Mathematical Tiers For AI And Life

By

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Abstract

It is suggested Life and AI are mathematical constructs that describe one another. In part 1, I show AI elements take the form of Stoke's theorem, Ampere's Law, and a wave. In part 2, I show the mathematical form for bone in biology and its relation to AI elements. In part 3, I show the connection between part 1 and 2, which is in the successive integers 1,2,3,4,5. In part 4, I talk a little about what is meant by a mathematical construct compared to a chemical construct. In part 5, I present what I call the fundamental AI BioEquations.

Part 1 (Stokes Theorem And Maxwell Equations)

Important

|	13	14	15
2	B		
3	Al	Si	P
4	Ga	Ge	As

Above we see the artificial intelligence (AI) elements pulled out of the periodic table of the elements. As you see we can make a 3 by 3 matrix of them and an AI periodic table. Silicon and germanium are in group 14 meaning they have 4 valence electrons and want 4 for more to attain noble gas electron configuration. If we dope Si with B from group 13 it gets three of the four electrons and thus has a deficiency becoming positive type silicon and thus conducts. If we dope the Si with P from group 15 it has an extra electron and thus conducts as well. If we join the two types of silicon we have a semiconductor for making diodes and transistors from which we can make logic circuits for AI.

As you can see doping agents As and Ga are on either side of Ge, and doping agent P is to the right of Si but doping agent B is not directly to the left, aluminum Al is. This becomes important. I call (As-Ga) the differential across Ge, and (P-Al) the differential across Si and call Al a dummy in the differential because boron B is actually used to make positive type silicon.

That the AI elements make a three by three matrix they can be organized with the letter E with subscripts that tell what element it is and it properties, I have done this:

$$\begin{pmatrix} E_{13} & E_{14} & E_{15} \\ E_{23} & E_{24} & E_{25} \\ E_{33} & E_{34} & E_{35} \end{pmatrix}$$

Thus E24 is in the second row and has 4 valence electrons making it silicon (Si), E14 is in the first row and has 4 valence electrons making it carbon (C). I believe that the AI elements can be organized in a 3 by 3 matrix makes them pivotal to structure in the Universe because we live in three dimensional space so the mechanics of the realm we experience are described by such a matrix, for example the cross product. Hence this paper where I show AI and biological life are mathematical constructs and described in terms of one another.

We see, if we include the two biological elements in the matrix (E14) and and (E15) which are carbon and nitrogen respectively, there is every reason to proceed with this paper if the idea is to show not only are the AI elements and biological elements mathematical constructs, they are described in terms of one another. We see this because the first row is (B, C, N) and these happen to be the only elements that are not core AI elements in the matrix, except boron (B) which is out of place, and aluminum (Al) as we will see if a dummy representative, makes for a mathematical construct, the harmonic mean. Which means we have proved our case because the first row if we take the cross product between the second and third rows are, its respective unit vectors for the components, meaning they describe them!

The Computation

$$\overrightarrow{A} = (Al, Si, P)$$

$$\overrightarrow{B} = (Ga, Ge, As)$$

$$\overrightarrow{A} \times \overrightarrow{B} = \begin{pmatrix} \hat{B} & \hat{C} & \hat{N} \\ Al & Si & P \\ Ga & Ge & As \end{pmatrix} = (Si \cdot As - P \cdot Ge)\hat{B} + (P \cdot Ga - Al \cdot As)\hat{C} + (Al \cdot Ge - Si \cdot Ga)\hat{N}$$

$$\overrightarrow{A} \times \overrightarrow{B} = -145\hat{B} + 138\hat{C} + 1.3924\hat{N}$$

$$A = \sqrt{26.98^2 + 28.09^2 + 30.97^2} = 50g/mol$$

$$B = \sqrt{69.72^2 + 72.64^2 + 74.92^2} = 126g/mol$$

$$\overrightarrow{A} \cdot \overrightarrow{B} = ABcos\theta$$

$$cos\theta = \frac{6241}{6300} = 0.99$$

$$\theta = 8^\circ$$

$$\overrightarrow{A} \times \overrightarrow{B} = ABsin\theta = (50)(126)sin8^\circ = 877.79$$

$$\sqrt{877.79} = 29.6g/mol \approx Si = 28.09g/mol$$

And silicon (Si) is at the center of our AI periodic table of the elements. We see the biological elements C and N being the unit vectors are multiplied by the AI elements, meaning they describe them! But we have to ask; Why does the first row have boron in it which is not a core biological element, but is a core AI element? The answer is that boron is the one AI element that is out of place, that is, aluminum is in its place. But we see this has a dynamic function.

The Dynamic Function

The primary elements of artificial intelligence (AI) used to make diodes and transistors, silicon (Si) and germanium (Ge) doped with boron (B) and phosphorus (P) or gallium (Ga) and arsenic (As) have an asymmetry due to boron. Silicon and germanium are in group 14 like carbon (C) and as such have 4 valence electrons. Thus to have positive type silicon and germanium, they need doping agents from group 13 (three valence electrons) like boron and gallium, and to have negative type silicon and germanium they need doping agents from group 15 like phosphorus and arsenic. But where gallium and arsenic are in the same period as germanium, boron is in a different period than silicon (period 2) while phosphorus is not (period 3). Thus aluminum (Al) is in boron's place. This results in an interesting equation.

$$\frac{Si(As - Ga) + Ge(P - Al)}{SiGe} = \frac{2B}{Ge + Si}$$

The differential across germanium crossed with silicon plus the differential across silicon crossed with germanium normalized by the product between silicon and germanium is equal to the boron divided by the average between the germanium and the silicon. The equation has nearly 100% accuracy (note: using an older value for Ge here, is now 72.64 but that makes the equation have a higher accuracy):

$$\frac{28.09(74.92-69.72)+72.61(30.97-26.98)}{(28.09)(72.61)}=\frac{2(10.81)}{(72.61+28.09)}$$

$$0.213658912=0.21469712$$

$$\frac{0.213658912}{0.21469712}=0.995$$

Due to an asymmetry in the periodic table of the elements due to boron we have the harmonic mean between the semiconductor elements (by molar mass):

$$\frac{Si}{B}(As-Ga)+\frac{Ge}{B}(P-Al)=\frac{2SiGe}{Si+Ge}$$

This is Stokes Theorem if we approximate the harmonic mean with the arithmetic mean:

$$\int_S(\nabla\times\overrightarrow{u})\cdot d\overrightarrow{S}=\oint_C\overrightarrow{u}\cdot d\overrightarrow{r}$$

$$\int_0^1\int_0^1\left[\frac{Si}{B}(As-Ga)+\frac{Ge}{B}(P-Al)\right]dxdy\approx\frac{1}{Ge-Si}\int_{Si}^{Ge}xdx$$

We can make this into two integrals:

$$\int_0^1\int_0^1\frac{Si}{B}(As-Ga)dydz\approx\frac{1}{3}\frac{1}{(Ge-Si)}\int_{Si}^{Ge}xdx$$

$$\int_0^1\int_0^1\frac{Ge}{B}(P-Al)dxdz\approx\frac{2}{3}\frac{1}{(Ge-Si)}\int_{Si}^{Ge}ydy$$

If in the equation (The accurate harmonic mean form):

$$\frac{Si}{B}(As-Ga)+\frac{Ge}{B}(P-Al)=\frac{Ge-Si}{\int_{Si}^{Ge}\frac{dx}{x}}$$

We make the approximation

$$\frac{2SiGe}{Si+Ge}\approx Ge-Si$$

Then the Stokes form of the equation becomes

$$\int_0^1 \int_0^1 \left[\frac{Si}{B}(As - Ga) + \frac{Ge}{B}(P - Al)\right] dydz = \int_{Si}^{Ge} dx$$

