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High rate protolysis activate molecules over zero level water $G_{H_2O}=G_{CO_2gas}=0$ $^{kJ}/_{mol}$ and carbon dioxide free energy content. Attractors functionally activated as Biosphere Self-Organization creates perfect order irreversible homeostasis progress for bioenergetic, evolution and survival.

Abstract The quantitative studies for oxygen, carbon dioxide and water protolysis functional activity reveal multiply generated Self-Organization Attractors: water $[H_2O]=55.3$ $^{mol}/_{Liter}$ concentration, pH=7.36, enzyme Carbonic Anhydrase reactivity, air oxygen level 20.95 %, osmolar concentration 0.305 M, ionic strength 0.25 M, temperature 310.15 K degree etc.[1] High rate protolysis in water make oxygen fire safe , functionally activate CO_{2aqua} for Life Homeostasis. In 2023rd have to note hundred years since Brønsted - Lowry protolysis, which high rate protonation stay at equilibria while other reactions continues as much more slower. Arterial dissolute oxygen concentration $[O_{2aqua}]=6*10^{-5}$ M makes safe Bioenergetic sustaining isooxia with air oxygen level 20.95 % is the Attractor 500 MYears. [6,14]

The perfect order irreversible non-equilibrium reactions of Homeostasis are created by activation with high rate protolysis Attractors, which stay at equilibrium and activate molecules for progress of Homeostasis. Those indispensably are for irreversible continuing Homeostasis. Homeostasis generates bioenergetic concentration gradients for transport down and for osmosis against the gradients, which as Brownian molecular engines drive the organism Homeostasis for evolution and for survival. [2,3,4] Deviation from high rate protolysis Attractors values disorder the Self-Organization perfect reaction order of Homeostasis. The nascent Chaos disorders and stops the Homeostasis which disappears as extinct from Biosphere. Zero energy $G_{\underline{e-}}=G_{H_2O}=G_{CO_2gas}=0$ $^{kJ}/_{mol}$ to free electrons e^-, for water $\mathbf{H_2O}$ and $\mathbf{CO_{2}}_{gas}$ bases on Hydrogen $G_{H_2gas}=\mathbf{85.6}$ $^{kJ}/_{mol}$ in water $G_{H_2aqua}=\mathbf{103}$ $^{kJ}/_{mol}$ and hydrogen metal $\mathbf{G}_{H(Pt)}=51$ $^{kJ}/_{mol}$. [8]

In 1977th Prigogine [4] declares: equilibrium state is Attractor for non-equilibrium states in plural reactions and mixtures of compounds. Ilya Prigogine [3,4] explains perfect order of reactions formation in Universe and Sciences as Self-Organization Attractors.

About Universe creation in perfect order Maria Kuman: „The nonlinear no equilibrium theory of Scientist [4] is also called The Chaos Theory because it claims that our Universe was created in perfect order out of the chaos.”. [5] Chaos is just apparent disorder. The Biosphere Homeostasis belongs to our human civilization and is best studied perfect part of Universe.

High rate protolysis attractors create irreversible homeostasis perfect order and bioenergetic progress.

Homeostasis products $G_{H_2O}=G_{CO_2gas}=0$ level zero free energy compounds water and carbon dioxide gas in Hess law free energy of formation are negative $G°_{H_2O}=-237.19\ ^{kJ}/_{mol}$, $G°_{CO_2gas}=-394.36\ ^{kJ}/_{mol}$. [1]

Alberty [8] free energy for Hydrogen gas $G_{H_2gas}=85.64\ ^{kJ}/_{mol}$ lets determinate oxygen $G_{O_2aqua}=330\ ^{kJ}/_{mol}$, carbon $G_{gr}=91.26\ ^{kJ}/_{mol}$, peroxide $G_{H_2O_2}=364.8\ ^{kJ}/_{mol}$ and glucose $\mathbf{G}_{C_6H_{12}O_6}=2268.8\ ^{kJ}/_{mol}$ in Biochemical potential scale relative to zero background values of water and carbon dioxide gas $G_{H_2O}=G_{CO_2gas}=0\ ^{kJ}/_{mol}$.

1) Free energy from gas to solubility in water increases $G_{O_2aqua}=G_{O_2gas}+G_{O_2sp}=303.1+26.58=330\ ^{kJ}/_{mol}$

as low solubility constant $\mathbf{O_2}_{gas\ AIR}+\mathbf{H_2O}\overset{\underline{Aquaporins}}{=>}\mathbf{O_2}_{aqua}$ value $\mathbf{K_{sp}}=\dfrac{[O_{2\ aqua}]}{[O_{2\ gas}]\cdot[H_2O]}=2.205*10^{-5}$

the free energy increases about $G_{O_2sp}\mathbf{=-R\bullet T\bullet ln(K_{sp})}=-8.3144*298.15*\ln(2.205*10^{-5})=26.58\ ^{kJ}/_{mol}$. [14]

$O_{2aqua}+4H_3O^++4e^-<=>6H_2O$ thermodynamic standard potential $E°_{O_2}=1.485$ V create arterial potential

$E_{O_2}=E°_{O_2}+^{0.0591}/_4\bullet\log([O_{2aqua}]\bullet[H_3O^+]^4/_{[H_2O]}{}^6)=1.485+^{0.0591}/_4*\log(6*10^{-5}*10^{-7.36*4}/_{55.346}{}^{\wedge 6})=0.833$ Volts .

$\Delta E_{arterial}=E°_{O_2}-E_{O_2}=-1.485+0.833=-0.652$ V change $\Delta G_{arterial}=\Delta E_{arterial}*F*n=-0.652*96485*4/1000=-251.6\ ^{kJ}/_{mol}$.

