

## Nine Insights

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### Abstract

During a primordial ice age, the ferroelectric phase transition at 72 K in ice crystallised in liquid N<sub>2</sub> released latent energy as ~4 μ infrared laser light, ice-light. It photo-phosphorylated deoxynucleotides creating DNA, order amidst chaos. DNA formed tRNA analogues, transport DNAs, tDNAs selectively fed coacervate proto-cells with nutrients promoting anabolic reactions, a replicate tDNA signalled life's origin. Sub-cellular organelles forming resonant cavities for phosphodiester bond energy released from ATP (replacing ice-light) mediate energy conversions. 189 anti-parallel β-pleated-sheet hairpin protein units with alternate neutral/basic A | L | I | V / K | R residues, P forming 17°C bends between adjacent units, form 21-unit coils and nine coils complete a minion; probably evolved to pack chromosomes for efficient replication, their inter-connecting proton-ordered H-bonds serve as biological clocks and chips-in-the-brain. Apart from substrate transport, tDNAs interact with NAD[PH]'s nicotinamide, protonating gases for nitrogen fixation and oxygenating Earth's atmosphere. Contrary to Mitchell's chemiosmotic hypothesis, tDNAs exchanging phospho-mevalonate, residue of saturated fat breakdown, for its lactone actively transports water, Se exchanging Mn<sup>++</sup>/Ca<sup>++</sup> enables Mn to cofactor enzymes converting surplus mevalonate to cholesterol. AI modelled on minions would compensate for personality bias, promising better matchmaking, diplomacy and interdisciplinary discourse. Protons accelerated along minion tunnels have sufficient energy to fuse with obstructing nuclei, harnessing the energy of γ-rays released by the carbon-nitrogen cycle could counter climate change. Nutrient starved DNAs feeding from gastrula or blastula at cell division synthesize hook proteins, their pairing inter-connects tissue cells and enables suppression of tumour and cancer formation.

### Introduction

#### Ice, the ordering force

My proposal's are based on results obtained with the apparatus shown in Figure 1, designed to test Clausius-Clapeyron's relationship [1-4]. A vacuum pump withdrew N<sub>2</sub> boiling in the thermos flask. A mercury manometer measured pressure and a helium thermometer (not meant to be immersed) temperature. A plot of P versus T showed hysteresis. I suggested ice forming on the bulb had undergone a phase transition and distorted it.

#### Origin of life

Most of ice's 16 crystal types [5] retain entropy as Pauling argued, ice XIc crystallizing in liquid N<sub>2</sub> does not. Its molecules accommodate their irregular tetrahedral shape by rearranging themselves, emitting latent energy as ~4 μ infrared laser beams, ice-light [6]. During a long lasting primordial ice-age it crystallised in pools of liquid N<sub>2</sub> on Earth's poles. Ice-light polarized by multiple reflection in cloud and surface ice selectively photo-phosphorylated nucleotides [6], turning Darwin's warm tropical waters to DNA noodle soup. The first bioactive molecules were tRNA analogues, transport DNAs. Embedded in lightning-charged coacervate membranes, tDNAs formed H-bond-lined pores. An electric field created by absorbed ice light imported carrier-substrate complexes. Concentration fostered chemical reactions (Figure 2). Replication of a tDNA signalled life's origin. A family of 64 yet undetected tDNA variants complement barrels of α-helical protein.

#### Bioenergetics

Sarcomeres of striated muscle contract to form ½-wave resonant cavities for ~4 μ released from ATP's phospho-diester bond, more efficient than Huxley's model [7-9]. Chloroplast grana commensurate with light wavelengths converting them to infrared, synthesising ATP. Centrioles firing on nine cylinders transmit ~4 μ via α-helical spindle-proteins' conjugated -/= bonds to chromosomes. There, protons accelerated along minion tunnels, T (Figures 3 and 4) create alternating magnetic causing their mutual repulsion. Mitochondria are the right size to couple Krebs cycle to oxidative phosphorylation.