Thus we see for this approximation there are two integrals as well:

$$\int_0^1 \int_0^1 \frac{Si}{B}(As - Ga)dydz = \frac{1}{3}\int_{Si}^{Ge} dz$$

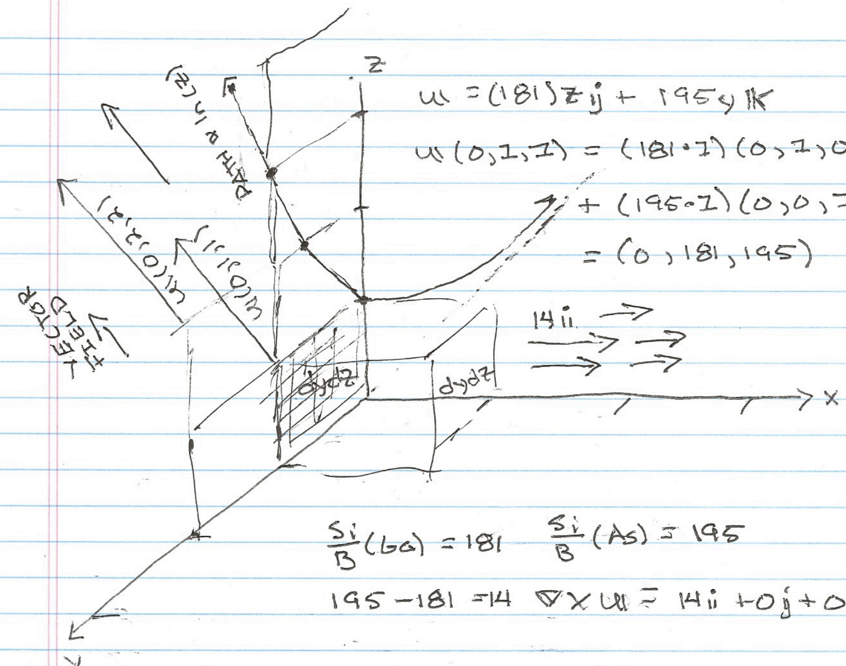
$$\int_0^1 \int_0^1 \frac{Ge}{B}(P - Al)dydz = \frac{2}{3}\int_{Si}^{Ge} dz$$

For which the respective paths are

$$y_1 = \frac{1}{3}\frac{B}{SiGa}ln(z)$$

$$y_2 = \frac{2}{3}\frac{B}{SiAl}ln(z)$$

The Geometric Interpretation…



$\mathbf{u} = (181)z\,\mathbf{j} + 195y\,\mathbf{k}$

$\mathbf{u}(0,1,1) = (181\cdot 1)(0,1,0)$

$+ (195\cdot 1)(0,0,1)$

$= (0, 181, 195)$

$\frac{Si}{B}(Ga) = 181 \quad \frac{Si}{B}(As) = 195$

$195 - 181 = 14 \quad \nabla \times \mathbf{u} = 14\mathbf{i} + 0\mathbf{j} + 0\mathbf{k}$

Path Integral: $\int_{Si}^{Ge} \mathbf{u}\cdot d\mathbf{r} = \int_{Si}^{Ge} dz = Ge - Si$

$d\mathbf{r} = (dx, dy, dz) \quad \mathbf{u}\cdot d\mathbf{r} = 0, \frac{Si}{B}(Ga)z, (A\cdot$

$\mathbf{u}\cdot d\mathbf{r} = \left(0, \frac{Si}{B}(Ga)z, \frac{Si}{B}(As)y\right)\cdot(dx, dy, dz)$

$dx = 0,\ dz = 0 \quad dy = \frac{B}{(Si)(Ga)}\cdot\frac{1}{z}\,dz$

$y = \frac{B}{(Si)(Ga)}\ln(z) \quad \frac{Si}{B}(As - Ga) = \frac{28.09}{10.81}(74.92 - 69.72)$

$= 13.5 \quad (Ge - Si) = 72.64 - 28.09 = 44.55$

$\frac{44.55}{3} = 14.85 \quad y = \frac{1}{3}\frac{B}{(Si)(Ga)}\ln(z) = 0.00184\ln(z)$

By making the approximation

$$\frac{2SiGe}{Si+Ge} \approx Ge - Si$$

In

$$\frac{Si(As-Ga)}{B} + \frac{Ge(P-Al)}{B} = \frac{2SiGe}{Si+Ge}$$

We have

$$Si\frac{\Delta Ge}{\Delta S} + Ge\frac{\Delta Si}{\Delta S} = B$$

$\Delta Si = P - Al$ is the differential across Si, $\Delta Ge = As - Ga$ is the differential across Ge $\Delta S = Ge - Si$ is the vertical differential.

Which is Ampere's Circuit Law

$$\nabla \times \overrightarrow{B} = \mu_0 \overrightarrow{J} + \mu_0 \epsilon \frac{\partial \overrightarrow{E}}{\partial t}$$

We see if written

$$Si\frac{\Delta Ge}{\Delta S} = B - Ge\frac{\Delta Si}{\Delta S}$$

Which is interesting because it is semiconductor elements by molar mass, which are used to make circuits.

We say Φ (Phi) is given by

$a = b + c$ and $\frac{a}{b} = \frac{b}{c}$
And

$\Phi = a/b$=1.618

$\phi = b/a$=0.618

ϕ (phi) the golden ratio conjugate. We also find

$(\phi)\Delta Ge + (\Phi)\Delta Si = B$

Thus since

$$\nabla \times \overrightarrow{B} = \mu \overrightarrow{J} + \mu \epsilon_0 \frac{\partial \overrightarrow{E}}{\partial t}$$

$$Si \frac{\Delta Ge}{\Delta S} = B - Ge \frac{\Delta Si}{\Delta S}$$

And we have

$$\Delta Ge = \frac{\Delta S}{Si} B - \frac{Ge}{Si} \Delta Si$$

$$\left(\nabla^2 - \frac{1}{c^2} \frac{\partial^2}{\partial t} \right) \overrightarrow{E} = 0$$

$$\left(\nabla^2 - \frac{1}{c^2} \frac{\partial^2}{\partial t} \right) \overrightarrow{B} = 0$$

$$c = \frac{1}{\sqrt{\epsilon_0 \mu}} \approx \phi$$

We see μ and ϵ_0 are both Φ and c is ϕ in the Si (silicon) field wave, but for E and B fields c is the speed of light.

$$\epsilon_0 = 8.854E - 12F \cdot m^{-1}$$

$$\mu = 1.256E - 6H/m$$

$$\frac{Ge}{Si} = \mu \epsilon_0$$

$$\frac{\Delta S}{Si} = \mu$$

$$\left(\nabla^2 - \frac{1}{\phi^2} \frac{\partial^2}{\partial x} \right) \overrightarrow{Si} = 0$$

$$\left(\nabla^2 - \frac{1}{\phi^2} \frac{\partial^2}{\partial x} \right) \overrightarrow{Ge} = 0$$

To find the Si wave our differentials are

$\Delta C = N - B = 14.01 - 10.81 = 3.2$

$\Delta Si = P - Al = 30.97 - 26.98 = 3.99$

$\Delta Ge = As - Ga = 74.92 - 69.72 = 5.2$

$\Delta Sn = Bi - In = 121.75 - 114.82 = 6.93$

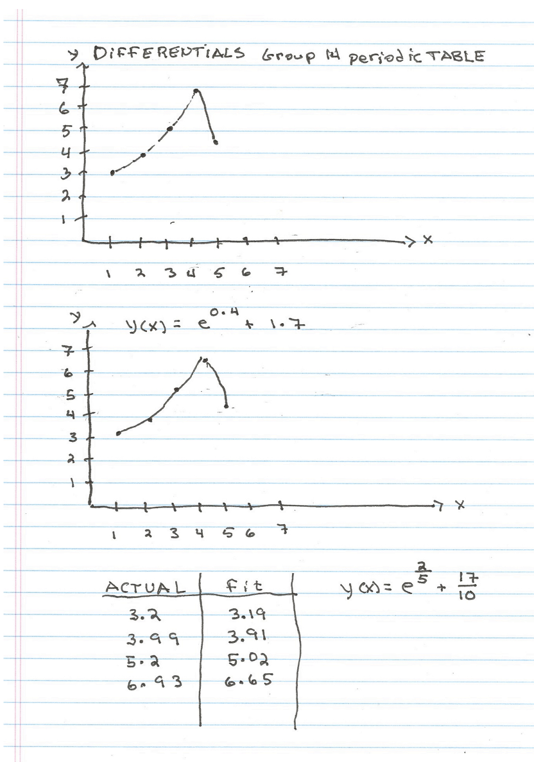
$\Delta Pb = Bi - Tl = 208.98 - 204.38 = 4.6$