Protolysis free energy $G_{O_2Biochem\_arterial}=G_{O_2gas}+G_{O_2sp}+\Delta G_{arterial}=303.1+26.58-251.6=78.08\ ^{kJ}/_{mol}$ decreases and oxygen becomes fire safe biochemical oxidant, forming arterial concentration $[\mathbf{O_2}_{aqua}]=6*10^{-5}$ M isooxia as normal safe progress of Bioenergetic. [3]

2) Carbonic Anhydrase generates free energy content from zero $G_{CO_2+2H_2O}=0\ ^{kJ}/_{mol}$ to $G_{H_3O+HCO_3-}=68.4\ ^{kJ}/_{mol}$. Zero level $\mathbf{CO_2}_{\mathit{gas}}+\mathbf{H_2O}<=>\mathbf{CO_2}_{aqua}$ to aqua is $G_{spCO_2aqua}=8.379\ ^{kJ}/_{mol}$ with solubility product constant:

$\mathbf{K_{sp}}_{CO_2aqua}=[\mathbf{CO_2}_{aqua}]/[\mathbf{CO_2}_{gas}]/[\mathbf{H_2O}]=EXP(-\Delta\mathbf{G}_{spCO_2aqua}/R/T)=EXP(-8379/8{,}3144/298{,}15)=0{,}034045$ and free energy increase about $\Delta\mathbf{G}_{spCO_2aqua}\mathbf{=-R\bullet T\bullet ln(K_{sp}}_{CO_2aqua}\mathbf{)}=-8.3144*298.15*\ln(0.034045)/1000=8.379\ ^{kJ}/_{mol}$.

The reaction $\mathbf{CO_2}_{aqua}+\mathbf{2H_2O+\Delta G+Q=v1}\overset{\underline{CA}}{>}\mathbf{H_3O^++HCO_3^-}$

velocity constant is $\mathbf{k}_{1CO_2aqua}=1.5\times10^8\ M^{-1}s^{-1}$ and protolytic acid $\mathbf{CO_2}_{aqua}$ equilibrium constant value is

$$\frac{[HCO_3^-]_{aqua}.[H_3O^+]}{[CO_2]_{aqua}\cdot[H_2O]^2}=\mathbf{K_{eq}}_{CAHCO3aqua}=\mathbf{K}_{a\_CO_2aqua}/[\mathbf{H_2O}]^2=10^{-7.0512}/55.3^2=2.906*10^{-11}.\ [9]$$

CA high rate protolysis constant accumulate free energy for products $\mathbf{H_3O^++HCO_3^-}$ activate its:

$$\Delta\mathbf{G}_{eqCO_2aqua}\mathbf{=-R\bullet T\bullet ln(K}_{eqCO_2aqua}\mathbf{)}=-8{,}3144*298{,}15*\ln(2{,}906*10^{\wedge}(^{-11}))/1000=60.14\ ^{kJ}/_{mol}\ .$$

The total free energy increases activated to equilibrium state of protolysis:

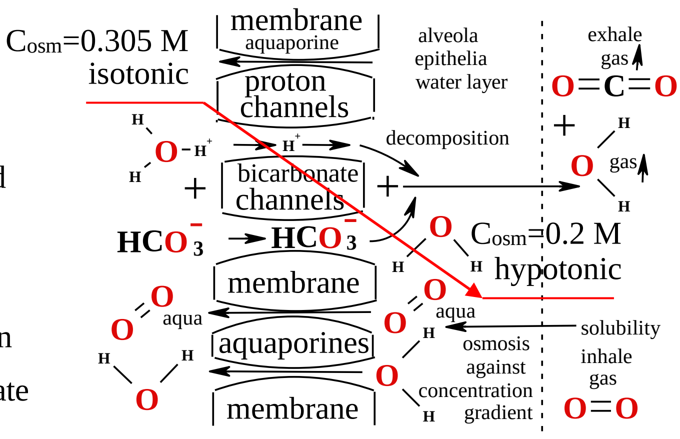
$$G_{H_3O+HCO_3}=G_{H_3O+}+G_{HCO_3-}=22.44+46.08=\Delta\mathbf{G}_{spCO_2aqua}+\Delta\mathbf{G}_{eqCO_2aqua}=8.379+60.14=68.52\ ^{kJ}/_{mol}\ .\ [1,8,14]$$

3) Water free energy content according Alberty increases from zero to $G_{H_2O\_Biochemistry}=\mathbf{85.}64\ ^{kJ}/_{mol}$. [1,8] Distilled water zero level $\mathbf{H_2O}_{distilled}\overset{\underline{activation}}{>}\mathbf{H_2O}_{Biochemistry}$ in biochemical medium activates to $\mathbf{85.}64\ ^{kJ}/_{mol}$ value;

$$G_{H_2O\_Biochemistry}=\Delta G°_{H_2O\_Biochemistry}-\Delta G°_{H_2O\_distilled}=\mathbf{-151{,}549}-(-237{,}191)=\mathbf{85.}64\ ^{kJ}/_{mol}.\ [1,8]$$

Endoergic free energy accumulation create Attractors in biochemical medium as osmolar concentration $C_{osm}=0.305$ M, ionic strength I=0,2 M, pH=7,36, Carbonic Anhydrase CA and etc., which drive Self-Organization of irreversible Homeostasis. High rate protolysis Attractors in Biochemical medium create water $G_{H_2O\_Biochemistry}=\mathbf{85{,}}64\ ^{kJ}/_{mol}$ activated from zero $G_{H_2O}=0\ ^{kJ}/_{mol}$. Alberty. [1,8]

4. Activated reactants $G_{H_3O^+}+G_{HCO_3^-}=22.44+46.08=68.52$ kJ/mol in Photosynthesis transfer free energy to products. Reaction $6H_3O^+ + 6HCO_3 \Rightarrow C_6H_{12}O_6 + 6O_{2aqua} + 6H_2O$ quasi state equilibrium calculation accumulate free energy change: 2840 kJ/mol=$G_{C_6H_{12}O_6}+6*G_{O_2Homeostasis\_arterial}+6*G_{H_2O\_Biochem}-(6*G_{H_3O^+}+6*G_{HCO_3^-})$.



Actual reactants generate free energy sum assigned to glucose $G_{C_6H_{12}O_6}=2268.8$ kJ/mol one mole and to oxygen six moles $6*G_{O_2aqua}=6*78.08=468{,}48$ kJ/mol and else to six water moles $6*G_{H_2O}=6*$**85.64** $=513.84$ kJ/mol, to activated $6*G_{H_3O^+}+6*G_{HCO_3^-}=6*68.52=411{,}12$ kJ/mol CA products. Photosynthesis generate glucose 6th page free energy $G_{C_6H_{12}O_6}=2268.8$ kJ/mol and $E^\circ_{C_6H_{12}O_6}=-0{,}393$ Volts reduction potential. Oxidation progress of ordered Homeostasis generate irreversible concentrations gradients $6HCO_3^- + 6H_3O^+$ for transport down and for osmosis of $6O_{2aqua}+6H_2O$ against the gradients.