### Minions

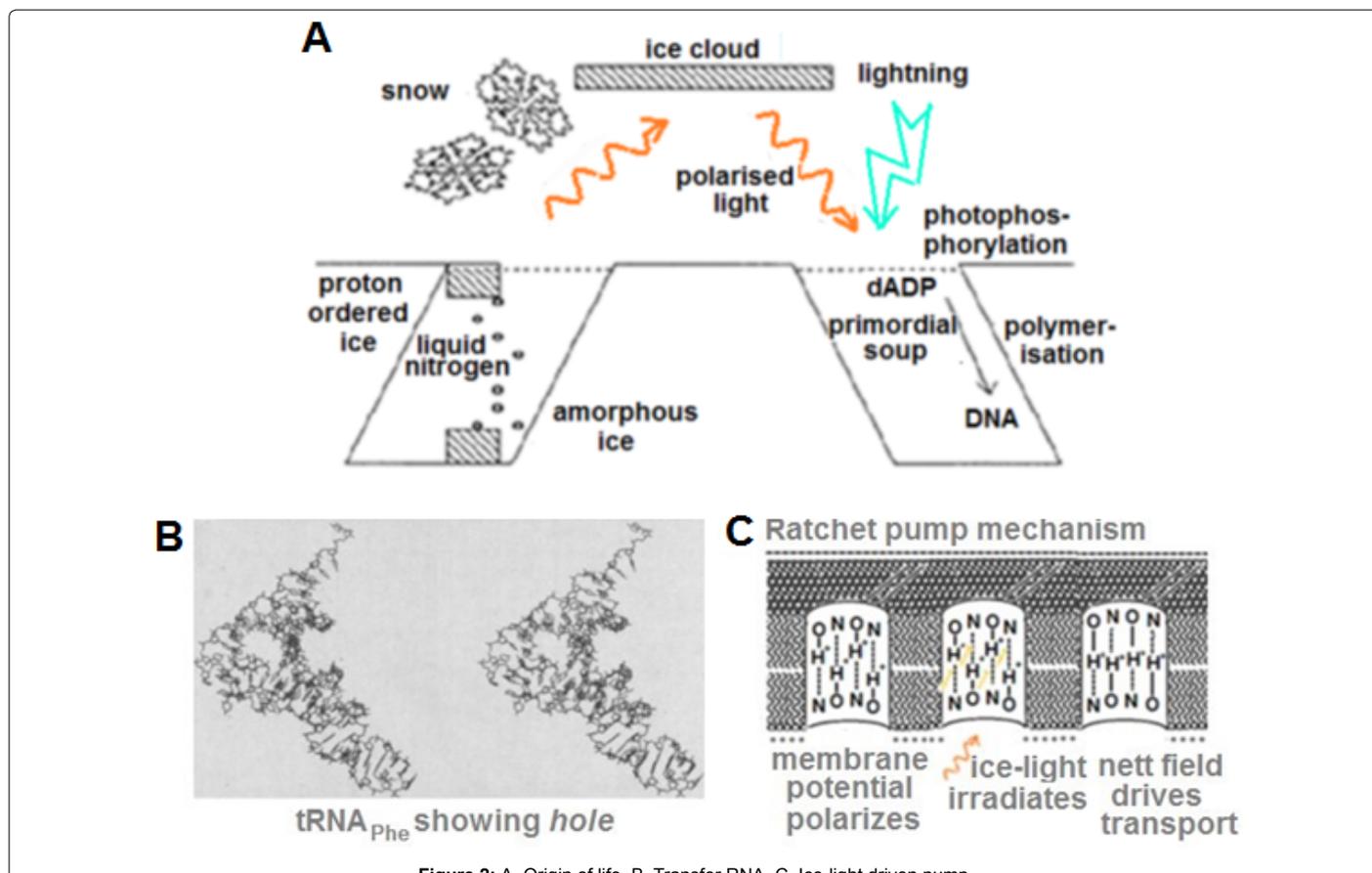
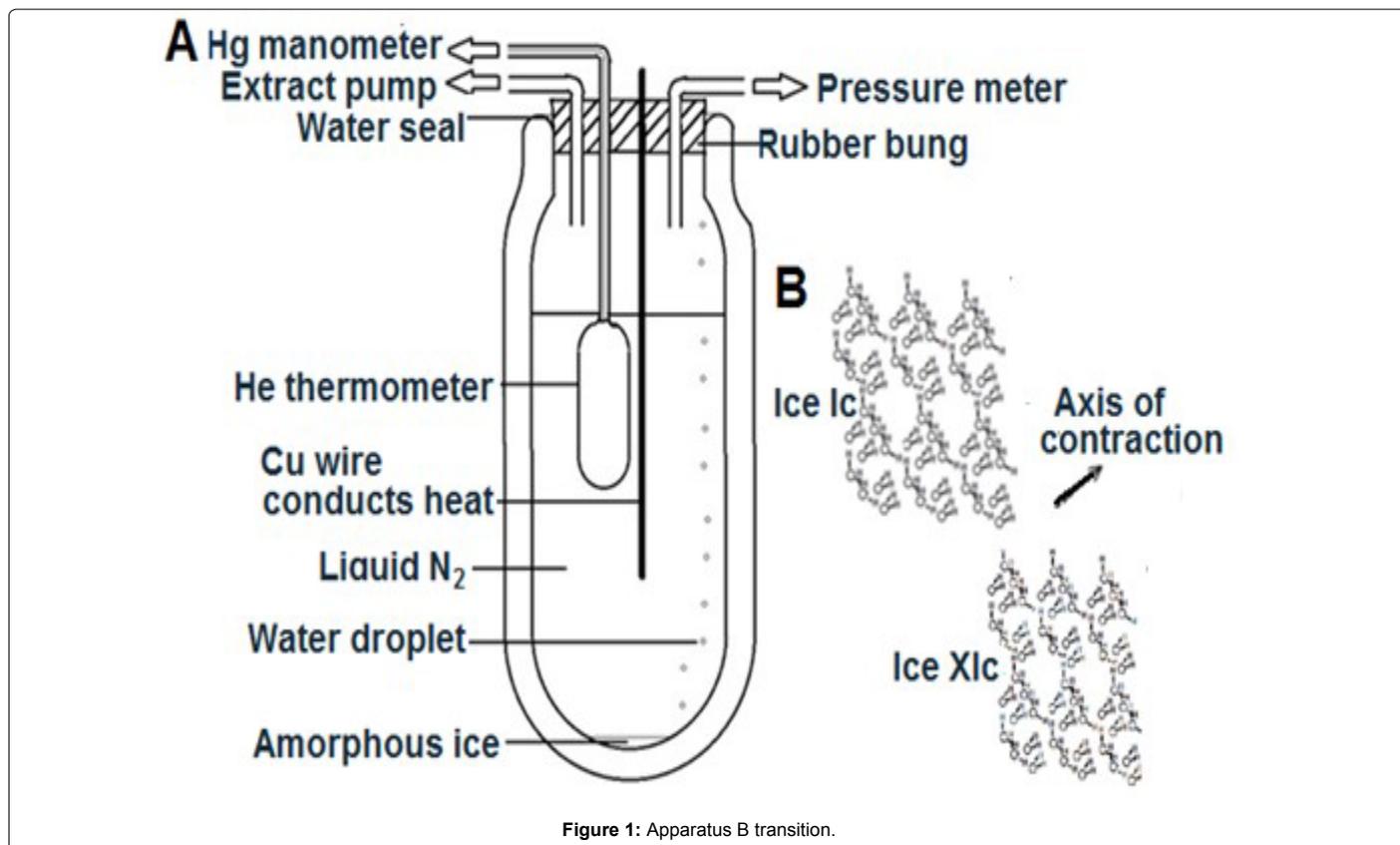
Showing binary instruction sets can be reduced, I suggested the minion base-9 chip in the brain (Figure 4). 189 anti-parallel β-sheet 8 protein hairpins bind 9-base-pair uncoiled B-helical DNA units. 21-unit coils degrade to nucleosome core particles [10] on extraction and 9 coils complete a minion, gramicidin S<sub>9</sub> is analogous. Minions pack chromosomes and enable replication without uncoiling or recoiling. Their bilateral H-bond arrays afford emergent properties. Amino-acids A, L, I and V specifically bind bases C, G, A and T, mnemonic A LIVE CiGAreTte, conserving critical sequences. Light passes thrice round the fastest coil in time τ: τ ≈ 3 × 189 × 7.37 × 10<sup>-10</sup> × 3 × 10<sup>8</sup> ≈ 1.39 × 10<sup>-15</sup> sec where 3 reflects Dekatron [11] logic, 189 base pairs form a coil, β-sheet spacing is 7.37 Å and c=3 × 10<sup>8</sup> m/sec. Protons accelerated along tunnels, T constitute 18-handed biological clocks with periods 63N τ, those of the 11<sup>th</sup>, 13<sup>th</sup>, and 18<sup>th</sup> equal day length, Sun spot cycle period and the age of the universe respectively. Minions serve as chips-in-the-brain, replacing neural networks. Their H-bond settings are conserved, they store 18-letter words using a 64-character alphabet. Those in any human cell could retain the Bible, Koran and Shakespeare's works. Their mutual resonance rings a bell, enabling memory recall faster than electronic signals. Nerve fibres serve as wave-guides and synaptic junctions as gates. Biological intelligence exceeds that of binary computers.

