

# Minimizing Digital & analog Bio-information loss for aging toward reversing

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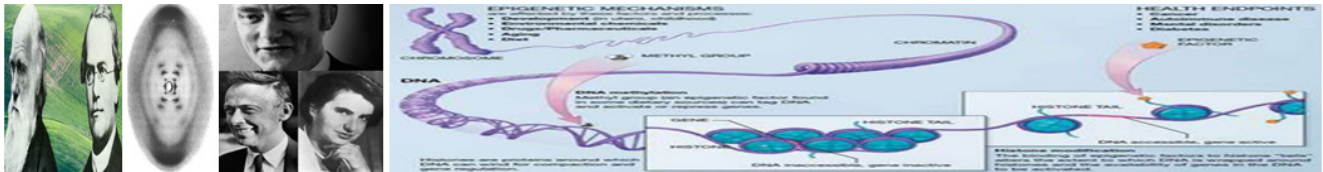
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## Summary

We match *Health spans* with *Lifespan* of Homo sapiens. Acknowledge ONR\* N00014-20-1-2279

## Background: Why Do We Care About Bio-Information-Retrieval?

During the maturity of cells, a general belief in aging is a slowly loss of digital genomic info as well as analog epi(outside)-genomic namely phoneme info (cf. Figure 1). Then, these bio-info-retrieval processing could be a graceful aging toward reverse aging. Nonetheless, **according to the physics of irreversible thermodynamics**, the **entropy** as a measure of the degree of uniformity, namely a loss of natural dynamics information, seems to be always increasing, which must be compensated. How? This will be the rest of our Readers' Digest story.



**Figure 1** (a) Sir Charles Darwinian Phenotype (common descent, gradualism, multiplication of species, and natural selection) versus Fr. Gregor Mendel Genotype (computational);

(b) 23 pairs of X & Y shaped chromosome made of double helix A-T & C-G pairs discovered by **Jim Watson, Francis Crick, Rosaline Franklin** (did X-ray cryptography 51; died of oval cancer 1958 before the announcement of Nobel Prizes. When each untwined it will be about 3 meter long, that's why the epigenetic information is necessary **via Histone** spooling's & **Methylation** NH<sub>3</sub> tags. These may account for Charles Darwinian Phenotype via epi-genetic & Gregor Mendel Genotype for variety changes in animal and plant species, of which in the long run the fittest will survive to breed more offspring. On the other hands, the loss of these digital genome and analog phenome of the survival species may nevertheless be getting old and perished.

For example, the **Eukaryotes** cells have nuclei of DNA's, of which the systems have both analog phenome and digital genome information. Thus, we must generalize the digital Shannon information to include the analog **system** which may interact under external noisy and internal disturbance. In Figure 1 we demonstrate our **co-evolutional partner Mitochondria organelle**(M.O.), and its chemical molar energy production **30.5 kilo joules (7.5 kilo calories)** by means of water **hydrolysis** mechanism of **Adrinolum Triple Phosphate (ATP) to ADP**.

**For example, FDA recommended taking Elysium matter Long-Term Brain Health** manufactured in New York; Oxford University has developed a double blind protocol with the Gold Standard (double blind (NY and Oxford/Patients), negative control using placebo; sufficient statistics about 168 in 2 years) with proven mixture of Vitamin B complex and Omega-3 Lysine Complex extracted from coral reefs, sea grass beds, and mangrove forests. Thus, for two symbiotic species, we have  $\frac{1}{4}$  probability to be successful in lossless intact cellular information.

$$\frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4} \quad (1)$$

(a) In order to provide **Homo sapiens fast sensory systems**, we can understand why we always have the power of pairs, 2 eyes, 2 ears, 2

nose holes, 2 sides of tongue, 2 hands, "**agree must be signal, disagree must be noise**," that require no processing, an instantaneous result for survival purpose. Yet the artificial system what **Harry Nyquist** did in 1959 that **optical sensing** may involve the photon **energy of the wave number of the target**, mediated by Max Planck constant ( $\hbar \equiv h / 2\pi$ ).

