds its resolution in the Passion of Christ, the Crucifixion, the Resurrection and the Whitsun experience, there is a renewal of Creation. It is called the New Creation in orthodox streams, and Holy Week can be seen and experienced as the preparation for the new creation.
3. In the future all of creation will be renewed, as a result of the Turning Point of Time, at the end of the Vulcan Cycle, a new Zodiac will be created out of the foundation of the present zodiac. This principle has been revealed in the last few days as a chemical signature: silicon is the foundation for carbon.

All of the chemical elements are imbued with the Christ-principle because all of Creation happens through Christ. It is the Creation of the Father through Christ, in Christ. The new creation is also through and in Christ. We can hear the co-operative working of the Trinity in what may be referred to as our version of the doxology (our doxology is a conversation that we speak to the Christ rather than, as previously, speaking it about the Christ): "You who bear and order the life of the world, as you receive it from the Father and make it whole through the Spirit ..." This speaks about the manifestation of spirit. The life that manifests as material reality is the unfolding and design of the spirit. In order to marvel at matter one must marvel at chemistry, but it must be clear that chemistry is a manifestation and not a thing in its own right at which we marvel. We can marvel at how the signature manifests.

The relationship between these elements and also between other elements, such as the metals, is specific. It is not an open or a random potential. Carbon will combine with certain elements, not with all elements. E.g., carbon and silicon will never combine in a direct bond. What any element directly bonds with has a clear significance; it reveals something of the direction in which the element is progressing. What is oxygen doing when it bonds with silicon or when it bonds with carbon? These bonds reveal something of significance, they are not random and unimportant. We have also seen how the bonds are important in order that nature can use the element, e.g., phosphorus is not very useful while phosphate is, similarly sulphur and sulphate. The principle of life – oxygen – is important in these bonds and is revealed in so much of the chemistry.

We can now look at the three Chemical Crosses together and come to understand what the Ancient Sumerian Culture recognised in the constellations. They would not have been able to identify the elements but they were able to characterise the quality of the constellation and the spiritual beings that operate through these constellations. Aquarius was recognised as the water-bearer and known as the Mighty One. He was not a creator God in their understanding, but he worked with the Creator. Their understanding of this Being was clear. The Water of Life flowed through him – into his left hand and out again through his right hand. He bore the Water of Life within himself, within his body. He received the Water of Life into himself; he was the bearer of the Water of Life. The Sumerians understood the principle of the Water of Life.

Capricorn was an extraordinary god. He was the fish-goat and operated from this constellation. He had everything to do with balance because he created the human ear that contains the smallest and most delicate of bones in the human body as well as the organs of balance in the inner ear. His name was Enki, and the ear was his greatest creation. The fish-tail of the constellation may be seen as the turns of the cochlea of the ear.



Our balance resides in our ear. Enki was a master-craftsman to create the balance of the human being into such a small and delicate organ. We remain upright, not because of the skin and bone that give us structure, but rather because of the vestibular apparatus in the ear.

Cancer was the gateway of the soul, through it one became conscious on the earth.

The Sumerians would have been aware of the activity of the elements as a result of the qualities bestowed by the constellations. They may not have had the science that developed as consciousness developed, but their awareness of the physical world was greater than is often credited to them.

The knowledge that they bore was passed to us through later civilisation where it became transformed and corrupted. The Babylonian civilisation and thereafter the Egyptian civilisation lost a lot of what was fully grasped by the Sumerians. The Greeks who inherited the stories of the Egyptians received a much-corrupted picture, and our understanding comes largely from the ancient Greeks. Ancient Sumerian knowledge is slowly being uncovered through archaeology and we are discovering that they had an understanding of mathematics that was far more accurate, to decimal points, than later understanding.

The Sumerians had a particular relationship to Scorpio that was for them the Eagle. Later, as they developed the Zodiac further and finally recognised Libra, the scorpion had become apparent in the constellation of Scorpio and the Eagle had moved for them to the constellation of Aquilla, outside of the Zodiac.