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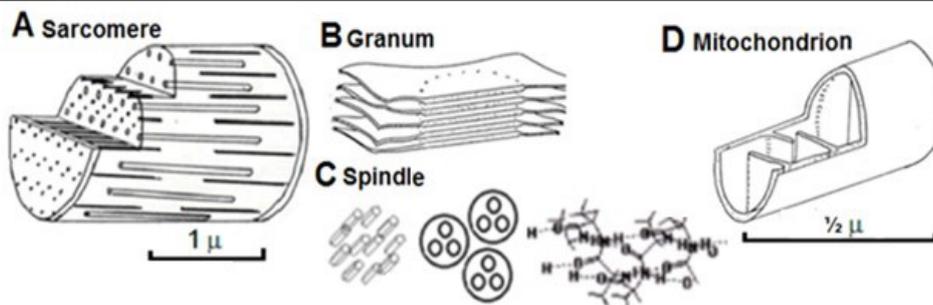


Figure 3: A. Sarcomere, B. Granum, C. Centriole, α-helices & conduction paths, D. Mitochondrion.

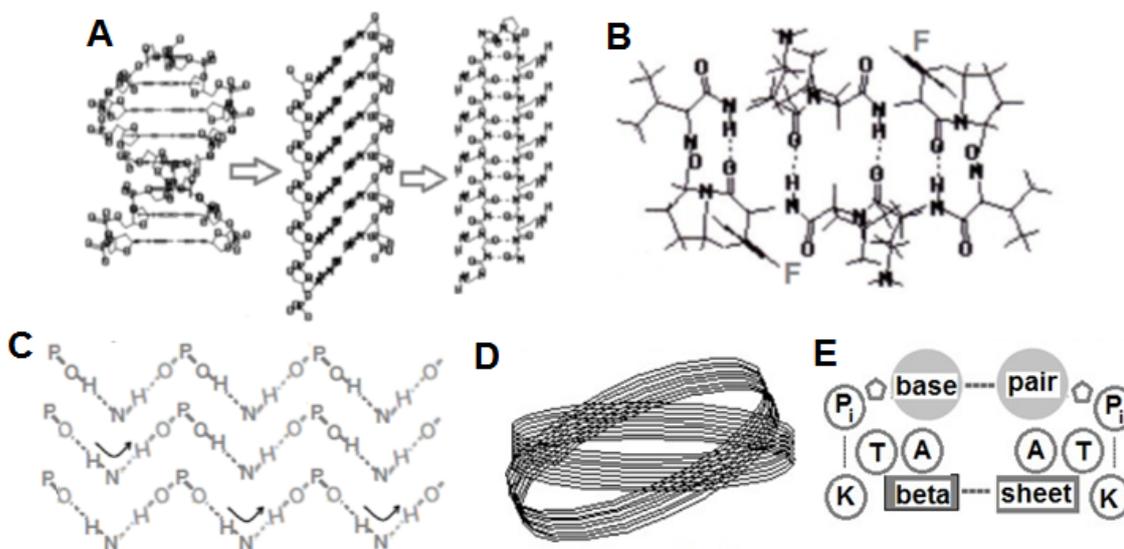


Figure 4: A. Anti-parallel β-sheet binds uncoiled DNA, B. Gramicidin has<sub>o</sub>phenyl-alanines, F analogous to bases, C. Oscillating H-bonds, D. 1,701 base-pairs replicate, E. Tunnels, T.

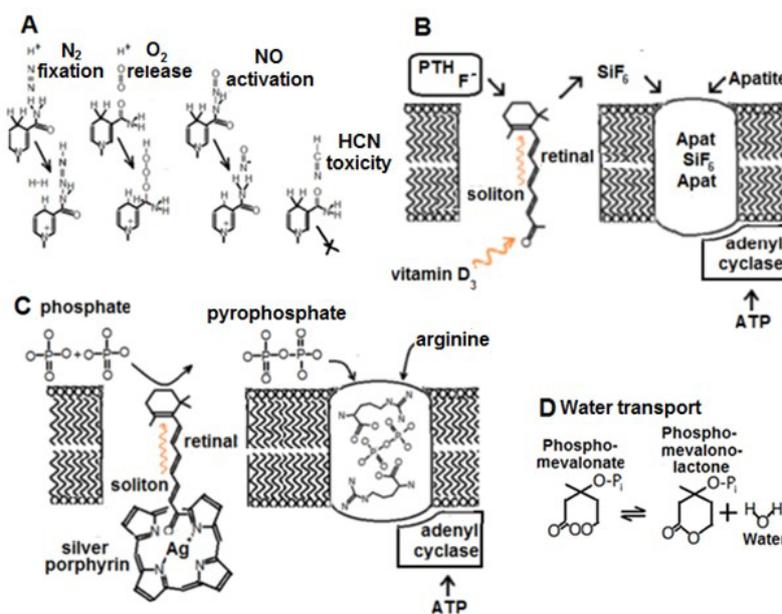


Figure 5: A. H<sup>+</sup> transport incorporates permanent gases. B. Inappropriate SiF<sub>6</sub> synthesis causes Alzheimer's. C. P<sub>i</sub> transported as Arg<sub>2</sub>, PP<sub>i</sub> complex. D. Phosphomevalonate transports H<sub>2</sub>O.

## Pump strategies

Protons transported through tDNAs interact with the amide group of the nicotinamide component of NAD[P][H]. It accounts for N<sub>2</sub> fixation and Earth's oxygenated atmosphere [12], enabling symbiosis between plants and animals (Figure 5A). The first role of amino-acids was neutralizing nucleic acid acidity, ribosomes and protein synthesis evolved later. Protons now activates NO and explain HCN toxicity. Genetically modified organisms mimicking these processes could fix N<sub>2</sub> more efficiently than the Haber process and might also facilitate desalination (Figure 5B). Vitamin D<sub>3</sub> stores UV sunlight energy matching that of Si ~ F bonds [13]. It synthesises SiF<sub>6</sub> via the pH-sensitive reaction,