The glucose oxidation reactants are the sum $G_{C_6H_{12}O_6}+6*G_{O_2aqua}+6*G_{H_2O}=3251$ kJ/mol to products sum are $6*G_{H_3O^+}+6*G_{HCO_3^-}=411{,}12$ kJ/mol.

3251 kJ/mol ; $C_6H_{12}O_6+6O_{2aqua}+6H_2O$=osmosis=>channels<=transport=$6H_3O^+ + 6HCO_3$; 411 kJ/mol.[1,8]

5) Water protolysis increases free energy content from zero water level $G_{2H_2O}=0$ kJ/mol in to activate products accumulating free energy $G_{H_3O+OH}=G_{H_3O^+}+G_{OH^-}=22.44+77.36=99.8$ kJ/mol :

$$H_2O+H_2O \Leftrightarrow H_3O^+ + OH^-:\ \frac{[OH^-]\cdot[H_3O^+]}{[H_2O]\cdot[H_2O]} = K_{H_3O^++OH^-}=[OH^-]*[H_3O^+]/[H_2O]^2=3.26\bullet10^{-18},$$

$$\Delta G_{H_3O^++OH^-}=-R\bullet T\bullet\ln(K_{H_3O^++OH^-})=-8.3144*298.15*\ln(3.26\bullet10\wedge(^{-18}))/1000=99.8\ ^{kJ}/_{mol},$$

$$G_{H_3O^++OH^-}=G_{H_3O^+}+G_{OH^-}-2*G_{H_2O}=22.44+77.36-2*0=-R\bullet T\bullet\ln(K_{H_3O^++OH^-})=99.8\ ^{kJ}/_{mol}.$$ [1,8,14]

6) Peroxide $2H_2O_2$ conversion to life resources $O_{2aqua}+2H_2O+2H_2O+Q$ start with activation molecules.

High rate protolysis elevate free energy of peroxide 364.8 kJ/mol to protolysis products H_3O^+ and anion of peroxide $G_{H_3O^+}+G_{HOO^-}=22.44+418.32=440.76$ kJ/mol on zero reference $G_{H_2O}=G_{CO_2gas}=0$ kJ/mol scale.

1) Activity initiate protolysis , than **2**) collision disproportionate **OO** atoms and **3**) finally neutralizes.

1) High rate protolysis $HOOH+H_2O \Leftrightarrow H_3O^+ + HOO^-$ $pK_a=11.75$ make possible **2**) collisions of anions $HOO^- >< ^-OOH$ with high activation energy $E_a=79000$ J/mol and slow velocity constant $\vec{k}=1.416*10^{-16}\ M^{-2}s^{-1}$ **3**) disproportionate ^-OOH atoms exothermic and oxidize collided oxygen atoms about O_{2aqua}.

Non colliding oxygen atoms reduce about 2 OH^- ions, which neutralizes with hydroxonium to water:

$$2H_2O_2+2H_2O \rightarrow H_3O^+ + HOO^- >< ^-OOH + H_3O^+ \rightarrow O_{2aqua}+2H_2O+2H_2O+Q.$$

Catalase the ions negative to positive collision $HOO^- > Fe^{3+}$ have $E_a=29$ J/mol indispensible law activation energy with protonation at first **His74** on second Asn147 what velocity constant increases 30 million times:

$$H_2O_2+H_2O_2+Fe^{3+} \rightarrow \mathbf{His74}\text{-}H^+ + HOO^- > Fe^{3+} <^{--}OOH + \text{Asn147-}H^+ \rightarrow O_{2aqua}+H_2O+H_2O+Q_{exothermic}+Fe^{3+}.$$

$$\vec{k}=A\bullet e^{-\frac{Ea}{RT}}=0.131*e^{-\frac{29}{8{,}314\bullet298}}=0.131*0.988=0.1296\ M^{-2}s^{-1};\quad {}^{CAT}\sqrt{\vec{k}}\,/\sqrt{\vec{k}}=\frac{0{,}36}{1{,}19\bullet10^{-8}}=30*10^6.$$

In summary Catalase produce the Life resources $O_{2aqua}+2H_2O+2H_2O+Q$:

7) High rate protolysis Attractors Catalase reactivity is indispensable Brownian molecular engine driving perfect order reactions of irreversible Homeostasis progress with production the hundred percents 100% absolute efficiency and the life resources: **oxygen**+**water**+**heat** ($O_{2aqua}+2H_2O+Q$) for evolution and for survival.

Catalases with hundred percents ● 100% efficiency erase peroxide molecules thirty million times faster. So activate perfect order of irreversible homeostasis reactions.

$$\vec{v}=\vec{k}\bullet[H_2O_2]^2=1.419\bullet10^{-16}\bullet[H_2O_2]^2\ Ms^{-1}\ ;\text{if } [H_2O_2]=1\ M\ ;\ \sqrt{\vec{v}}=\sqrt{\vec{k}}\bullet[H_2O_2]=1.191\bullet10^{-8}\ .$$

$$\sqrt{\vec{v}}={}^{CAT}\sqrt{\vec{k}}\bullet[H_2O_2]=\mathbf{0.36}\bullet[H_2O_2]\ ;\ \text{So is } {}^{CAT}\sqrt{\vec{k}}\ /\sqrt{\vec{k}}=\frac{0{,}36}{1{,}19\bullet10^{-8}}=30\bullet10^{6} \text{ times greater velocity constant.}$$

8) High rate protolysis Attractors pH=7.36, CA, H_2O, Shuttle Hemoglobin functionally activate O_2 ,CO_2. For dominate primary Attractor of Biosphere the bicarbonate buffer of Brensted protolysis :

$$CO_{2aqua}+2H_2O \overset{CA}{<=>} H_3O^+ + HCO_3^-$$

Henderson Haselbalh expression calculates the primary Attractor value pH=7.36 for Human blood:

$$pH=pK_a+\log\frac{[HCO_3^-]}{[CO_2]_{aqua}}=7.0512+\log(0.0154\ M/0.0076\ M)=7.36.\ [14]$$

Hess zero standard values of **elements** actually are positive Biochemistry energies.

G_{H2gas}=**85.6** $^{kJ}/_{mol}$ Alberty referring to homeostasis products water and CO_{2gas} zero $G_{H2O}=G_{CO2gas}=0\ ^{kJ}/_{mol}$.