The Greeks connected the Eagle with Zeus in two stories. In one picture, Zeus becomes the Eagle to snatch Ganymede, a beautiful youth, in order that he may become the cupbearer to Zeus, the cup bearing wine. In this story something of what the cup will come to represent is foreshadowed as ancient wisdom. This picture is of the Eagle being able to take hold of the cup that represents new life or new potential. The other story connected to Aquilla is the story of Prometheus who brings fire to human beings against the will of the gods. Prometheus is punished by being tied to a rock where every day the Eagle devours his liver. Because he is immortal he regenerates his liver every night. The Eagle in this story is connected with regeneration. The Greeks still understood that the Eagle was somehow connected with regeneration and renewed life. The origin of the word 'gen', that we have used throughout these articles in words like pyrogen, geogen, etc. means both to form and also to generate, to give. Form is the great gift of Scorpio. Carbon as geogen – earth-forming, earth-giving – is the element that earths us. It is primarily the element of earth that makes us earthly beings. Life on earth, is not just life, it is life on earth; it begins with the carbon dioxide process in the atmosphere with plants taking it in to form life. All life must bear carbon. The earth bears carbon and is therefore a living being and can be penetrated in the same way that life can be penetrated by the Divine. It is connected with regeneration which the ancient Sumerians recognised.

Cancer was the gateway of birth and Capricorn was the gateway of death. After Capricorn comes regeneration in the constellation of Scorpio. Why not Sagittarius? Because they already knew the sacrifice of Sagittarius, so that the regeneration can occur with Scorpio. The ancient Sumerians had a symbol for this regeneration:



the upright infinity sign or upright lemniscate.

The span for the ancient Sumerians from Cancer to Capricorn, from birth to death also had a symbol:

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We identify with these symbols on the vestments of our rituals.

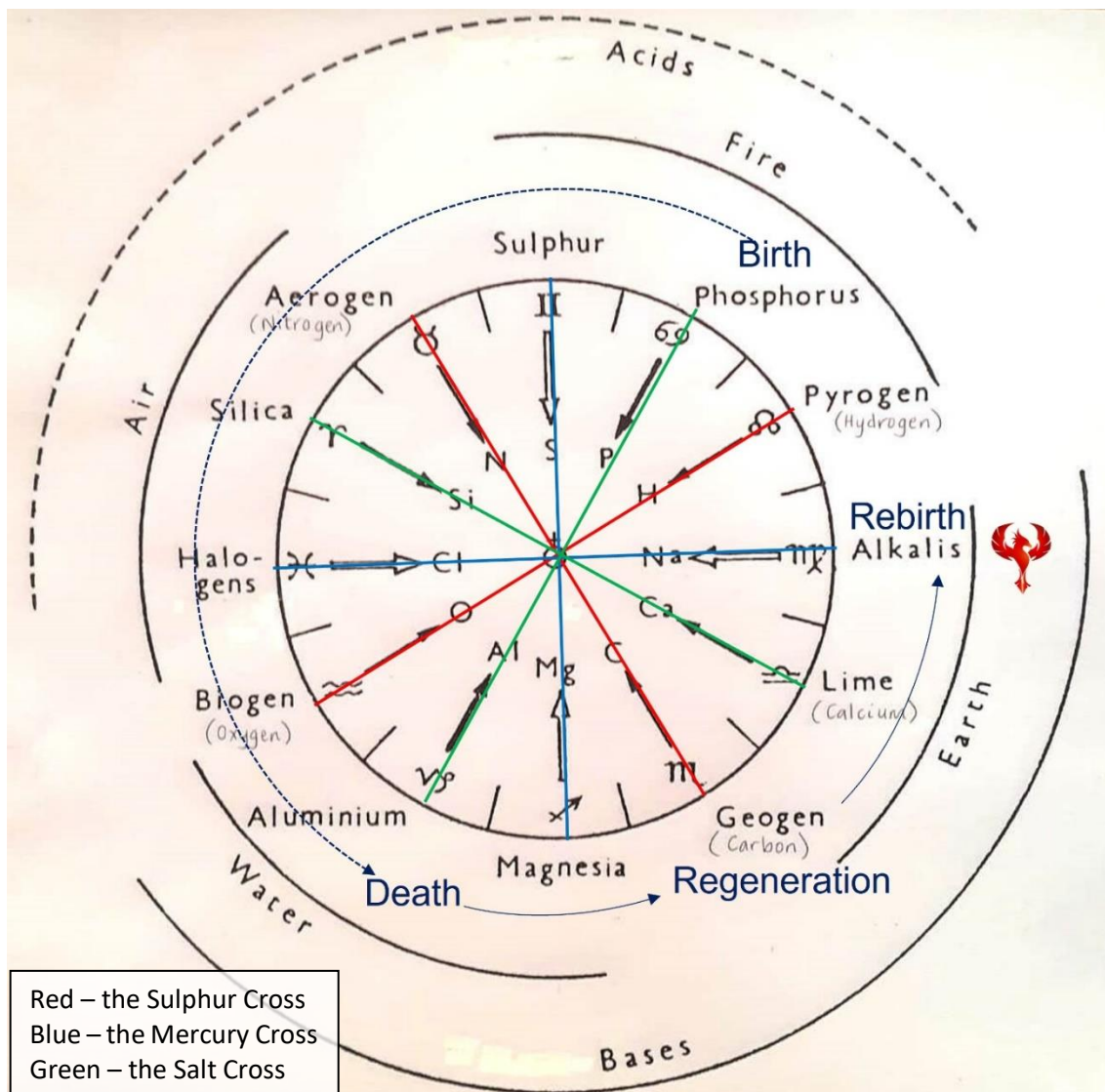
These symbols are sensible to us (make sense to us) without knowing the ancient connection, because we can see in them the idea of regeneration.