SiF<sub>6</sub> carrying fluorapatite maintains teeth and bones. A parallel process maintains plants' SiO<sub>2</sub> hard parts. Acidity arising in kidney failure and at menopause causes osteoporosis. SO<sub>x</sub>/NO<sub>x</sub> air pollution, first noted for causing acid rain [14], enables inappropriate SiF<sub>6</sub> synthesis in the nasal fossa, explaining Alzheimer's Disease [15-17]. Olfactory nerves transfer SiF<sub>6</sub> to the brain. There, its breakdown deposits aluminosilicate plaques, F-released is retained by the blood/brain barrier. It disrupts Krebs cycle, progressively killing cells and interferes with protein folding, creating β-amyloid and τ-protein tangles. I propose fluorinated anaesthetics, typically administered for hip replacement, promote renal AlF<sub>6</sub> excretion and simultaneously clear the brain of F, bringing temporary symptomatic relief. That suggests controlling acid air pollution or designing a fluorinated pharmaceutical delivering F- to the brain might manage the condition. Pi's high charge precludes passage through tDNAs. Pineal hormones serotonin and melatonin control differentiation by distribute Ag. Ag porphyrin shares the pink colour of leaf buds (Figure 5C). At cell division, retinal feeds energy as solitons [18]. Pi esterified to PPi complexes with arginine forming Arg<sub>2</sub>.PPi which tDNAs transport, delivering: H<sub>24</sub>, C<sub>12</sub>, O<sub>11</sub>, N<sub>8</sub> and 2P, the atomic ingredients for DNA replication. Anticancer drugs canaverine, aminoimidazole, dacarbazine and chloroplatinate mimic Arg<sub>2</sub>.PPi. Membrane potential precludes Peter Mitchell's assumption when proposing his chemiosmotic hypothesis [19] that water diffuses freely through unit membranes (Figure 6F). The residue of saturated fat metabolism, mevalonate is named after the herb Valerian, aka All-heal. Figure 5D shows 5-phosphomevalonate reversibly forming 5-phospho-mevalano-lactone and actively transporting water. The -S-Se- bonds of pituitary hormones oxytocin and vasopressin distribute Se. At target tissues pumping water, vitamin E, α-tocopherol delivers energy as solitons, oxidising Se to SeO<sub>3</sub>. Selenite exchanging Mn<sup>++</sup> for Ca<sup>++</sup> controls Mn cofactoring enzymes converting excess mevalonate to cholesterol [20,21]. In industrial societies, dietary Se deficiency is the prime cause of morbidity, causing deaths from heart attacks, strokes, pre-eclampsia and cancers of breast, bowel, prostate and cervix.

## AI satisfying turing's criteria

Modelling artificial intelligence on minions would satisfy Turing's criteria [22]. Such AI would foster happy families with better matchmaking, forge international peace treaties with improved diplomacy and create scientific consensus by facilitating interdisciplinary discourse. That could restore the confidence in science prevailing before Michelson and Morley measured in 1887. Tables 1 and 2 lists qualities associated with the 18 coil surfaces evidenced by academic specialists. They concur with statistical, psychological personality types and confirm astrological tradition [22].

## Trace element nutrition

**Motility:** SO<sub>3</sub>=exchanges Ca<sup>++</sup>/Mg<sup>++</sup>, (Figure 6A) Mg activates release of ATP's Pi ~ Pi bond energy. It drives muscle contraction, chromosome separation and H-bond chains propelling H<sup>+</sup> along minion tunnels separating chromosomes, vide supra.

**Sensitivity:** Na<sup>+</sup> resembles H<sub>2</sub>O, forming large hydrates. Catecholamines form 4-/6-member rings around Na<sup>+</sup>/K<sup>+</sup> (Figure 6B) stable in the high voltage tDNA environment, exchanging 3Na<sup>+</sup> for 2K<sup>+</sup>, the fight or flight response, changing viscosity and metabolic rate. The larger complexes morphine creates (Figure 6C) block tDNAs, explaining addiction. Differentiated brain regions deploying different neurotransmitters justify the neural network approach. A mutant tDNA deploying dopamine causes Parkinson's and L Dopa prevents it.

**Excretion:** Mn chlorides are implicated in salt excretion. The chloride shift exchanging HCO<sub>3</sub><sup>-</sup>/Cl<sup>-</sup> controls ionic strength. Haemoglobin distributes O<sub>2</sub> and Zn cofactors carbonic anhydrase controlling pH.

**Respiration:** Membranes are impermeable to O<sub>2</sub>.H<sub>2</sub>O. Thyroid hormone T4 distributes I and H<sup>+</sup> releases I<sup>+</sup> forming I+[O<sub>2</sub>.H<sub>2</sub>O]<sup>2</sup> (Figure 6D). The purple/yellow colours of littoral seaweeds compensating tidal O<sub>2</sub> fluctuations are those of I+/I-. Mutant tDNAs explain bipolar, hyper-/hypo- brain-cell oxygenation correspond to mania/depression and Li<sup>+</sup>, diagonally related to I<sup>+</sup>, stabilizes mood.

**Growth:** Differentiation DNAs inherited with nuclear genes selecting tDNAs control cell diet. They thereby differentiate tissue metabolism, c.f. mRNAs and tRNAs controlling protein synthesis. The liver interconverts amino-acids (Figure 6E) balancing those the brain receives maintains sanity.

**Rigidity:** CaF<sub>2</sub> illustrates Ca's affinity for F. The conjugated bonds of retinal and α-tocopherol transfer energy as solitons, mediating SiF<sub>6</sub>=synthesis, Pi esterification etc. Fluoridation hardens tooth enamel, preventing dental caries [23-32]. Tea drinking supplies adequate F-, excess causes fluorosis.