Some reactants [1,8] free energy content applied to homeostasis products zero values scale are:

Glucose $G_{C6H12O6}=2268.8\ ^{kJ}/_{mol}$ >$G_{HOO-}=338\ ^{kJ}/_{mol}$ > $G_{O2aqua}=330\ ^{kJ}/_{mol}$>
> $G_{O2gas}=303\ ^{kJ}/_{mol}$> peroxide $G_{H2O2}=284\ ^{kJ}/_{mol}$>$G_{NH4+}$=**232,9** $^{kJ}/_{mol}$>
>protolysis of water pH=pOH=7 $G_{H3O++OH-}=G_{H3O+}+G_{OH}=22.44+77.36=99.8\ ^{kJ}/_{mol}$>
> G_{NH3aq}=**91,1** $^{kJ}/_{mol}$ >G_{H2gas}=**85.6** $^{kJ}/_{mol}$ ≡ $G_{H2O\_Biochemistry}$=**85.6** $^{kJ}/_{mol}$ > $G_{O2Biochem\_arterial}=78.1\ ^{kJ}/_{mol}$ >
>protolysis of CO_{2aqua} solution by Carbonic Anhydrase $G_{H3O+HCO3}=G_{H3O+}+G_{HCO3-}=22.44+46.08=68.5\ ^{kJ}/_{mol}$ >
> $G_{H(Pt)}=51\ ^{kJ}/_{mol}$ > homeostasis products zero values $G_{H2O}=G_{CO2gas}=0\ ^{kJ}/_{mol}$ >
>$G_{H2Saqua}$=**-30,82** $^{kJ}/_{mol}$ > $G_{Srombic}$=**-85.64** $^{kJ}/_{mol}$> G_{N2gas}=**-257** $^{kJ}/_{mol}$;

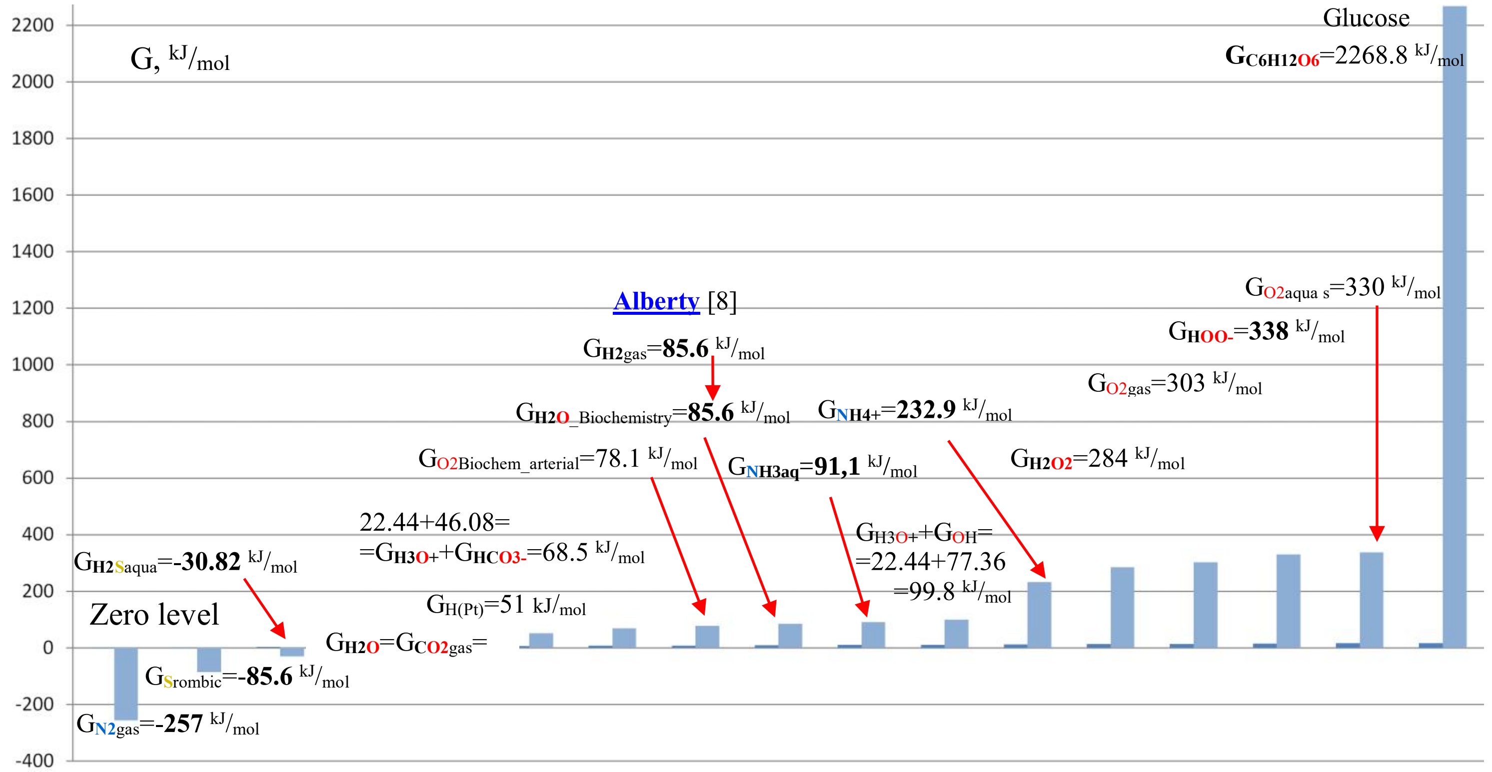


Figure 1. Free energy content starting from zero $G_{H2O}=G_{CO2gas}=0\ ^{kJ}/_{mol}$ of Homeostasis metabolites ascending.