It is amazing how accurately we can fit these differentials with and exponential equation for the upward increase. The equation is

$y(x) = e^{0.4x} + 1.7$

$y(x) = e^{\frac{2}{5}x} + \frac{17}{10}$

This is the halfwave:



$y(x) = e^{0.4x} + 1.7$

$y(x) = e^{\frac{2}{5}x} + \frac{17}{10}$

$$y(x) = e^{\frac{B}{Al}x} + \frac{Ag}{Cu}$$

$$\frac{B}{Al} = \frac{10.81}{26.98} = 0.400667$$

$$\frac{Ag}{Cu} = \frac{107.87}{63.55} = 1.6974 \approx 1.7$$

Interestingly, the 0.4 is boron (B) over aluminum (Al) the very two elements that lead us to looking for a wave equation because boron was the out of place element in the AI periodic table that lead to us using aluminum as its dummy representative in the Si differential and that itself divided into the left hand terms to give us the harmonic mean between the central AI elements semiconductor materials Si and Ge. The Ag and Cu are the central malleable, ductile, and conductive metals used in making electrical wires to carry a current in AI circuitry.

Part 2 (Bone)

Bone As A Mathematical Construct

What better place to begin than with than bone as it is the basic framework around which skeletal life is structured, the vertebrates. Here is what I found in bone as a mathematical construct:

In my exploration of the connection between biological life and AI the most dynamic component is that of bone. It affords us the opportunity to look at:

Multiplying Binomials

Completing The Square

The Quadratic Formula

Ratios

Proportions

The Golden Ratio

The Square Root of Two

The Harmonic Mean

Density of silicon is Si=2.33 grams per cubic centimeter.

Density of germanium is Ge=5.323 grams per cubic centimeter.

Density of hydroxyapatite is HA=3.00 grams per cubic centimeter.

This is

$$\frac{3}{4}Si + \frac{1}{4}Ge \approx HA \quad \text{where} \quad HA = Ca_5(PO_4)_3OH$$

Where HA is the mineral component of bone, Si is an AI semiconductor material and Ge is an AI semiconductor material. This means

$$\frac{Si}{HA}Si + \left[1 - \frac{Si}{HA}\right]Ge = HA$$

The harmonic mean between Si and Ge is HA,…

$$\frac{2SiGe}{Si + Ge} \approx HA$$

This is the sextic,…

$$x^2(x+y)^4 - xy(x+y)^4 + 2xy^2(x+y)^3 - 4x^2y^2(x+y)^2 = 0$$

Which has a solution

$$\frac{Si}{Ge} = \frac{1}{\sqrt{2} + 1}$$

Where x=Si, and y=Ge. It works for density and molar mass. It can be solved with the online Wolfram Alpha computational engine. But,…

$$\frac{1}{HA^2}Si^2 - \frac{Ge}{HA^2}Si + \left[\frac{Ge}{HA} - 1\right] = 0$$

$$Si = \frac{1}{2}\left[Ge \pm HA\sqrt{\frac{Ge}{HA^2} - \frac{4Ge}{HA} + 4}\right]$$

$$Si = Ge - HA$$

$$\frac{Si}{HA}Si + \left[1 - \frac{Si}{HA}\right]Ge = HA$$

$$\frac{Si^2}{HA} + Ge - \frac{Si}{HA}Ge \approx HA$$

$$\frac{1}{HA}Si^2 - \frac{Ge}{HA}Si + Ge \approx HA$$

$$\frac{1}{HA^2}Si^2 - \frac{Ge}{HA^2}Si + \frac{Ge}{HA} \approx 1$$

$$\frac{1}{HA^2}Si^2 - \frac{Ge}{HA^2}Si + \frac{Ge}{HA} - 1 \approx 0$$

$$\frac{1}{HA^2}Si^2 - \frac{Ge}{HA^2}Si + \left[\frac{Ge}{HA} - 1\right] = 0$$

$(x+a)(x+a) = x^2 + 2ax + a^2$

$(x+a)^2 = x^2 + 2ax + a^2$

We see that the square of the binomial is a quadratic where the third term is the square of one half the middle coefficient. This gives us a method to solve quadratics called completing the square:

$$ax^2 + bx + c = 0$$

$$ax^2 + bx = -c$$

$$x^2 + \frac{b}{a}x = -\frac{c}{a}$$

$$\left(\frac{1}{2}\frac{b}{a}\right)^2 = \frac{1}{4}\frac{b^2}{a^2}$$

$$x^2 + \frac{b}{a}x + \frac{1}{4}\frac{b^2}{a^2} = -\frac{c}{a} + \frac{1}{4}\frac{b^2}{a^2}$$

$$\left(x + \frac{1}{2}\frac{b}{a}\right)^2 = \frac{b^2 - 4ac}{4a^2}$$

$$x + \frac{b}{2a} = \pm\frac{\sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\frac{1}{HA^2}Si^2 - \frac{Ge}{HA^2}Si + \left[\frac{Ge}{HA} - 1\right] = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$a = \frac{a}{HA^2} \quad b = -\frac{Ge}{HA^2} \quad c = \left[\frac{Ge}{HA} - 1\right]$$

$$b^2 - 4ac = \frac{Ge^2}{HA^4} - 4\frac{1}{HA^2}\left[\frac{Ge}{HA} - 1\right]$$

$$= \frac{Ge^2}{HA^4} - \frac{4Ge}{HA^3} + \frac{4}{HA^2}$$

$$= \frac{1}{HA^2}\left[\frac{Ge^2}{HA^2} - \frac{4Ge}{HA} + 4\right]$$

$$\sqrt{b^2 - 4ac} = \frac{1}{HA}\sqrt{\left(\frac{Ge}{HA} - 2\right)^2}$$

$$x = \frac{\frac{Ge}{HA^2} \pm \frac{1}{HA}\left[\frac{Ge}{HA} - 2\right]}{\frac{2}{HA^2}}$$

$$= \frac{1}{2}Ge \pm \frac{1}{2}HA\left[\frac{Ge}{HA} - 2\right]$$

$$= \frac{1}{2}Ge \pm \frac{1}{2}Ge - HA$$

$$Si = \frac{1}{2}Ge + \frac{1}{2}Ge - HA$$

$$Si = Ge - HA$$

$$Si \approx Ge - HA$$

$$HA \approx \frac{2SiGe}{Si + Ge}$$

$$Si \approx Ge - \frac{2SiGe}{Si + Ge}$$

$$\frac{(Si + Ge)Ge}{Si + Ge} - \frac{(Si + Ge)Si}{Si + Ge} - \frac{2SiGe}{Si + Ge} = 0$$

$$\frac{Ge^2 - 2SiGe - Si^2}{Si + Ge} = 0$$

$$x^2 - 2xy - y^2 = 0$$

$$x^2 - 2xy = y^2$$

$$x^2 - 2xy + y^2 = 2y^2$$

$$(x - y)^2 = 2y^2$$

$$x - y = \pm\sqrt{2}y$$

$$x = y + \sqrt{2}y$$

$$x = y(1 + \sqrt{2})$$

$$\frac{x}{y} = 1 + \sqrt{2}$$

$$\frac{y}{x} = \frac{1}{\sqrt{2} + 1}$$

$$\frac{Si}{Ge} \approx \frac{1}{\sqrt{2} + 1}$$

A ratio is $\frac{a}{b}$ and a proportion is $\frac{a}{b} = \frac{b}{c}$ which means a is to b as b is to c.