**Assimilation:** Pancreatic β-cells pack Zn in insulin for distribution and α-cells distribute glucagon recycling it. Zn transports glucose, binding to the triangle of sweetness they exhibit (Figure 6G), defects cause diabetes, an implanted Zn monitor might improve its management. The derivative of vitamin C which Pauling advocated, diketo-Lgluconate, takes Zn where insulin cannot, preventing rhinovirus entry via tDNAs. Zn conjugates glucose to bilirubin, preventing neo-natal jaundice [24,25].

**Reproduction:** Pineal hormone serotonin (Figure 6H) distributes Ag until puberty. Before antibiotics were introduced, Ag was widely used in medicine [25]. Ag colloid has successfully treated cancer in domestic animals [26], suggesting its reinstatement.

**Water transport:** The persistent correlation between breast cancer distribution and surface geology evidences [27] pandemic Se deficiency [28-30]. As mentioned above, failure of blood pressure control (Figure 7) causes most Western morbidity. Hard water percolating through sedimentary and igneous rocks incorporating remnants of early Se-dependent life is preferable to soft water. Animal husbandry [31] affords further evidence: S in superphosphate fertilizer competing with Se causes white muscle disease in sheep, Se deficient cattle suffer hypertension in pregnancy and swine suffer heart failure en route to market.

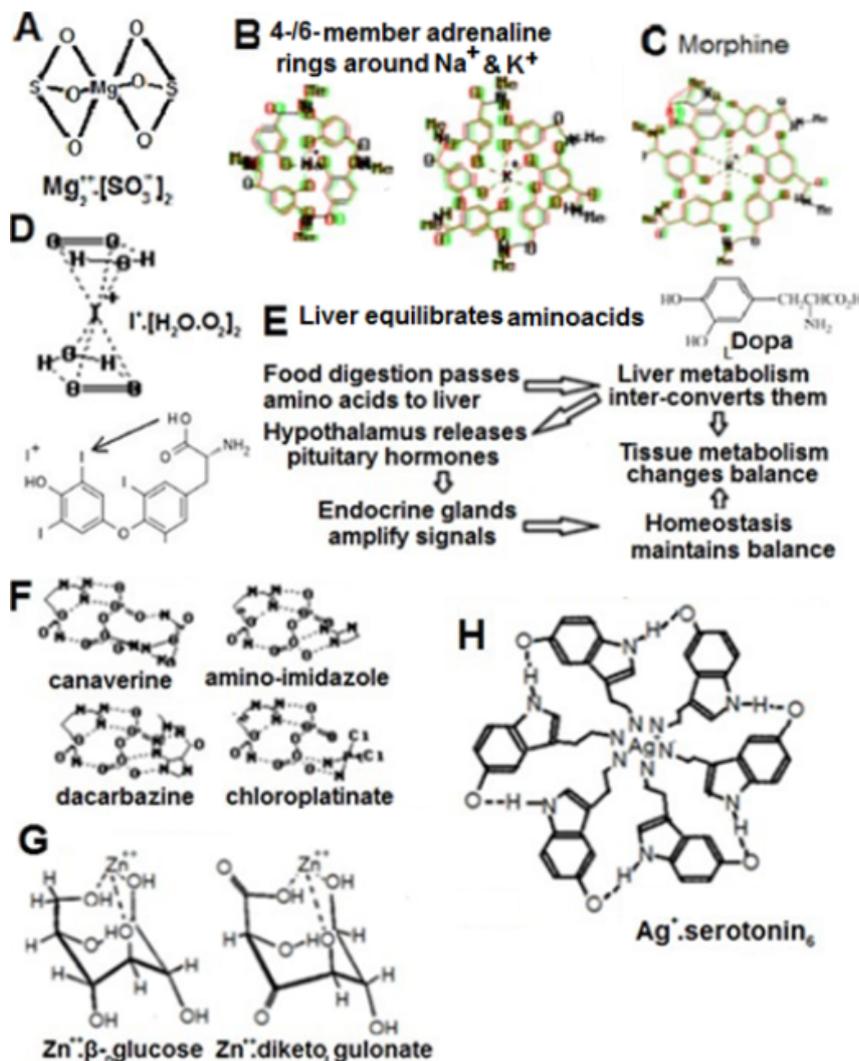


Figure 6: A-H Substrate/carrier complexes.

### Safe nuclear fusion

Minion logic contradicting Heisenberg's uncertainty principle affords insights on atomic chemistry. Though as counter-intuitive as quantum-mechanics, it simplifies particle physics and cosmology. The Tyger equation [32-37], compensating for 1 in 639 wrap-around counting errors the coiled abacus makes, replaces Einstein's relativity. It describes the apparent path of light: locally Newton's straight line then following a boomerang-like path returning to source.

Protons pass along minion tunnels, T (Figure 4) with sufficient energy, ~13 keV to fuse with methane's C or ammonia's N nuclei, enabling minions to perform the carbon-nitrogen cycle [36].