Hydroxonium reduction by proton captures electron from platinum lattice $H_3O^+ + \underline{(Pt)} + e^- \Leftrightarrow \underline{(Pt)H} + H_2O$ produce metal $\underline{(Pt)H}$. $\Delta G_{Hess}=G_{H3O+}+G_{\underline{(Pt)}}+G_{\underline{e-}}-(G_{H2O}+G_{H(Pt)})=22{,}44+\mathbf{38{,}375}+0-(0+\mathbf{51{,}05})=9{,}765\ ^{kJ}/_{mol}$ free energy change

near equilibrium $\Delta \mathbf{G_{eq}}=E^{\circ}_{H}\bullet F\bullet 1\bullet 1=0{,}1016*96485*1/1000=9.81$ kJ/mol is metallic Hydrogen (Pt)H reduction potential on zero scale $G_{H2O}=G_{CO2gas}=0$ kJ/mol of free electron e^-, water and $\mathbf{CO_{2}}_{gas}$. High rate protolysis Attractors pH=7,36 and $[O_{2aqua}]=6*10^{-5}$ M activate metallic
Hydrogen (Pt)H and Glucose $\mathbf{C_6H_{12}O_6}$ to strong reduction potential -0,436 Volts 3rd page and -0,393 V:

$$\mathbf{E}_{(Pt)H=7,36}=0{,}1016+0{,}0591*\log(10^{-7,36}/55{,}3)=-0{,}436\text{ V and }\mathbf{E_{C6H12O6}=\Delta E+E_{O2}}=-1{,}226+0{,}833=-0{,}393\text{ V;}$$

$\mathbf{O_{2}}_{aqua}$ **Hemoglobin shuttle exchange** with **protolysis** generate $\mathbf{HCO_3^-}$ and $\mathbf{H^+}$ **gradients** across membranes.

Hemoglobin in tissue desorbs oxidant oxygen $\mathbf{O_2}_{aqua}$ for exchange by oxidation products HCO_3^-, H^+. In lungs HCO_3^- and H^+ release due to adsorption of oxygen $\mathbf{O_2}_{aqua}$. [6] Exchange equilibrium affinity of hemoglobin to oxygen increases reaching mole fraction $[Hb_R(O_2)]=0.96$ concentration $[\mathbf{O_2}_{aqua}]=6*10^{-5}$ M in arterial blood and deoxy mole fraction lefts $[(H^+\mathbf{BPG^{5-}})Hb_T$...salt bridge...$(HCO_3^-)]=0.04$. In tissue Bisphospho glycerate $\mathbf{BPG^{5-}}$ of erythrocyte squeezed in hemoglobin creates deoxy mole fraction $0.37=[(H^+\ \mathbf{BPG^{5-}})Hb_T$...salt bridge...$(HCO_3^-)]$ and decreases oxy to $[Hb_R(O_2)]=0.63$ mole fraction. In circulation organism consume $0.37-0.04=0.33$ oxygen mole fraction sustaining venous $[\mathbf{O_2}_{aqua}]=0.426\cdot 10^{-5}$ M concentration. $[HCO_3^-]/[CO_{2aqua}]=0.0154$ M/0.0076 M ratio stabilizing at pH=7.36 level as multi functional Attractor of Self-Organization. Actual seven components concentrations at saturated oxygen arterial blood and consumed 0.33 oxygen venous state:

$$\mathbf{O_2}+(H^+\mathbf{BPG^{5-}})Hb_T\ldots\text{salt-bridge}\ldots(HCO_3^-)+\mathbf{H_2O}\leftrightarrow Hb_R(O_2)+\mathbf{H_3O^+}+\mathbf{HCO_3^-}+\mathbf{BPG^{5-}};\ [6,14]$$

$K=[Hb_R(O_2)]*[BPG^{5-}]*[H_3O^+]*[HCO_3^-]/[(H^+BPG^{5-})Hb_T\text{..salt bridge...}(HCO_3^-)]/[H_2O]/[\mathbf{O_2}_{aqua}]=2.43*10^{-8}$;

$[Hb_R(O_2)]*[BPG^{5-}]*$ $[H_3O^+]*$ $[HCO_3^-]/$ $[Hb_T]/$ $[H_2O]/$ $[\mathbf{O_2}_{aqua}]$

arterial blood $K=0.96*$ $\mathbf{0.005}*$ $10^{\mathbf{-7.36}}*$ $0.0154/$ $0.04/$ $55.3/$ $6/10^{-5}$ $=2.43*10^{-8}$;

venous blood $K=0.63*$ $\mathbf{0.005}*$ $10^{\mathbf{-7.36}}*$ $0.0154/$ $0.37/$ $55.3/$ $0.426/10^{-5}$ $=2.43*10^{-8}$;

high land

venous blood $K=0.48*$ $\mathbf{0.008}*$ $10^{\mathbf{-7.36}}*$ $0.0154/$ $0.52/$ $55.3/$ $0.3692/10^{-5}$ $=2.43*10^{-8}$;

See level air Attractor $[\mathbf{O_2}]=20.95\%$ make in erythrocytes $[\mathbf{BPG^{5-}}]=$**5 mM**, but high land (see Oxygen in blood [6]) low air $[\mathbf{O_2}]$ in erythrocytes have content of $[\mathbf{BPG^{5-}}]=$**8 mM** and keep equilibrium at $K=2.43*10^{-8}$.

Stabilized multi functional Attractor pH=7.36 keep $[HCO_3^-]=0.0154$ M, $[CO_{2aqua}]=0.0076$ M despite blood circulation cycle generate amounts of $[\mathbf{H^+}]=459*6\bullet 10^{-5}$ M and 0.0275 $M=[\mathbf{HCO_3^-}]$. Arterial concentrations $[\mathbf{O_2}]=6\cdot 10^{-5}$ M, $[Hb_R(O_2)]=0.96$, $[(H^+)Hb_T$..salt bridge..$(HCO_3^-)]=0.04$ and venous Homeostasis concentrations are $[\mathbf{O_2}]=0.426\cdot 10^{-5}$ M, $[Hb_R(O_2)]=0.63$, $[(H^+)Hb_T$...salt bridge...$(HCO_3^-)]=0.37$.[6,14]

Self-Organization Attractors pH=7.36, CA Carbonic Anhydrase, water $\mathbf{H_2O}$ create functional activity with charged groups negative and positive: $\mathbf{HPO_4^{2-}}$, $\mathbf{HCO_3^-}$, $\mathbf{R\text{-}COO^-}$, $\mathbf{R\text{-}NH_3^+}$, $\mathbf{R\text{-}PO_4^{2-}}$ now free now linked in molecules **R**: amino acids, proteins, nucleic acids, carbohydrates, coenzymes. BUFFERs 11th, 12th pages:. [1]