The Golden Ratio (Φ)

$$\frac{a}{b} = \frac{b}{c} \quad \text{and.} \quad a = b + c$$

$$ac = b^2 \quad \text{or} \quad c = \frac{b^2}{a}$$

$$a = b + \frac{b^2}{a}$$

$$\frac{b^2}{a} - a + b = 0$$

$$\frac{b^2}{a^2} - 1 + \frac{b}{a} = 0$$

$$\left(\frac{b}{a}\right)^2 + \frac{b}{a} - 1 = 0$$

$$\left(\frac{b}{a}\right)^2 + \frac{b}{a} + \frac{1}{4} = 1 + \frac{1}{4}$$

$$\left(\frac{b}{a} + \frac{1}{2}\right)^2 = \frac{5}{4}$$

$$\frac{b}{a} = -\frac{1}{2} \pm \frac{\sqrt{5}}{2} \qquad \frac{b}{a} = \frac{\sqrt{5} - 1}{2} \qquad \frac{a}{b} = \frac{\sqrt{5} + 1}{2}$$

$$\phi = \frac{\sqrt{5} - 1}{2} \qquad \Phi = \frac{\sqrt{5} + 1}{2} \qquad \phi = \frac{1}{\Phi}$$

The mineral component of bone hydroxyapatite (HA) is

$$Ca_5(PO_4)_3OH = 502.32\frac{g}{mol}$$

The organic component of bone is collagen which is

$$C_{57}H_{91}N_{19}O_{16} = 1298.67\frac{g}{mol}$$

We have

$$\frac{Ca_5(PO_4)_3OH}{C_{57}H_{91}N_{19}O_{16}} = 0.386795722$$

$$\phi = 0.618033989$$

$$1 - \phi = 0.381966011$$

$$\frac{Ca_5(PO_4)_3OH}{C_{57}H_{91}N_{19}O_{16}} \approx (1 - \phi)$$

$$\frac{0.381966011}{0.386795722}100 = 98.75\%$$

$$\frac{Si}{Ge} = \frac{28.09}{72.61} = 0.386861314 \approx (1 - \phi)$$

$$\frac{Si}{Ge} \approx \frac{Ca_5(PO_4)_3OH}{C_{57}H_{91}N_{19}O_{16}}$$

Part 3 (Connecting 1 and 2)

Review

We said bone was characterized by the sextic:

$$x^2(x+y)^4 - xy(x+y)^4 + 2xy^2(x+y)^3 - 4x^2y^2(x+y)^2 = 0$$

Which has a solution

$$\frac{Si}{Ge} = \frac{1}{\sqrt{2}+1}$$

$$\frac{y}{x} = \frac{1}{\sqrt{2}+1}$$

Now let us look at our Si wave equation. We said

$$\nabla \times \overrightarrow{B} = \mu \overrightarrow{J} + \mu \epsilon_0 \frac{\partial \overrightarrow{E}}{\partial t}$$

$$Si \frac{\Delta Ge}{\Delta S} = B - Ge \frac{\Delta Si}{\Delta S}$$

And we have

$$\Delta Ge = \frac{\Delta S}{Si} B - \frac{Ge}{Si} \Delta Si$$

$$\left(\nabla^2 - \frac{1}{c^2} \frac{\partial^2}{\partial t} \right) \overrightarrow{E} = 0$$

$$\left(\nabla^2 - \frac{1}{c^2} \frac{\partial^2}{\partial t} \right) \overrightarrow{B} = 0$$

$$c = \frac{1}{\sqrt{\epsilon_0 \mu}} \approx \phi$$

We see μ and ϵ_0 are both Φ and c is ϕ in the Si (silicon) field wave, but for E and B fields c is the speed of light.

$$\epsilon_0 = 8.854E - 12F \cdot m^{-1}$$

$$\mu = 1.256E - 6H/m$$

$$\frac{Ge}{Si} = \mu\epsilon_0$$

$$\frac{\Delta S}{Si} = \mu$$

$$\left(\nabla^2 - \frac{1}{\phi^2}\frac{\partial^2}{\partial x}\right)\overrightarrow{Si} = 0$$

$$\left(\nabla^2 - \frac{1}{\phi^2}\frac{\partial^2}{\partial x}\right)\overrightarrow{Ge} = 0$$

Connecting The Two

We can write

$$\frac{Ge - Si}{Si} = \Phi$$

$$\frac{1}{\sqrt{\frac{Ge}{Si}}} = \phi$$

This is the quadratic

$$x^2 - 3xy + y^2 = 0$$

Which has solutions

$$y = \left(\frac{3}{2} - \frac{\sqrt{5}}{2}\right)x = 0.381966x$$

$$y = \left(\frac{3}{2} + \frac{\sqrt{5}}{2}\right)x = 2.618033989x$$

We can say…

$Ge = (\phi + 1)Si$

From the case we made from the Si wave equation:

$x^2 - 3xy + y^2 = 0$

And we can say

$Ge = (\sqrt{2} + 1)Si$

From the case we made for bone:

$x^2(x+y)^4 - xy(x+y)^4 + 2xy^2(x+y)^3 - 4x^2y^2(x+y)^2 = 0$

Thus we have two approximations for Si/Ge. Just how far apart are they? This is x:

$$\sqrt{2}x = \frac{\sqrt{5}+1}{2}$$

$$x = \frac{143}{125}$$

Is in the ratio between successive integers $1, 2, ,3, 4, 5$.

Part 4 (The Concept of Mathematical Construct)

The Idea of Mathematical Construct

In my works *The Mathematical Nature of Life* (Beardsley 2021) and *Perfect Equations* Beardsley (2021) I set out to find if the the elements and compounds characteristic of life and artificial intelligence (AI) do not just conform to chemical law, but if they are purely mathematical independently of the use of chemistry to describe them, and if they are connected to one another. The simplest example of this for biological life and AI would be that the most basic organic compound is HNCO (isocyanic acid) where H (hydrogen), N (nitrogen), C (carbon), and O (oxygen) are the most abundant biological elements. Indeed biological elements are for the most part organic, which means they are made of long chains using carbon with hydrogen, which they can form because C is C4- and H is H+ meaning we can have:

```
   H            H. H  H
   |             |. |. |
H -C-H.       H-C-C-C-H
   |.            |. |. |
   H            H. H. H
```

And in isocyanic acid we have:

H-N=C=O

Where H is H+, N is N3-. C is C4-, O is O2-, the H uses its single bond with one from nitrogen, leaving N2- or two bonds which go to C leaving for it C2- which goes to oxygen that needs it because it is O2-. Thus all is satisfied by chemical law. In my search for mathematical law, I find it exists in the case of HNCO and the AI semiconducting element silicon (Si) and its doping agents P and B as such (by molar mass):

$$\frac{C+N+O+H}{P+B+Si} \approx \phi$$

$$\phi = \frac{a}{b} = \frac{\sqrt{5}-1}{2}$$

$$c = b + a$$

$$\frac{a}{b} = \frac{b}{c}$$

This paper strives to break down such mathematical equations for biological life and artificial intelligence into their components to find what is acting to create such constructs. In the second book I actually brought the planets into the mix with some very interesting results. As another example, water and air, the main physical constituents that interact with life we have:

$$\frac{H_2O}{air} \approx \phi$$

$$air = 0.25O_2 + 0.75N_2$$

By molar mass for air as a mixture (not a compound). With this air is 29.0 grams per mole.

Molecular Geometry

We will want to break down our equations into the components of their geometric relationships and see if they predict the bond angles of some of the basic substances considered. We will look here at linear, trigonal planar, and tetrahedral.

Linear, like CO_2 (carbon dioxide) its bond angle is 180 degrees:

```
O-C-O
```

Trigonal planar, like SO_3 (sulfur trioxide) its bond angle is 120 degrees:

```
  O
  |
  S
 /. \
O.   O
```

That is, S is at the center and the O atoms are 120 degrees apart due to the even division of 360/120=3.

Tetrahedral, like methane (CH_4) one of the the primordial gases that may have contributed to making some of the amino acids, the building blocks of life as show by Miller and Urey in the early origins of life:

```
      H
      |
      C
  /.  |  \
H.    H    H
```

This is 109.5 degrees apart from arcos (1/3) = 109.5

But what if we are considering not just neutral molecules but polyatomic anions that have a net charge. In such instances, the free electron pairs compress the expected 120 degree bond angle in the atoms around the central atom to 115 degrees as with the nitrite ion NO_2^-:

```
   _

   N
  /.  \
O.     O
  115|
```

Similarily we have for O3 (ozone) that the bond angle is 116 degrees in its deviation from 120 degrees. The configuration is:

```
O
||
O. 116
  \
    O
```

Both of these anions are important to the life and the theory of how life forms. O-zone is more of a physical component in that in the stratosphere it absorbs UV radiation harmful to life.