Minion dimensions determine the  $\frac{1}{2}$ -lives and energies of  $\gamma$ -rays emitted. Diffracted at source by DNA, correlate with those of pulsars on return, suggesting Burnell's little green men [38] are figments of our imagination. Minions serving as chips-in-the-brain are our interface with reality. They create relativity between conception and perception,

rendering plane surfaces spherical. Figures 7 and 8 shows polyhedrons extending Plato's perfect solids. Nested, they predict nuclear allotropes and the heaviest element in Mendeleev's periodic table. Harnessing the  $\gamma$ -rays released by vats of genetically modified bugs recycling waste release to power supplies might end global warming. Public education is essential to counter irrational opposition to nuclear fusion [39,40].

### Hook proteins

At cell division, tDNAs feeding from gastrula or blastula (Figure 9) are starved of nutrients and over-heat. Guanyl-cyclase-driven protein synthesis creating hook proteins replaces adenylyl-cyclase-driven substrate transport. Hook proteins, probably evolved before tRNAs and ribosomes, determine cell morphology. Stem cells have no hooks, gametes and leukocytes one, filamentous algae two, sponges three, simple worms four. Five suffice to create and limit tissue growth. One-hook leukocytes pairing with any 6<sup>th</sup> hook arising prevent neoplastic growths. A published proof of my Five hook theorem: 'All possible tissue morphologies can be created from cells with fewer than 6 hooks'; 3D equivalent of the 2D Four color mapping theorem would attract interest in confirming this proposal.

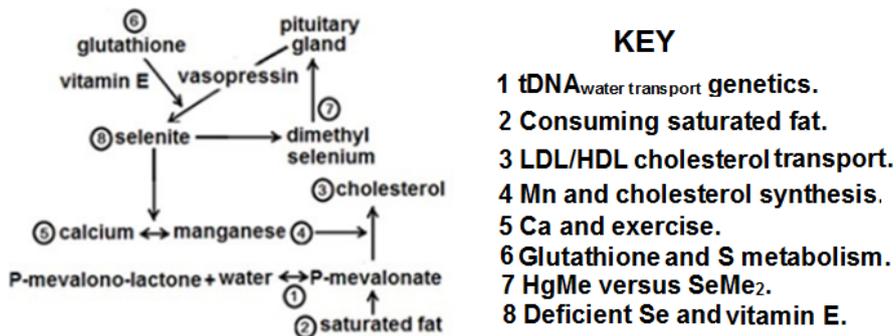


Figure 7: Blood pressure controls.

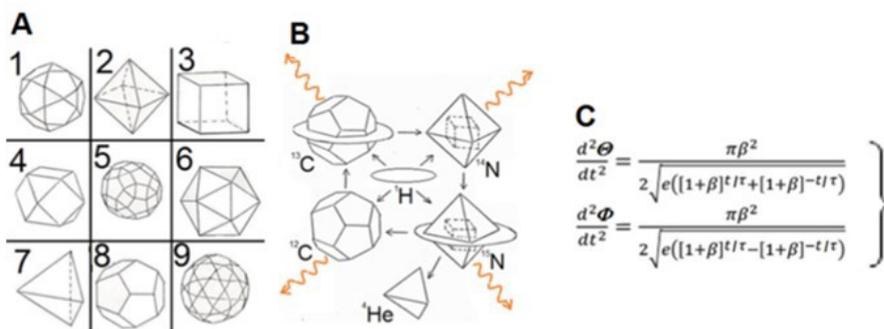


Figure 8: A. Nine plane combinations. B. Nuclei as nested polyhedrons performing carbon-nitrogen cycle. C. Tyger equation in polar coordinates  $\Theta$  and  $\Phi$ ,  $\beta=63^\circ$  and  $\tau \approx 1.4$  f sec.