**Harry Nyquist Sampling Theorem 1959:** a simultaneous 2 samples per period:  $f = d/2$ ,

**Prof: Multiply Planck constant**

$LHS = \hbar 2\pi f = \hbar \omega = E = \hbar c_o k = \hbar c_o \frac{2\pi}{\lambda} = \hbar c_o \frac{\pi}{d} = RHS$ , where use is made of  $\omega \equiv c_o k$  photon linear dispersion law. **Nyquist** concluded  $\lambda = 2d$ ; where **d** is the half optical (microscope) wavelength:  $\lambda / 2$  **Q.E.D.**

(b) Secondly, we refer to Prof. **David A. Sinclair** of Harvard Medical School who has written a best-seller book "**Life Span, Why We Age and Why We Don't Have To**." He concluded that the **loss of biological information** (genome digital information, and epi-genetic analog information) can cause **aging over the time**.

Moreover, the **dynamic proofreading mechanisms** of **John J. Hopfield**, and independently Ninio, are **non-equilibrium active processes self-correction mechanism in time** that consume **Adenosine**

**Tri-Phosphate (ATP)** energy which is generated by co-evolution partner **Mitochondria organelle** under the hydrolysis of **ATP** into **ADP** releases **30.5 kilo joules or 7.5 kilo calories of energy per mole** due to releasing one Phosphate from ATP. **Hopfield has developed, together with D.W. Tank, an associative neural network** in 1982 that can solve the NP-Complete **Travelling Salesman Problem**.

**NIH/NIA Former Director Mark P. Mattson** has proposed how to **avoid Dementia Alzheimer Disorder (DAD) brain aging** and furthermore useful for **graceful aging** in **6 dimension of common sense** of which **3 physical**: (1) **Exercise Daily** (to demand Mitochondria to work hard or replenish themselves); (2) **Eat Right** (In order to replace senescent cells by apoptosis, former **NIH/NIA** director **Dr. Mark P. Mattson** who is an expert in **Brain Aging DAD** has also advocated **intermittent fasting** skipping dinner is over 12~18 hours. Note that English word Breakfast for a morning meal is after a late 6~8 O' Clock dinner till the next morning 6 am about 12~10 hour

fasting. (3) **Sleep Tight** (as brain is known to use up 20% of the whole body energy but by-products must be cleaned out of the brain where there is nothing much except glia cells and blood capillary); **3 mental dimensions**: (4) **Social Often** (to keep harmful lonely feeling out), (5) **Stimulate Brains** (used it or lose it), (6) **Relax Minds** (in Tai Chi & Yoga Breathing exercise: "Do your best (to ward-off devils) and God will do the rest" said by Mr. Wang C-S (王健瑄)).

Recently, Stanford CS Dept Prof. **Andrew Ng** has applied efficient **matrix-matrix massively parallel computing** of the deep learning following **human visual system (HVS)** from unsupervised optical discrete **edges extraction** ("on-center. off-surround" due to **time-limited resource sharing for firing rates**) that discrete ones feed-in to decide connected edge or not, that leads to closed object with furthermore **2<sup>nd</sup> derivative as the curvatures to final stage supervised associative object recognition associative memory at Hippocampus, i.e. deep layer learning.**<sup>1</sup> Figure 3(a-g)

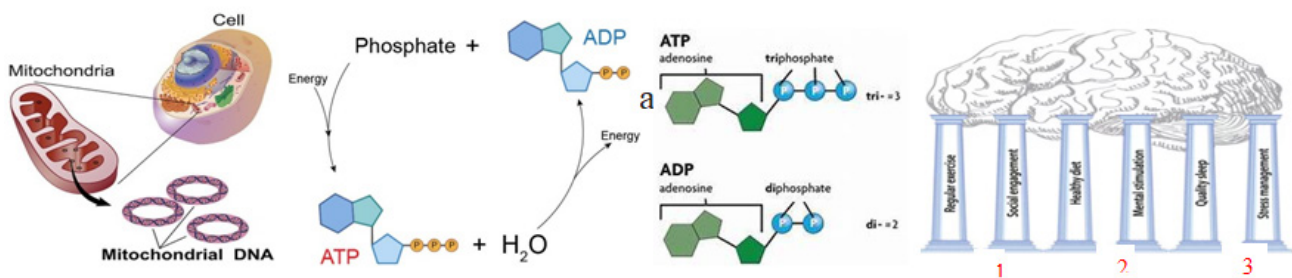


Figure 2

(i) Co-evolution partners *Eukyote* are indicated as about 100 or so **Mitochondria Organelle (M.O.)** which can efficiently rotate themselves to add a phosphate atom back to Adolescence Double Phosphate **ADP+P→ATP** chemical inside an Eukaryote cell of Homo sapiens. If we define young to be preserving both analog and digital information, while the otherwise as old.