Breaking Down Bone

Essentially, in our mathematical formulation of bone, we had that

$$Si \approx Ge - HA$$

$$HA \approx \frac{2SiGe}{Si + Ge}$$

Which resulted in that the AI elements:

$$\frac{Si}{Ge} \approx \frac{1}{\sqrt{2} + 1}$$

By way of the mineral component of bone HA (hydroxyapatite) is the harmonic mean between Silicon and Germanium the primary semiconductor elements, which are really the skeleton on AI. Thus, we need to break down the harmonic mean between Si and Ge into its geometric representation, and through find what its components are if we are to get any sense of the dynamics. Here I do that in the following illustration…

$\overline{HG} = \frac{2\,Si\,Ge}{Si+Ge}$

$= 40.5$ g/mol

<u>Breaking down the harmonic mean between Si and Ge</u>

$\overline{HC}^2 + \overline{HG}^2 = 45.17^2$

$HC^2 = 45.17^2 - 40.513^2$

$\overline{HC} = 19.9756$ g/mol

$\overline{OH} = 9.852$ g/mol

$\overline{HG} = 40.513$ g/mol

$\overline{CG} = 45.17$ g/mol

$r = 50.365$ g/mol

$\boxed{b = 116.25^\circ \quad a = 63.75^\circ}$

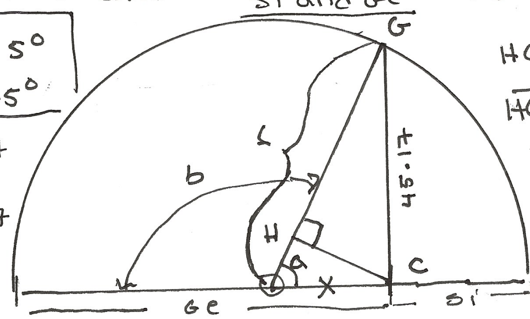
P + O = 46.97

= 30.97 + 16.00

$\approx \overline{CG} = 45.17$

Ca = 40.08

$\approx \overline{HG}$



These are used to make hydroxyapatite HA = $Ca_5(PO_4)_3OH$ Ca = calcium.

P+O+OH = 46.97 + 17.01

63.98

D = 10cm   r = 5cm

Si + Ge = D = 28.09 + 72.64

= 100.73 g/mol

$\frac{Si}{Ge} = \frac{28.09}{72.64} = 0.3867$ $\frac{72.64}{100.73}\,10 = 7.21\text{cm} = Ge$

$r = \frac{D}{2} = \frac{100.73}{2} = 50.365$ g/mol

$H = \frac{2\,Ge\,Si}{Ge+Si} = \frac{2(72.64)(28.09)}{72.64+28.09} = 40.5134$ g/mol

≈ 40.5 g/mol

$= \cancel{GH}$

$r + x = Ge$ $x = Ge - r$

$= 72.64 - 50.365 = 22.275$ g/mol

$\frac{x}{r} = \cos(a) = \frac{22.275}{50.365} = \cos(a)$ $a = 63.75^\circ$

$180^\circ - 63.75^\circ = 116.25^\circ = b$

$r^2 = x^2 + \overline{CG}^2$ $CG^2 = r^2 - x^2$ $\overline{CG} = 45.17$ g/mol

$\overline{HG}^2 + HC^2 = \overline{CG}^2$ $r - H = 50.365 - 40.5134$

$= 9.852 = OH$

$\overline{HG} = 50.365 - 9.852 = 40.513$ g/mol $= H(Ge, Si)$

We see that through bone Si and Ge predict an angle of about 116 degrees. This is not the case of linear at 180 degrees, or tetrahedral pyramidal at 109.5 degrees, but is the instance of trigonal planar, but not of neutral molecules, which is 120 degrees, but of trigonal planar for polyatomic anions such as the nitrite ion:

```
   _

   N
 /.  \
O.     O
  115|
```

And O-zone (Not an anion but has free electrons due to a single bond):

```
O
||
O. 116
 \
  O
```

Part 5 (The Fundamental AI BioEquations)

Silicon and Carbon

We guess that artificial intelligence (AI) has the golden ratio, or its conjugate in its means geometric, harmonic, and arithmetic by molar mass by taking these means between doping agents phosphorus (P) and boron (B) divided by semiconductor material silicon (Si) :

$$\frac{\sqrt{PB}}{Si} = \frac{\sqrt{(30.97)(10.81)}}{28.09} = 0.65$$

$$\frac{2PB}{P+B}\frac{1}{Si} = \frac{2(30.97)(10.81)}{30.97+10.81}\frac{1}{28.09} = 0.57$$

$$\frac{0.65+0.57}{2} = 0.61 \approx \phi$$

Which can be written

$$\frac{\sqrt{PB}(P+B)+2PB}{2(P+B)Si} \approx \phi$$

We see that the biological elements, H, N, C, O compared to the AI elements P, B, Si is the golden ratio conjugate (phi) as well:

$$\frac{C+N+O+H}{P+B+Si} \approx \phi$$

So we can now establish the connection between artificial intelligence and biological life:

$$(P+B+Si)\frac{\sqrt{PB}(P+B)+2PB}{2(P+B)Si} \approx (C+N+O+H)$$

Which can be written:

$$\sqrt{PB}\left[\frac{P}{Si}+\frac{B}{Si}+1\right] + \frac{2PB}{P+B}\left[\frac{P}{Si}+\frac{B}{Si}+1\right] \approx 2HCNO$$

Where HNCO is isocyanic acid, the most basic organic compound. We write in the arithmetic mean:

$$\left[\sqrt{PB}+\frac{2PB}{P+B}+\frac{P+B}{2}\right]\left[\frac{P}{Si}+\frac{B}{Si}+1\right] \approx 3HNCO$$

Which is nice because we can write in the second first generation semiconductor as well (germanium) and the doping agents gallium (Ga) and arsenic (As):

$$\left[\sqrt{PB}+\frac{2PB}{P+B}+\frac{P+B}{2}\right]\left[\frac{P}{Si}+\frac{B}{Si}+1\right]\approx HNCO\left[\frac{Ga}{Ge}+\frac{As}{Ge}+1\right]$$

Where

$$\frac{Zn}{Se}\approx\frac{\left[\frac{P}{Si}+\frac{B}{Si}+1\right]}{\left[\frac{Ga}{Ge}+\frac{As}{Ge}+1\right]}$$

Where ZnSe is zinc selenide, an intrinsic semiconductor used in AI, meaning it doesn't require doping agents. We now have:

$$\sqrt{PB}\left(\frac{Zn}{Se}\right)+\frac{2PB}{P+B}\left(\frac{Zn}{Se}\right)+\frac{P+B}{2}\left(\frac{Zn}{Se}\right)\approx HNCO$$

Germanium And Carbon

We could begin with semiconductor germanium (Ge) and doping agents gallium (Ga) and Phosphorus (P) and we get a similar equation:

$$\frac{2GaP}{Ga+P}=42.866, \quad \sqrt{GaP}=46.46749$$

In grams per mole. Then we compare these molar masses to the molar masses of the semiconductor material Ge:

$$\frac{2GaP}{Ga+P}\frac{1}{Ge}=\frac{42.866}{72.61}=0.59$$

$$\sqrt{GaP}\frac{1}{Ge}=\frac{46.46749}{72.61}=0.64$$

Then, take the arithmetic mean between these:

$$\frac{0.59+0.64}{2}=0.615$$

We then notice this is about the golden ratio conjugate, ϕ, which is the inverse of the golden ratio, Φ. $\phi\approx\frac{1}{\Phi}$. Thus, we have