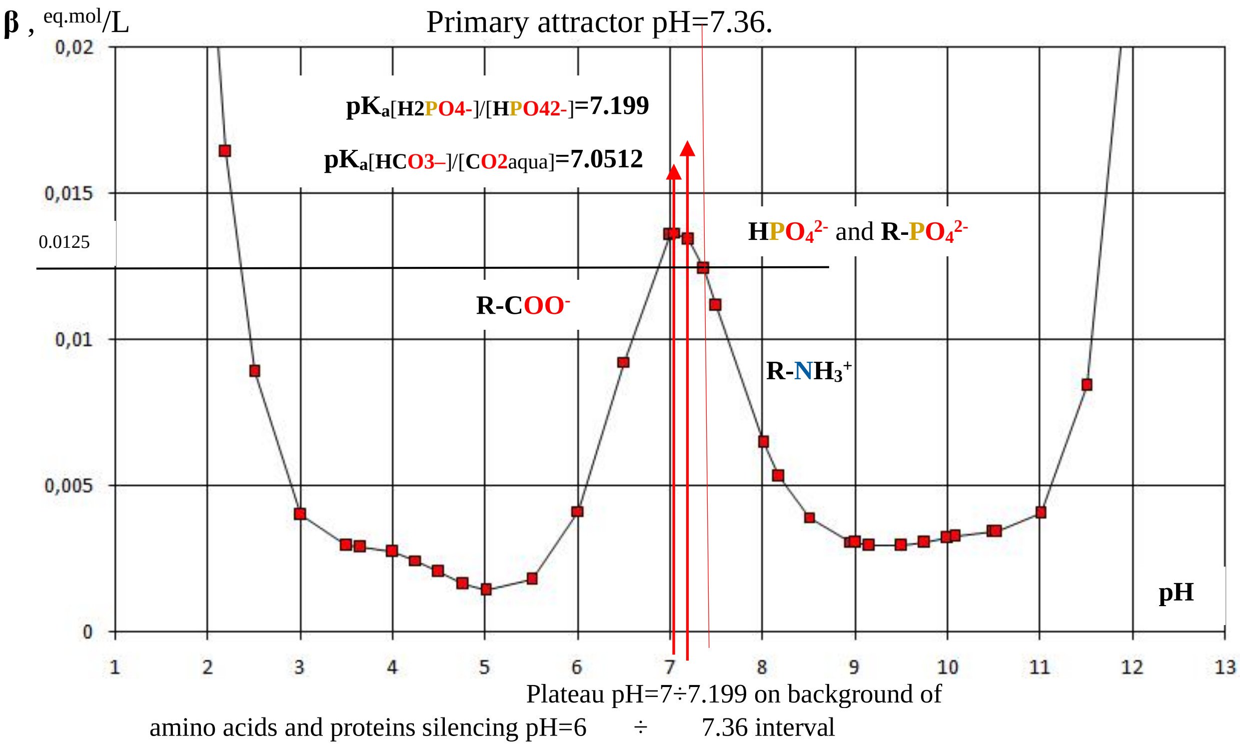


Figure 2. Bicarbonate alkaline reserve ratio 2/1=[HCO_3^-]/[CO_{2aqua}] and phosphates [$H_2PO_4^-$]/[HPO_4^{2-}]=1,45/1 alkaline reserve ratio on background of proteins silencing interval from pH=6 to pH=7,36. The three buffer systems create broad band buffer capacity **β** maximum plateau on interval from pH=7 to pH=7,199. [14]

In blood *plasma* dominate two buffers: the enzyme **CA** Carbonic Anhydrase bicarbonate and phosphate buffer with capacity maximums plateau interval pH 7÷7.199. Alkaline reserve 2 and 1.45 at Attractor **pH=7.36** value is created on the protein buffer capacity silencing interval from pH=6 to pH=7.36 background. [14] BUFFERs . Also in cytosols, sweat, urine and digestive apparatus dominate bicarbonate and phosphates common buffer.

High rate protolysis Attractors **pH**=7.36, CA, **H_2O** functionally activate arterial and venous oxygen concentrations by driving oxygen **O_2** Shuttle Hemoglobin to exchange of bicarbonate **HCO_3^-** and proton H^+ for transport in blood circulation from lungs to tissues and reverse **HCO_3^-** , H^+ to **O_2**. Those exchange on interface to environment through Homeostasis irreversible reactions in ***lungs*** from AIR inhaling **O_2** and exhaling **CO_2**. High rate protolysis Attractors activate in perfect order Brownian molecular engines and creates Self-Organization the biosphere for irreversible Homeostasis to evolution and survival.

Results and Conclusions Summary.

Attractor studies reveal thermodynamics standard potential for metallic Hydrogen incorporate in platinum lattice: $H_3O^+ + (Pt) + e^- \Leftrightarrow (Pt)H + H_2O$ at standard mole fractions the logarithm of $\mathbf{K_{eq}}=X_{H_3O^+}/X_{H_2O}=1$ is zero and:

Potential is $\mathbf{E}=E^\circ_H+\frac{\ln(10)\bullet R\bullet T}{F\bullet 1}\bullet\log\frac{X_{H_3O^+}}{X_{H_2O}}=E^\circ_H+0=$0.10166 Volts over classic zero $E^\circ_{Hclassic}=0$ V. [1]

Hydrogen metal reduction half reaction shows $\mathbf{G_H}=E^\circ_H \bullet F \bullet 1 \bullet 1=0.10166*96485*1/1000=$ 9.81 $^{kJ}/_{mol}$ free energy positive. Hess value is $\Delta\mathbf{G}_{Hess}=G_{H_3O^+}+G_{(Pt)}+G_{e^-}-(G_{H_2O}+G_{H(Pt)})=22{,}44+\mathbf{38{,}375}+0-(0+\mathbf{51{,}05})=$ 9,765 $^{kJ}/_{mol}$.

High rate protolysis Attractors pH=7,36 and [O_{2aqua}]=$6*10^{-5}$ M activate metallic Hydrogen (Pt)H and Glucose **$C_6H_{12}O_6$** to strong reduction potential -0,436 Volts 3rd page and -0,393 Volts.

$\mathbf{H_{2gas}}+\mathbf{H_2O}\overset{\underline{Aquaporin}}{=>}\mathbf{H_{2aq}}$ accumulate $\Delta G_{H2sp}=G_{H2aq}-G_{H2gas}-G_{H2O}=\mathbf{103.24-85.64-0=17.6}$ $^{kJ}/_{mol}$ **Alberty**:

Solubility is $[\mathbf{H_{2aq}}]=K_{sp}*[\mathbf{H_2O}]=0.00082526*55.3=0.04564$ M, if $\mathbf{H_{2gas}}$ mol fraction is one $[\mathbf{H_{2gas}}]=1$ pure gas.