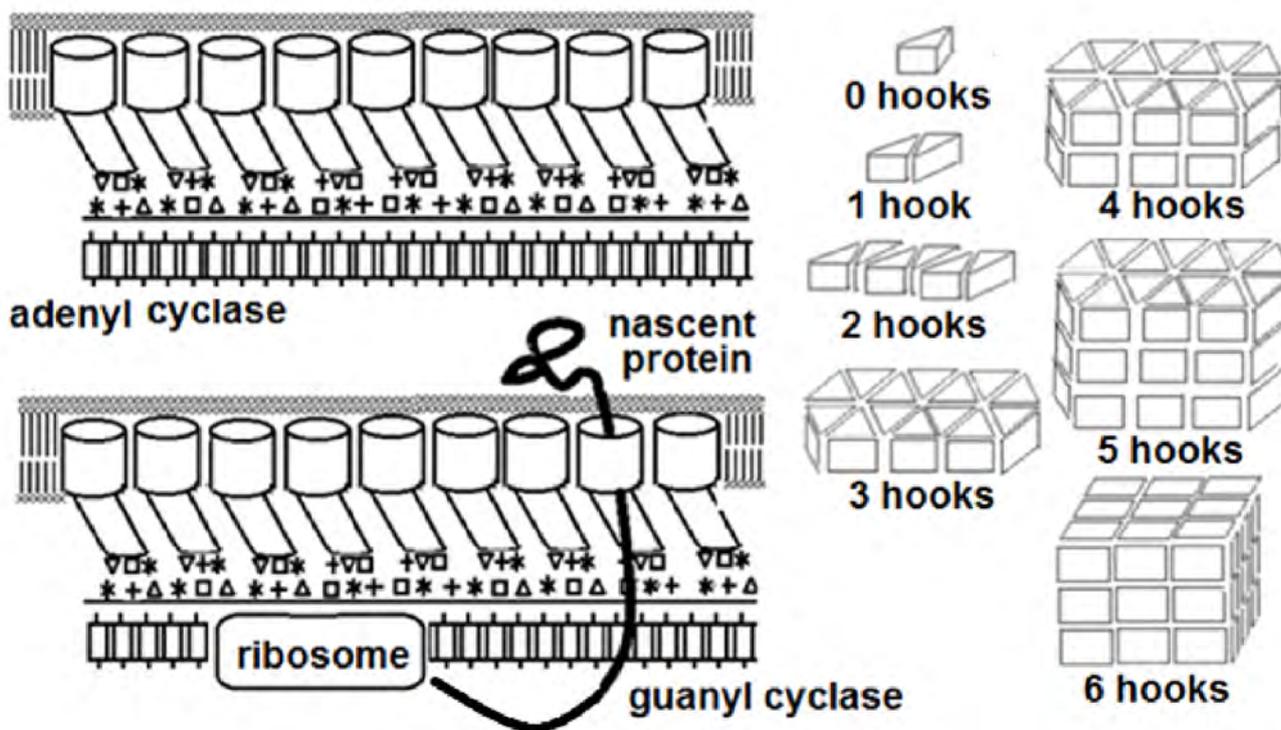


Figure 9: Hook proteins synthesized at cell division determine tissue morphology.

#	Quality	Period	Colour	Mass	Discipline
-9	Unity	8.7 f sec	Red	$M_e/7$	Quantum mechanics
-8	Justice	5.5 p sec	Silver	$m_p/7$	Physics
-7	Stability	350 p sec	Blue	$2 \times b\text{-p masses}$	Chemistry
-6	Progress	22 n sec	Violet	8.3 ng	Computer processing
-5	Love	1.4 $\mu$ sec	Bronze	0.033 pg	Biochemistry
-4	Peace	87 $\mu$ sec	Yellow	130 pg	Genetics
-3	Beauty	5.5 m sec	Pied	0.51 $\mu$ g	Biology
-2	Truth	350 m sec	Gold	2 mg	Engineering
-1	Goodness	22 secs	Green	8.1 g	Psychology
1	Goodness	23 min	Green	32 kg	Psychiatry
2	Truth	1 day*	Gold	130 ton	Head hunting
3	Beauty	9 weeks	Pied	0.5 M ton	Sociology
4	Peace	11 Y*	Yellow	2000 M ton	Politics
5	Love	685 Y	Bronze	8 G ton	History
6	Progress	43 KY	Violet	31 P ton	Archaeology
7	Stability	2.7 MY	Blue	$1.8 \times \text{moon mass}$	Palaeontology
8	Justice	170 My	Silver	$84 \times \text{earth mass}$	Astronomy
9	Unity	11 BY*	Red	$1 \times \text{sun mass}$	Cosmology

$\pm$  Correspond to introvert/extravert personalities, periods= $63^N \tau$ , colours feature in metaphors, masses are in ratio  $63^2$ ,  $m_e$  and  $m_p$  are electron and proton masses. \*Connotes approximation.  $\pm$  Correspond to introvert/extravert personalities, periods= $63^N \tau$ , colours feature in metaphors, masses are in ratio  $63^2$ ,  $m_e$  and  $m_p$  are electron and proton masses. \*Connotes approximation.

**Table 1:** Qualities associated with minion coils.

#	System	Tissue	Carrier Complexes	Pathology
1	Motility	Muscle	$\text{Ca}^{++}   \text{Mg}^{++}$ and $\text{SO}_3^-$	Spasticity
2	Sensitivity	Nerve	$\text{Na}^+   \text{K}^+$ and adrenalin	Depression
3	Excretion	Kidney	$\text{Mn}^{++}$ and salt	Kidney Failure
4	Respiration	Lung	$\text{I}^+$ and $\text{O}_2\text{-H}_2\text{O}$	Bipolar Disorder
5	Metabolism	Liver	$\text{Cu}^{++}$ and amino-acids	Growth Defects
6	Rigidity	Bone	$\text{SiF}_6^-   \text{AlF}_6^-$ and apatite	Alzheimer's
7	Assimilation	Gut	$\text{Zn}^{++}$ and glucose	Diabetes
8	Reproduction	Gonads	$\text{Ag}^+$ and pyrophosphate	Cancer
9	Water pumping	Heart	$\text{Ca}^{++}   \text{Mn}^{++}$ and $\text{SeO}_3^-$	Heart Disease

**Table 2:** Nine metabolic systems.

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