(ii) This including the possibilities of their young or old. **ATP + H<sub>2</sub>O → ADP + P + 7.5 kilo calories** per mole (iii) Reversible **ATP↔ADT** (iv) Brains will use daily 20% of our whole body energy, as one feels hungry after study, but unfortunately the waste Brain Burning By-products (**BBB**) must be secreted outside of the **brain blood barrier (bbb)** by sleeping tight in those 6 Dimensions (3 physical + 3 mental) prevention for **Dementia Alzheimer Disorder (DAD: 3 Physical Dimensions**: (1)Regular Exercise, (2) Healthy Diet, (3) Quality Sleep, **3 Mental Dimensions**: (4) Social Engagement, (5) Mental Stimulation, (6) Stress Management.



Figure 3

- a) Harvard Med Sch. David A. Sinclair;
- b) Harvard Syst. Biol. Marc W. Kirschner;
- c) Princeton U. John J. Hopfield;
- d) NIH/NIA Mark Mattson (cf. 18 hours fasting facial collaping);
- e) Stanford Andrew Ng;
- f) Hippocampus/Amygdala,
- g) type of neuroglia(90% of the central nervous system is made up of neuroglia).

(c) Prof. **Marc W. Kirschner** Founding Chair of System Biology Dept. of Harvard, advocated mathematics approach to Investigate biological organization in space and time, e.g. cytoskeleton, the regulation of the cell cycle, and the process of signaling in embryos, as well as the evolution of the vertebrate body plan, e.g. microtubules established their unusual molecular assembly from **tubulin proteins** and identified the first microtubule-stabilizing protein tau, the so-called treadmill mechanism, in order to build up the cell differentiation,

**Kirschner** studies how frog embryo cells divide, how they generate their shape, how they control their size, and how embryos develop. If that dynamic information were partially lost, **Should that loss of information create aging?**

In order to generalize aforementioned information theory, we will explore explicitly **Human Visual System (HVS)** as an indication a potential **shortfall** of current **AI: meaning AI electric ion signals**

through tubes work all right currently; but 5 to 10 years later may fall short of some aspect, e.g. emotion IQ at Amygdala pair must be able to receive and send large chemical hormone signals, that can diffusion without tubes but targeted toward receptor collectors.

(i) Without light, HVS will have a flow of “Dark Currents (Ca<sup>++</sup>)”: meaning no incoming photons yet,” circulated continuously around 90 rods (built in closed packaged honey comb structure for collective detection of a few photons. The purpose of the dark currents is to inhibit the rods’ integrator Ganglion behind the 90 rods from firing detection signal with its own energy. Ganglion coordinate (X,θ) are organized in polar exponential grid at the distance X and polar θ for a

gracefully size s-scale invariant to the back of our head called Cortex 17 (Figure 4).

$$sX = \exp(U); U = \log X + \log s; \text{ e.g. size } s=2, \text{ We perceive } U \approx \log 2 \approx 0.3 \quad (2)$$

$$\Delta X_{90} \Delta P_1 \approx \hbar \quad (3)$$

Moonlight chase, a pray size has changed by a factor of 2 is only changed about 0.3 at Cortex 17, we are easier to aim at the prey; (a) This is called gracefully scale invariant; (b) Schrodinger Quantum Mechanics Uncertainty Principle, where the Planck constant  $\hbar \equiv h / 2\pi$ .