Constant is $K_{sp}=\frac{[H_{2\,aqua}]}{[H_{2\,gas}]\cdot[H_2O]}$ $=EXP(-\Delta\mathbf{G}_{Alberty}/R/T)=EXP(-\mathbf{17600}/8.3144/298.15)=0.00082526$. [8] **Alberty**

Solubility $\mathbf{H_2}$ 0.000155 $^{g}/_{100g}$ at density 0.996 g/L is $[\mathbf{H_{2aq}}]$=0,000155/100,000155*996=0,0015438 M ;

Constant $K_{sp}=0{,}0015438/[\mathbf{H_2O}]=0{,}0015438/55{,}3=0{,}00002792$ is smaller about 0.00082526;

Free energy $\Delta G_{sp}=-R\bullet T\bullet\ln(K_{sp})=-8{,}3144*298{,}15*\ln(0{,}00002792)=26$ $^{kJ}/_{mol}$ is greater about **17.6** $^{kJ}/_{mol}$.

Engineering ToolBox -;G.W.C. Kaye and T.H. Laby, "Tables of Physical and Chemical Constants," 15th ed., Longman, NY, 1986, p. 219.

Hydroxonium reduces in protolysis captured electron from crystal lattice $H_3O^++e^-+\underline{(Pt)}\Leftrightarrow\underline{(Pt)H}+H_2O$.

Hess free energy change equilibrium $\Delta\mathbf{G}_{\mathbf{eq}(Pt)H}=E^\circ_H\bullet F\bullet 1=0{,}10166*96485/1000=9.81$ $^{kJ}/_{mol}$ shows minimum. The **proton reduction potential** in sulfuric acid $[H_3O^+]=1$ M water $[\mathbf{H_2O}]=963/18=53.5$ M 53,5-1=52,5 M has classic 0 Volts, bet metāla $\underline{(Pt)H}$ thermodynamic standard potencial is $\mathbf{E}°=0+0{,}0591*\log(1/52{,}5)=0{,}10166$ V.

Alberty [8] $\Delta\mathbf{G}_{Hess}=G_{H3O+}+G_{\underline{(Pt)}}+G_{\underline{e-}}-(G_{H2O}+G_{H(Pt)})=22{,}44+\mathbf{38{,}375}+0-(0+\mathbf{51{,}05})=9{,}765$ $^{kJ}/_{mol}$

Hesa free energy is similar equilibrium $\Delta\mathbf{G}_{\mathbf{eq}(Pt)H}=E^\circ_H\bullet F\bullet 1\bullet 1=9.81$ $^{kJ}/_{mol}$ zero subject account scales to zero $G_{H2O}=G_{CO2gas}=G_{\underline{e-}}=0$ $^{kJ}/_{mol}$ of water, $\mathbf{CO_{2gas}}$ and electron $\mathbf{+e^-}$.

$$K_{sp(Pt)H}=\frac{X_{H_3O^+}}{X_{H_2O}}=EXP(-\Delta\mathbf{G}_{Alberty}/R/T)=EXP(-\mathbf{9810}/8{,}3144/298{,}15)=0.0191\ ;$$

Concentration $[H_3O^+]=K_{(Pt)H}*[H_2O]=0{,}0191*52{,}5=1$ M creates classic standard hydrogen electrode 0 Volts. Homeostasis $[H_3O^+]=10^{\wedge(-7{,}36)}$ M $\mathbf{E}=0{,}10166+0{,}0591*\log(10^{\wedge(-7{,}36)}/55{,}3)=-0{,}436$ V metal $\underline{(Pt)H}$ is reductant:

Ox: $2\mathbf{H_3O^+}+2e^-\Leftrightarrow\mathbf{H_{2aq}}+2H_2O$; $\Delta\mathbf{G}_{Hess\_H3O+}=2G_{H3O+}+2G_{\underline{e-}}-(G_{H2aq}+2G_{H2O})=2*22{,}44-2*0-\mathbf{103{,}24}-2*0=-58{,}36$ $^{kJ}/_{mol}$;

Graphite electrode oxidises hydrogen liberate (Pt) lattice $E^\circ_{H3O+}=-58{,}36*1000/96485/2=-0{,}302$ V

Red: $2\underline{(Pt)H}+2H_2O\Leftrightarrow 2H_3O^++2e^-+2\underline{(Pt)}$; $E^\circ_{H+}=0{,}1016$ V;

$2\underline{(Pt)H}\Leftrightarrow\mathbf{H_{2aq}}+2\underline{(Pt)}$;

$\Delta E^\circ_{eqH3O+}=0{,}10166-(-0{,}302)=0{,}40366$ V; $\Delta\mathbf{G}_{eqH3O+}=\Delta E^\circ_{H3O+}\bullet F\bullet 2=0{,}40366*96485*2=\mathbf{77{,}89}$ $^{kJ}/_{mol}$;

$\Delta\mathbf{G}_{Hess\_šķ\_(Pt)H}=G_{H2aq}+2G_{\underline{(Pt)}}-2G_{H(Pt)}=\mathbf{103{,}24+2*}G_{(Pt)}-2*\mathbf{51{,}05=77{,}89}$ $^{kJ}/_{mol}$.