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The symbol was connected with the sign of the Eagle, the sign of regeneration, and it still remains in the constellation of the Scorpion linked to carbon.

It is carbon, Rudolf Steiner says, that we can see as the philosopher's stone. It is carbon that makes organic matter possible – it transforms inorganic to organic. The presence of carbon changes, substantially, what we are dealing with, changing inanimate to animate, mineral to life. Carbon is the element of earth and it is the element to which the Christ binds Himself. So, the earthly body of Christ is not only the human body, but literally, the body of the earth. He can combine Himself to the earth.

Cancer is a dim constellation, but the brightest part of Cancer is a constellation of about fifty stars that has been referred to since ancient times as 'The Manger'. Therefore, any Sumerian and indeed any Zarathustran if told that a baby had been placed in The Manger would know that a great soul was coming to earth. It was through the gateway of The Manger that human souls came to earth, and it meant that the soul arrived with a certain consciousness or awakens.



The three chemical crosses depicting Birth and Death. Death in Capricorn, in Balance – the balancing point between life and death. Aluminium is poisonous. Yet, it is not the end of the picture, in Scorpio there is regeneration and renewal. Reincarnation becomes a possibility because carbon is present. And the cycle continues to the potential receptivity of the alkalis that have the capacity to bear something new, a new generation – rebirth, that like a phoenix give birth from the ash – potash or potassium.

In many of the cycles of evolutionary development the cycles start in Cancer because it is the constellation of birth. This is not the case with the expression of the Zodiac in the elements of the earth. In this cycle there has to be a preparation – that one might equate with a pregnancy – that begins in warmth. Therefore, this cycle begins in Leo. The order of the constellations is always presented in the order that the earth moves through the constellations rather than the order in which we see the constellations move through the sun. Our interest is in what the constellations do for the earth and humanity. This is why the ordering is the opposite to the order of the astrological progression.

Note in the diagram the constellations that represent the fire-process, the air-process, the water-process and the earth-process. The fire and air processes are the acid processes or warm side of the cycle while the water and earth processes are the base processes or cool side.