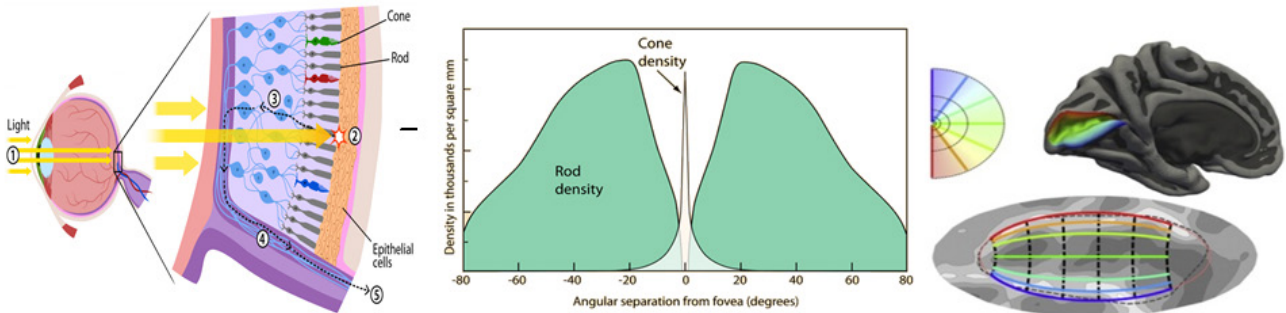


Figure 4 The bundle of 90 rods are distributed in polar exponential coordinates is flowing with Dark Ca<sup>++</sup>Currents, as discovered by NIH/DDKD William Archer Hagins.

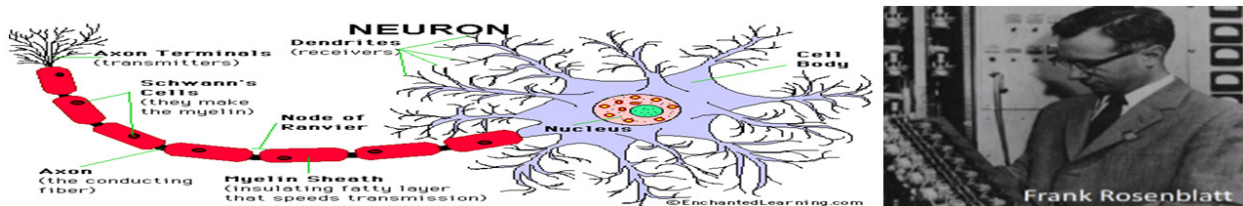


Figure 5 Model of Neural Net by Cornell Univ. Frank Rosenblatt single layer neural net exhibited at Smithsonian Museum.

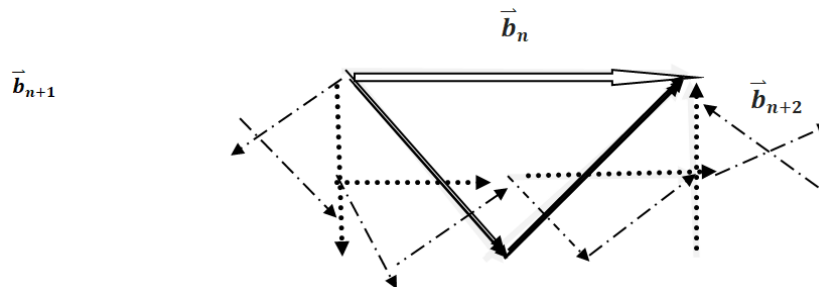


Figure 6 Directional Vector Information Flow Theory which can be recursively going down small bits segments. Eventually, we have algebraically reduced to orthogonal segments within the channel capacity, which can be furthermore digitized.

Bit pair: {(1111,0000) to (0000,1111)}

Bit pair: {(11,00) to (00,11)};

Bit pair: {(1,0) to (0,1)}.



Figure 7 Former 9 Scientists have left us with their wisdoms a. Charles Darwin, b. Ludwig Boltzmann, c. Allan Turing, d. Claude Shnnon, e. Marvin Minsky, f. Stanford John McCarthy, g. Hermann Helmholtz, h. William Archer Hagins, i. Alex Lyapunov (Isn't that a shame all these 9 great scientists have gone from the Earth.)