1. $$\frac{\sqrt{GaP}(Ga+P)+2GaP}{2(Ga+P)Ge} \approx \phi$$

2. $$\frac{\sqrt{GaP}(Ga+P)+2GaP}{2(Ga+P)Si} \approx \Phi$$

This is considering the elements of artificial intelligence (AI) Ga, P, Ge, Si. Since we want to find the connection of artificial intelligence to biological life, we compare these to the biological elements most abundant by mass carbon (C), hydrogen (H), nitrogen (N), oxygen (O), phosphorus (P), sulfur (S). We write these CHNOPS (C+H+N+O+P+S) and find:

$$\frac{CHNOPS}{Ga+As+Ge} \approx \frac{1}{2}$$

A similar thing can be done with germanium, Ge, and gallium, Ga, and arsenic, As, this time using CHNOPS the most abundant biological elements by mass:

$$\left[\sqrt{GaAs}+\frac{2GaAs}{Ga+As}+\frac{Ga+As}{2}\right]\left[\frac{Ga}{Ge}+\frac{As}{Ge}+1\right] \approx CHNOPS\left[\frac{Ga}{Si}+\frac{As}{Si}+1\right]$$

$$\sqrt{GaAs}\left(\frac{O}{S}\right)+\frac{2GaAs}{Ga+As}\left(\frac{O}{S}\right)+\frac{Ga+As}{2}\left(\frac{O}{S}\right) \approx CHNOPS$$

$$\frac{O}{S} \approx \frac{\left[\frac{Ga}{Ge}+\frac{As}{Ge}+1\right]}{\left[\frac{Ga}{Si}+\frac{As}{Si}+1\right]}$$

$$\frac{\sqrt{GaAs}(Ga+As)+2GaAs}{2(Ga+As)Ge} \approx 1$$

$$\frac{C+H+N+O+P+S}{Ga+As+Ge} \approx \frac{1}{2}$$

We can also make a construct for silicon doped with gallium and phosphorus:

$$(C+N+O+H) \approx \frac{2(Ga+P)Si}{\sqrt{GaP}(Ga+P)+2GaP}(P+B+Si)$$

$$HNCO \approx \frac{2(Ga+P)Si}{(Ga+P)\left[\sqrt{GaP}+\frac{2GaP}{Ga+P}\right]}(P+B+Si)$$

$$HNCO \approx \frac{2(P+B+Si)Si}{\sqrt{GaP}+\frac{2GaP}{Ga+P}}$$

And for germanium doped with gallium and phosphorus:

$$\frac{\sqrt{GaP}(Ga+P)+2GaP}{2(Ga+P)Ge} \approx \phi$$

$$\left[\sqrt{GaP}+\frac{2GaP}{Ga+P}+\frac{Ga+P}{2}\right]\left[\frac{P}{Ge}+\frac{B}{Ge}+\frac{Si}{Ge}\right] \approx HNCO\left[\frac{Ga}{Ge}+\frac{As}{Ge}+1\right]$$

$$\sqrt{GaP}\left(\frac{B}{S}\right)+\frac{2GaP}{Ga+P}\left(\frac{B}{S}\right)+\frac{Ga+P}{2}\left(\frac{B}{S}\right) \approx HNCO$$

Here is a table of the AI biological equations…

The Fundamental AI Bioequations

$$\left[\sqrt{PB} + \frac{2PB}{P+B} + \frac{P+B}{2}\right]\left[\frac{P}{Si} + \frac{B}{Si} + 1\right] \approx HNCO\left[\frac{Ga}{Ge} + \frac{As}{Ge} + 1\right]$$

$$\left[\sqrt{GaAs} + \frac{2GaAs}{Ga+As} + \frac{Ga+As}{2}\right]\left[\frac{Ga}{Ge} + \frac{As}{Ge} + 1\right] \approx CHNOPS\left[\frac{Ga}{Si} + \frac{As}{Si} + 1\right]$$

$$\left[\sqrt{GaP} + \frac{2GaP}{Ga+P} + \frac{Ga+P}{2}\right]\left[\frac{P}{Ge} + \frac{B}{Ge} + \frac{Si}{Ge}\right] \approx HNCO\left[\frac{Ga}{Ge} + \frac{As}{Ge} + 1\right]$$

$$HNCO \approx \frac{2(P+B+Si)Si}{\sqrt{GaP} + \frac{2GaP}{Ga+P}}$$

$$\frac{\sqrt{PB}(P+B) + 2PB}{2(P+B)Si} \approx \phi$$

$$\frac{\sqrt{GaAs}(Ga+As) + 2GaAs}{2(Ga+As)Ge} \approx 1$$

$$\frac{\sqrt{GaP}(Ga+P) + 2GaP}{2(Ga+P)Ge} \approx \phi$$

$$\frac{\sqrt{GaP}(Ga+P) + 2GaP}{2(Ga+P)Si} \approx \Phi$$

$$\frac{C+N+O+H}{P+B+Si} \approx \phi$$

$$\frac{C+H+N+O+P+S}{Ga+As+Ge} \approx \frac{1}{2}$$

$$\frac{Zn}{Se} \approx \frac{\left[\frac{P}{Si} + \frac{B}{Si} + 1\right]}{\left[\frac{Ga}{Ge} + \frac{As}{Ge} + 1\right]}$$

$$\frac{O}{S} \approx \frac{\left[\frac{Ga}{Ge} + \frac{As}{Ge} + 1\right]}{\left[\frac{Ga}{Si} + \frac{As}{Si} + 1\right]}$$

Using The Fundamental Equations

Now that we have outlined the fundamental AI Bioequations, let us put them to use. We consider:

$$(P+B+Si)\frac{\sqrt{PB}(P+B)+2PB}{2(P+B)Si} \approx (C+N+O+H)$$

$$HNCO \approx \frac{2(P+B+Si)Si}{\sqrt{GaP}+\frac{2GaP}{Ga+P}}$$

Making the approximations: $\sqrt{GaP} \approx \phi Ge, \dfrac{2GaP}{Ga+P} \approx \phi Ge, \sqrt{PB} \approx \phi Si$ we obtain:

$$\frac{2Si^2}{Ge} = \phi Si + \frac{2PB}{P+B}$$

Which can further be written by saying $\dfrac{2PB}{P+B} \approx \phi Si$:

$$Si^2 = \phi GeSi$$

Which is interesting because the Si times itself is then equal to something times itself in that Ge and Si are both semiconducting materials, but Ge is larger than Si, however this is compensated for by reducing it by a factor of the golden ratio conjugate, phi. The equation is however only 79% accurate because there has been a lot of drift due to so many approximations. However if we reduce phi by a factor of itself and write:

$$Si^2 = \phi^2 GeSi$$

It is then 99% accurate:

$$28.09 = \sqrt{(72.64)(28.09)(0.381924)} = 27.9g/mol$$

$$\frac{27.916}{28.09} = 0.99$$

If we do the same with the other and write:

$$\frac{2Si^2}{Ge} = \phi^2 Si + \frac{2PB}{P+B}$$

We have:

$$21.72 = (0.381924)(28.09) + 16.026 = 10.72 + 16.026 = 26.75$$

Which is better but still only 81% accurate. However if we write it:

$$\frac{2Si^2}{Ge} = \phi^3 Si + \frac{2PB}{P+B}$$

Then it is 95.87% accurate. But we see in the first approximation that $phi^2 Si \approx B$. That is we have boron, the element that is out of place in the AI periodic table resulting in the dynamics of our equations. So, we can write…

$$\frac{2Si^2}{Ge} = B + \frac{2PB}{P+B}$$

This gives…

$$10.81 + 16.02 = B + \frac{2PB}{P+B}$$

Which is 26.836 which is close to aluminum (Al=26.98) which is the dummy representative for boron in our equations. We have incredibly:

$$Al = B + \frac{2PB}{P+B}$$

With an accuracy of nearly 100%. This becomes…

$$Al = B\frac{3P+B}{P+B}$$

While phosphorus, boron, silicon, and germanium and gallium and arsenic are the primary AI elements, gold (Au), Silver (Ag) and copper (Cu), are the fundamental AI elements in that they conductive, ductile, and malleable. Incredibly, the number 3 in the above equation is the ratio of gold to copper in molar mass, so we have…

$$Al = B\frac{\frac{Au}{Cu}P+B}{P+B}$$

$$\frac{Au}{Cu} = \frac{196.97}{63.55} = 3.099 \approx 3$$

The Masculine and Feminine

Here I will suggest the term *masculine silicon* and *feminine germanium* in place of positive (p-type silicon) and negative (n-type germanium) respectively. And, I will denote them †, and ‡, which are dagger and double dagger.