$2G_{\underline{(Pt)}}=\Delta\mathbf{G}_{Hess\_šķ\_(Pt)H}-G_{H2aq}+2G_{H(Pt)}=\mathbf{77{,}89-103{,}24}+2*\mathbf{51{,}05=76{,}75}=2*\mathbf{38{,}375}$ $^{kJ}/_{mol}$;

$2\underline{(Pt)H}+\mathbf{H_2O}\Leftrightarrow\mathbf{H_{2aq}}+2\underline{(Pt)}$; Metal hydrogen solubility is non spontaneous and constant smaller about one:

$\Delta\mathbf{G}_{Hess\_šķH2}=G_{H2aq}+2G_{\underline{(Pt)}}-(2G_{H(Pt)}+G_{H2O})=\mathbf{103{,}24}+2*\mathbf{38{,}375}-(2*\mathbf{51{,}05}+0)=77{,}89$ $^{kJ}/_{mol}$. [8]

$K_{sp(Pt)H}=[\mathbf{H_{2aq}}]*[\underline{(Pt)}]^2/[\mathbf{H_2O}]/[\underline{(Pt)H}]^2=EXP(-\Delta\mathbf{G}_{(Pt)H}/R/T)=EXP(-\mathbf{77890}/8{,}3144/298{,}15=10^{\wedge(-13{,}65)}$: [8]

Saturated metallic hydrogen mol fraction is one $[\underline{(Pt)H}]=1$ and $[\underline{(Pt)H}]^2=1$. Metallic hydrogen (Pt)H create small solubility concentration: $[\mathbf{H_{2aq}}]=K_{sp}*[\mathbf{H_2O}]=10^{\wedge-13{,}6}*55{,}3=10^{\wedge-11{,}9}$ M. $2\underline{(Pt)H}+\mathbf{H_2O}\Leftrightarrow\mathbf{H_{2aq}}+2\underline{(Pt)}$;

Reference scale has based on Alberty Hydrogen $G_{H2gas}=\mathbf{85.6}$ $^{kJ}/_{mol}$, in water $G_{H2aqua}=\mathbf{103}$ $^{kJ}/_{mol}$ and metallic $G_{H(Pt)}=51$ $^{kJ}/_{mol}$ referring to Homeostasis zero $G_{\underline{e-}}=G_{H2O}=G_{CO2gas}=0$ $^{kJ}/_{mol}$ value of free energy which belongs to free electrons e^-, for water $\mathbf{H_2O}$ and $\mathbf{CO_{2gas}}$. [8]

- The oxygen $\mathbf{O_{2aqua}}$ molecules make functional activation as fire safe Biochemistry in water solution with protolytic decreasing free energy content from $G_{O2aqua}=330$ $^{kJ}/_{mol}$ to blood $G_{O2Homeostasis\_arterial}=78.08$ $^{kJ}/_{mol}$.
- Carbonic Anhydrase CA enzyme governed carbon dioxide protolysis increase free energy content of products $\mathbf{H_3O^++HCO_3^-}$ from zero $\mathbf{CO_{2gas}+2H_2O}$ to $G_{H3O+}+G_{HCO3-}=22.4+46.1=68.5$ $^{kJ}/_{mol}$.
- Water in biochemical medium increases free energy to $G_{H2O\_Biochemistry}=\mathbf{85.65}$ $^{kJ}/_{mol}$. [1,8,14]

- Photosynthesis (6th page) of glucose free energy $\mathbf{G_{C6H12O6}}$=2268.8 $^{kJ}/_{mol}$ generate concentrations gradients $6HCO_3^-+6H_3O^+$ free energy of $6G_{H3O+}+6G_{HCO3-}$=411 $^{kJ}/_{mol}$ across membranes for transport and osmosis reverse.
- Water protolysis increases free energy from zero $2*G_{H2O}=0$ $^{kJ}/_{mol}$ to $G_{H3O+}+G_{OH-}$=22.4+77.4=99.8 $^{kJ}/_{mol}$.
- Catalase with high rate protolysis increase peroxide molecules activity from $\mathbf{E_a}$=79000 $^{J}/_{mol}$ to $\mathbf{E_a}$=29 $^{J}/_{mol}$.
- High rate protolysis Attractors created Catalase reactivity $30*10^6$ times greater velocity constant which is indispensable Brownian molecular engine for essential ω=6, ω=3 fatty acids elongation in peroxisomes.
- High rate protolysis functionally activate revised molecules on behalf of rule Attractors including CA Carbonic Anhydrase synthesis, which stay at equilibrium as **pH**=7.36, as water concentration $[\mathbf{H_2O}]$=55.3 M, as oxygen concentration $[\mathbf{O_2}]$=20.95 % on air during 500 MYears, as arterial $[\mathbf{O_2}_{aqua}]=6*10^{-5}$ M and $[\mathbf{O_2}_{aqua}]=0.426*10^{-5}$ M venous oxygen concentration, which are indispensable for isooxia in bioenergetic and irreversible progress of Homeostasis. [14]

The order of functionally active molecules drive irreversible Homeostasis under rule Attractors, which stay at equilibrium, while Homeostasis continues with $\mathbf{CO_2+2H_2O}$ protolysis generate indispensable concentrations $\mathbf{H_3O^+ + HCO_3^-}$ gradients of free energy $G_{spCO2}+G_{CA}$=8,38 $^{kJ}/_{mol}$+60 $^{kJ}/_{mol}$. Using the gradients energy Brownian molecular engines drive irreversible homeostasis of $\mathbf{H_3O^+ + HCO_3}$ for transport down the gradient through membrane cannels exhaling $\mathbf{CO_2}_{gas}+\mathbf{H_2O}$ and inhaling $\mathbf{O_2}_{aqua}+\mathbf{H_2O}$ for osmosis against the gradients through aquaporins. Photosynthesis with carbonic anhydrase CA inhale $\mathbf{CO_2}_{gas}+\mathbf{H_2O}$ through proton $\mathbf{H^+ + HCO_3}$ bicarbonate cannels and exhale $\mathbf{O_2}_{aqua}+\mathbf{H_2O}$ through aquaporins cannels in osmosis manner establish global Attractor oxygen $[\mathbf{O_2}]$=20.95%. Reaching the Attractor values create the perfect order of Homeostasis out of disorder, out of chaos. Deviation from Attractors values disorder the Homeostasis and brings to the chaos that cause loss the Homeostasis order of functional activity. [5] Chaotic disordered reactions waste the resources and stop the Homeostasis, stop the progress of perfect order non-equilibrium complex processes. The Homeostasis becomes extinct from Biosphere.

The irreversible Homeostasis by Attractors ordered five type enzymatic composite **reactants** and **products** as Self-Organization trends to reach **equilibrium** state, but never reaches as Homeostasis are perfect ordered non equilibrium states. The Nobel Prize in Chemistry 1977th . [4,5]

Attractors are two types and multipurpose. The primary Attractors are common for Biosphere. The secondary Attractors are for individual organisms. The multipurpose Attractors are both primary and secondary. The primary global Attractors are multipurpose pH=7.36, water $[\mathbf{H_2O}]$=55.3 M, oxygen $[\mathbf{O_2}]$=20.95% in air during 500 MYears. [14]

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