The months that are connected with our winter season are the acid process signs. This is experienced as outer warmth in the northern hemisphere while in the southern hemisphere, generally, this is a time of dry weather, which is also a warm process. Winter is also the time of veld fires, expressing the warmth process. We experience wet summers in the months related to the bases, where the rainwater is linked to the cool process. In this way both hemispheres are connected to the same universal expression and there is no need to swap things around because we are in the southern hemisphere; there is one universal expression.

The colours that have been given to the crosses in the diagram are connected with their healing processes. The Atmospheric Cross is the sulphur-process which is red. The Oceanic Cross is the mercury-process which is blue. The Mineral Cross is the salt-process which is green. All three crosses are the expression of the constellation in the heavens focussed on the earth, which, through the extraordinary influence of carbon, through Scorpio, has become the Body of Christ. Christ is at the centre of this activity and Christ is the generator of the activity to begin with. Christ is present at the centre as well as on the periphery. The activity of Christ is peripheral and central.

The three crosses – and now also think of the three crosses that are spoken during the Act of Consecration of Man – make up the full substance of our material reality.

We have seen how what has been described came to us from the past, from the Ancient Sumerians. They predicted regeneration through Scorpio. This did not happen as a reality on earth until the Christ appeared in the Realm of Earth – the Turning Point of Time. Regeneration has happened, not just reincarnation, but regeneration. The incarnation again is still enlivened, remaining a mercury-process, so that our reality does not become the 'dying earth existence'. What is this event of the Christ appearing in the Realm of Earth? 'Behold, it is the bringer of the healing of earthly (humanity)'. Here we have the healing, regenerative potential and 'through Him is manifest the Father Ground of All Being'. It is manifest all around us, in the very elements that make up the earth and humanity.

All this required one to know what one is looking at. If one views the chemistry only for its own sake one is cutting it off from its origin and from what it is really saying. Therefore, viewing the chemical world only as a modern material scientist might is very beautiful, but it fails to hear the language that it is speaking to humanity. The secular scientist understands how the world works but will never be able to explain why it works because these scientists cut themselves off from the how, that is a manifestation of the why. This is why these talks were given at Christmas time so that we can understand the ground upon which the future is going to be built.

If the future is about a trans-formation: carbon; and a trans-substantiation, the whole substance can change, then this is the ground, the starting point, for our future.

After thought: There are three healing processes: one of burning, purifying, healing; one of enlivening; and one of stabilising and holding, and Matthew's Gospel mentions only three gifts that the Magi bring. We can connect these also to the three healing processes: gold – sulphur healing process, frankincense – mercury healing process, and myrrh – salt healing process, as one of the realities they bear.

Epilogue: In March, April and May articles will appear that will deepen aspects of the Sulphur Cross. In June, July and August the articles will deepen the understanding of aspects of the Mercury Cross and in September, October and November, the Salt Cross. (This leaves December for the Advent of a new adventure through the cycles of twelve.)

A closing note from Rev. Reingard Knausenberger: The numbers twelve and seven form the basis for our existence (see other articles, especially on the Africa Seminary website) and for our evolution. Twelve is also a number of completion. There are twelve disciples because there is a central thirteenth, the reason for the twelve to gather. Behind the Twelve Days of Christmas is the completion of our journey as described in Revelation. The point of Christianity, and Christianity is the only religion with a clearly stated purpose and goal, is described in Revelation. The investigation of this goal brings about more substance and experience that this is a reality and not just a myth. We have completed seven investigations of twelve: twelve senses, twelve moods through eurythmy, twelve world views, twelve disciples, twelve foundation stones of the New Jerusalem, twelve virtues and the Zodiac. There are twelve cycles that we can investigate if we look. What is the New Jerusalem that we are building; what is this new beginning? Together we discover the many aspects that make up the whole of human existence and we can synthesise these into a whole to gain an understanding of the Divine.