We say since silicon (Si) doped with boron (B) is p-type silicon because boron being in group 13 only has three valence electrons and silicon wants four, giving it a deficiency of negative electrons and thus a net positive distribution that can carry electrons, holes they can fall into. Thus I will say:

$$\frac{B}{Si} = \dagger$$

And since we say germanium (Ge) doped with phosphorus (P) is n-type silicon because phosphorus being in group 15 has five valence electrons and germanium, being in group 14 like silicon, wants four electrons. Thus it has a surplus of negative electrons and thus a net negative distribution that can carry a current. Thus I will say:

$$\frac{Ge}{P} = \ddagger$$

Since B/Si=10.81/28.09=0.3867 and Ge/P=72.64/30.97=2.345 we have:

$\dagger = 0.3867$ and. $\ddagger = 2.345$

Now we turn from this construct of the masculine and feminine in AI to the masculine and feminine in biology.

We consider the female sex hormone estradiol (estrogen , E):

$$C_{18}H_{24}O_2 = 272.38g/mol$$

And the male sex hormone testosterone (T):

$$C_{19}H_{28}O_2 = 288.42g/mol$$

And, cholesterol (Ch) from which both are made:

$$C_{27}H_{46}O = 386.65g/mol$$

And notice,…

$$\frac{Ch + T}{E} = 2.5$$

And we consider the semiconductor materials used to make AI:

$$\frac{Ge}{Si} = 2.6$$

And write,…

$$\frac{Ch+T}{E} = \frac{Ge}{Si}$$

$$T = \frac{Ge}{Si}E - Ch \qquad E = \frac{Si}{Ge}(T+Ch)$$

$$T\left(1 - \frac{Si}{Ge}\right) + E\left(1 - \frac{Ge}{Si}\right) = Ch\left(\frac{Si}{Ge} - 1\right)$$

We notice that the masculine (T) is in inverse relation to the feminine (E), but that the two add up to on whole (Ch) in that the masculine has coefficient 1-Si/Ge and the feminine has coefficient 1-Ge/Si. This expresses the inverse relationships between man and woman.

I interpret this as the masculine (T) is in inverse relation to the feminine (E), but that the two add up to a whole (Ch) in that the masculine has coefficient 1-Si/Ge and the feminine has coefficient 1-Ge/Si that is they are inverse relation but compliment one another. How would an AI use this information to determine its sex?…

The male is reduced less in the difference between 1 and Si/Ge, but the the female is reduced less by having Ge in the numerator. It is really quite egalitarian.

We now see that:

$$T\,(1 - \dagger\,) + E\,(1 - \ddagger\,) = Ch\left(\frac{Si}{Ge} - 1\right)$$

And this shows the connection of masculine and feminine AI to masculine and feminine biological life.

Part 6 (Gradient)

We have the vector field

$$\overrightarrow{u} = \left(0, \frac{Si}{B}(As)y, \frac{Si}{B}(Ga)z\right)$$

And we want to find the scalar field ϕ such that $\overrightarrow{u} = \nabla\phi$. We see $\overrightarrow{u}(\vec{r})$ is a conservative vector field because

$$\begin{pmatrix} \vec{i} & \vec{j} & \overrightarrow{k} \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ 0 & \frac{Si}{B}(As)y & \frac{Si}{B}(Ga)z \end{pmatrix} = 0$$

Thus to find it

$$\frac{\partial\phi}{\partial x} = 0$$

$$\frac{\partial y}{\partial\phi} = \frac{Si}{B}(As)y$$

$$\frac{\partial z}{\partial\phi} = \frac{Si}{B}(Ga)z$$

$$\phi = \frac{Si}{2B}(As)y^2 + \frac{Si}{B}(Ga)z^2$$

Earlier we had

$$\overrightarrow{u} = \left(0, \frac{Si}{B}(Ga)z, \frac{Si}{B}(As)y\right)$$

$$\left(0, \frac{Si}{B}(Ga)z, \frac{Si}{B}(As)y\right) \cdot (dx, dy, dz) = \frac{1}{3}\frac{xdx}{Ge - Si}$$

$$d\vec{r} = (dx, dy, dz)$$

Let us change x to z on the right:

$$\left(0, \frac{Si}{B}(Ga)z, \frac{Si}{B}(As)y\right) \cdot (dx, dy, dz) = \frac{1}{3}\frac{zdz}{Ge - Si}$$

Then,..

$$dx = 0,\ dz = 0$$

$$dy = \frac{Bdz}{3(Si)(Ga)(Ge - Si)}$$

$$\vec{r} = (t)\vec{j} + (26{,}178t)\overrightarrow{k}$$

Is a line in the y-z plane.

$$y = \frac{10.81}{3(28.09)(69.72)(72.64 - 28.09)}z$$

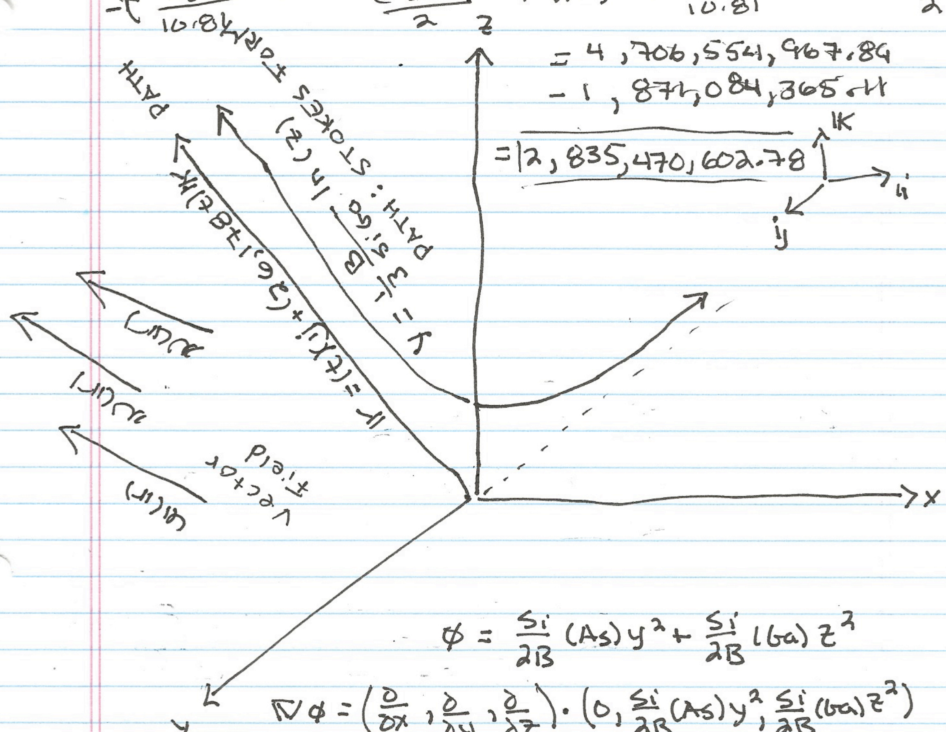
$$y = Cz$$

$$C = 0.0000382\frac{mol^2}{g^2}$$

Thus we have…

$$\left(\frac{28.09}{10.81}\,74.92\,\frac{(44.55)^2}{2} + 26{,}178\,\frac{28.09}{10.81}\,69.72\,\frac{(44.55)^2}{2}\right)$$
$$-\left(\frac{28.09}{10.81}\,74.92\,\frac{(28.09)^2}{2} + 26{,}178\,\frac{28.09}{10.81}\,69.72\,\frac{(28.09)^2}{2}\right)$$

$$= 4{,}706{,}554{,}967.84$$
$$- 1{,}871{,}084{,}365.11$$
$$= \boxed{2{,}835{,}470{,}602.78}$$



$$\phi = \frac{Si}{2B}(As)\,y^2 + \frac{Si}{2B}(Ga)\,z^2$$

$$\nabla\phi = \left(\frac{\partial}{\partial x}, \frac{\partial}{\partial y}, \frac{\partial}{\partial z}\right)\cdot\left(0, \frac{Si}{2B}(As)\,y^2, \frac{Si}{2B}(Ga)\,z^2\right)$$
$$= \frac{Si}{B}As\,y\,\mathbf{j} + \frac{Si}{B}(Ga)\,z\,\mathbf{k}$$

$$\mathbf{r} = (t)\,\mathbf{j} + (26{,}178)\,t\,\mathbf{k}$$

$$y = \frac{1}{3}\,\frac{B}{SiGa}\ln(z) \qquad t = Ge - Si = 44.55$$

$$d\mathbf{r} = (\ \mathbf{j} + (26{,}178)\ \mathbf{k})\,dt$$

$$\int \nabla\phi\cdot d\mathbf{r} = \int_{Si}^{Ge-Si}\left(\frac{Si}{B}(As)\,t\,\mathbf{j} + \frac{Si}{B}(Ga)\,t\,\mathbf{k}\right)\cdot\left(\mathbf{j} + 26{,}178\,\mathbf{k}\right)dt$$

$$= \left(\frac{Si}{B}(As)\frac{t^2}{2} + 26{,}178\,\frac{Si}{B}(Ga)\frac{t^2}{2}\right)\Bigg|_{28.09}^{44.55}$$

Thus applying the gradient theorem to our AI elements we look at the analog to the electric potential in electrodynamics. Since Coulombs law is:

$$F = k_e \frac{q_1 q_s}{r^2}$$

$$k_e = 8.988E9N \cdot m \cdot C^{-2} = \frac{1}{4\pi\epsilon_0}$$

Then,..

$$V_E = \frac{1}{4\pi\epsilon_0}\frac{Q}{r}$$

$$\epsilon_0 = 8.54E - 12F \cdot m^{-1}$$

We find that

$$\int_{Si}^{Ge-Si} \nabla\phi \cdot d\vec{r} = 2{,}835{,}470602.78\frac{g^5}{mol^5}$$

$$\sqrt[5]{2{,}835{,}470602.78} = 7.77g/mol$$

This is close to the molar mass of beryllium 8 (8.0053 g/mol). Beryllium 8 is key to the production of carbon in stellar nucleosynthesis and carbon is the central element necessary to life as we know it. Beryllium is second after the first element in group 2 of the periodic table.

If we take the cube root of 2,835470602.78 we get $1{,}415.3865(g/mol)^{\frac{5}{3}}$

We produce the number 19,241.72 (Next page). Thus we have:

$$\frac{19{,}241.72}{1{,}415.3865} = 13.59(g/mol)^{-5/3}$$

Which is on the order of the masses of carbon (12.01) and nitrogen (14.01) which is where it should be if our equation

$$\int_{Si}^{Ge-Si} \nabla\phi \cdot d\vec{r} = \left(\frac{Si}{B}(As)\frac{t^2}{2} + 26{,}178\frac{Si}{B}(Ga)\frac{t^2}{2}\right)\begin{cases} Ge - Si \\ Si \end{cases}$$

Is the integral over a path of some kind of potential that determines the amount of doping agent per semiconductor material.

Thus we have

$$\frac{5E22 atomsSi}{1E18 atoms} = 50{,}000 \frac{atomsSi}{atomsB}$$

Or

$$50{,}000 \frac{molSi}{molB}$$

$$\frac{28.09 \frac{g}{molSi}}{50{,}000 \frac{molSi}{molB}} = 0.0005618 \frac{g \cdot molB}{mol^2 Si}$$

$$\frac{10.81 g \cdot mol^2 Si}{0.0005618 g \cdot mol^2 B} = 19{,}241.72$$

We said

$$\int_{Si}^{Ge-Si} \nabla\phi \cdot d\vec{r} = 2{,}835{,}470602.78 \frac{g^5}{mol^5}$$

$$\sqrt[3]{2{,}835{,}470602.78} = 1415.3865 (g/mol)^{5/3}$$

$$\frac{19{,}242.72}{1{,}415.3865} = 13.59 (g/mol)^{-5/3}$$

Let us suggest there is some function F(M, N) where m=mass in grams and N=number of moles. Then,…

$$F(M, N) = 13.59 (g/mol)^{-\frac{5}{3}} (MN)^{\frac{8}{3}}$$

If NM=1 g/mol then F=13.58 grams/mole is right between our biological unit vectors carbon and nitrogen in:

$$\overrightarrow{A} \times \overrightarrow{B} = \begin{pmatrix} \hat{B} & \hat{C} & \hat{N} \\ Al & Si & P \\ Ga & Ge & As \end{pmatrix} = (Si \cdot As - P \cdot Ge)\hat{B} + (P \cdot Ga - Al \cdot As)\hat{C} + (Al \cdot Ge - Si \cdot Ga)\hat{N}$$

Part 7 (Divergence)

So far everything has lined up with mathematical theorems and their counterparts in electrodynamics to suggest that biological life and artificial intelligence are mathematical constructs that describe one another. Owing to the unusual placement of boron in what we I have called the AI Periodic Table of the Elements, and using aluminum in its place we have shown that Stoke's theorem follows, and that Ampere's Circuit law with Maxwell's addition, which is one of Maxwell's equations, follows and also that a wave equation follows if we are to parallel the laws of electricity and Magnetism and that if we take for it the exponential e, we raise it to B/Al, because B and Al are the components of the theory that give rise to its dynamics and that this works very accurately. We have proceeded to derive a potential to continue with idea and we have seen it predicts the amount of doping agents use to dope the semiconductor element silicon. It only remains to find the counterpart for the divergence theorem which relates a surface area to its volume and is Gauss's law (one of the Maxwell Equations) which is:

$$\oint \vec{E} \cdot d\vec{a} = \frac{Q}{\epsilon_0}$$

The flux of an electric field through any closed surface is the net charge Q over ϵ_0. For a point charge enclosed in a sphere we get Coulombs law, and an inverse square field. In other words, from a point charge the field diverges.

We arrived at our wave

$$y(x) = e^{\frac{B}{Al}x} + \frac{Ag}{Cu}$$

By saying (not literally, not equals, but analogous to)

$$\frac{Ge}{Si} = \mu\epsilon_0$$

Where

$$c = \frac{1}{\sqrt{\epsilon_0\mu}}$$

$$\frac{B}{Al} = \frac{10.81}{26.98} = \frac{2}{5}$$

We have that

$$\frac{\Delta S}{Si} = \frac{Ge - Si}{Si} = \mu$$

$$\mu = \frac{72.64 - 28.09}{28.09} = 1.58697 \approx \Phi$$

$$\epsilon_0 = \frac{Ge}{Si}\frac{1}{\mu} = \frac{72.64}{28.09}\frac{1}{\phi} \approx \Phi$$

We have that the electric potential is:

$$V_E = \frac{1}{4\pi\epsilon_0}\frac{Q}{r}$$

And we have said

$$\overrightarrow{u} = \left(0, \frac{Si}{B}(As)y, \frac{Si}{B}(Ga)z\right)$$

$$\phi = \frac{Si}{2B}(As)y^2 + \frac{Si}{B}(Ga)z^2$$

Where ϕ is not the golden ratio conjugate but plays the role of V_E. Thus,…

$$\frac{Si}{2B}(As)y^2 + \frac{Si}{2B}(Ga)z^2 = \frac{1}{4\pi\epsilon_0} \cdot \frac{Q}{r}$$

$$Q = \frac{Ge}{Si}\frac{4\pi Si}{(Ge - Si)}\left(\frac{Si}{2B}(As)r^3 cos^2\theta + \frac{Si}{2B}(Ga)r^3 sin^2\theta\right)$$

$$\int_{Si}^{Ge} \overrightarrow{u} \cdot d\vec{r} = \frac{1}{3}\int_{Si}^{Ge} \frac{Si}{B}(Ga) \cdot \frac{B}{Si \cdot Ga} ln(z)dz$$

Then

$$r = \frac{B}{Si \cdot Ga} ln(z)$$

And we se the units of Q are unity $\left(\frac{mol}{g}\right)^2$.

Thus,…

$$\frac{1}{4\pi(1.63)}\frac{Q}{r^2} = F$$

$$4\pi(1.63) = 20.5$$

$$0.05 = \frac{r^2 F}{Q}$$

$$0.05Q = F \cdot r^2$$

$$\oint d\overrightarrow{a} = 0.05\frac{Q}{F}$$

$$\oint F \cdot d\,\overrightarrow{a} = 0.05Q$$

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