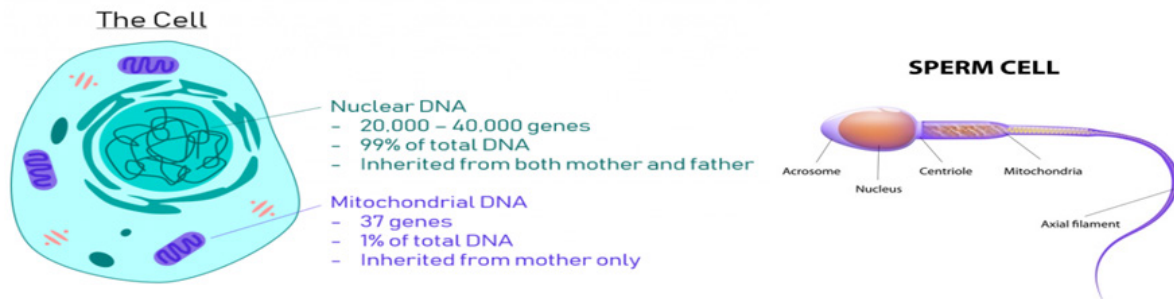


Figure 8

These **dark currents** were first discovered by **William A. Hagins of NIH**. If there were **no dark current circulates around bundle of 90 rods**, the **Ganglion integrator will reports the opposite “seeing a photon of light that change membrane potential.”** On the other hand, when there is incoming photons the membrane potential will be changed together with the path of the dark current, so that the dark current can **no longer inhibit the Ganglion**, of which the **ganglion will use its own energy to fire report back to Cortex 17** about seeing the light in the night. This phenomena captures the **“Negate the Converse”** logic and generalizes **Stanford Prof. John McCarthy** dual-track AI to **“IF & Only IF, Then or Else.”**

Evolutionally speaking we have thus far separated the **“energy from information”** so that **“detector and reporter”** are two different organs, to protect our ancestors from, say, a wolf eyes blinks in a dark cavern where we ancestor Homo sapiens hides for safety. We begin to mention those pioneers **who have defined classical AI**.

(1) British: **Alan Turing tested the other side to be Human or computer?**;

(2) MIT: **Marvin Minks** disproved Cornell Univ. **Frank Rosenblatt** single layer optical ANN “in 1957 that cannot do **ExOR**,” and introduce a logic **“If, Then,”** a simple logic; Both **Alan Turing** and **Frank Rosenblatt** have committed suicides.

(3) Stanford **John McCarthy** gave **dual track “If, Then, or Else”** in LISP programming that appears to be more intelligent. It would be interesting to compare between the loss information during artificial communication and biological genealogy Before we can explore biological recovery of noisy information, we shall review **Claude Shannon** developed digital communication information theory during 1945 ~1949 that can recover the error from sender to receiver that have suffered from both the propagation medium perturbation, as well as successiver noise degradation **without knowing what error they were**. Shannon introduced the binary notation in terms of logarithmic of probability  $p \leq 1$

$$\text{Information } I \equiv -\log_2 p = \log_2 \frac{1}{p} \tag{4}$$

For example, digital answer is “either yes, “1” or no, “0”, each with a half chance:

$$\text{Given Eq. (4)} \therefore p_{\text{yes}} = \frac{1}{2}; p_{\text{no}} = \frac{1}{2} \therefore I_{\text{yes}} = 1; I_{\text{no}} = 1. \quad \text{Q.E.D.}$$

Since English has **26** letters (a,b,c,...,x,y,z, ) plus a blank **space**, then Shannon considered **27** different characters in the message, and the information content of each letter is estimated by  $I_{\text{no}} = 1. I = -\log_2 \left( \frac{1}{27} \right) = 4.75 \text{bits}$ . For series of n characters, Shannon gave the average information called the **entropy  $H_{\text{Shannon}}$**

$$H_{\text{Shannon}} \equiv \langle I \rangle_{\text{ave}} \equiv -\sum_{i=1}^n p \log_2 p_i \tag{5}$$

The Shannon restoration involves a **divide-and-conquer** concept for amplification and truncation at each individual bits level. We wish to adopt a vector time segments generalization of Shannon theory. At the other side of the channel,  $\tau > 0$ , before these bits have been combined into the full digital information. We shall now review **Ludwig Boltzmann** definition of entropy in order to generalize **Shannon information theory** into continuous **temporal flow vector information**, in order to include **biological multi-dimensional kinetics for a graceful aging and possible reverse aging**. Herewith we shall review Ludwig Boltzmann analog definition of continuous Entropy  $S$  for biological system and introduced the supervised learning in artificial neural networks as follows: We introduce the internal time dynamics as our human thermal equilibrium reaching the isothermal  $k_B T_o = k_B (27 + 273)^\circ K = k_B 300^\circ K \cong 1 / 40 eV$

Thus we estimate for warm body temperature  $37^\circ C \equiv 310^\circ K$ ; we

$$\text{estimate } 1/37 \text{ eV, because } 9 \cong \frac{27}{37} = \frac{40}{37} = \frac{37}{40} \cong 9 \text{ equilibrium at the}$$

minimum Helmholtz free energy  $H_m$  as follows:

We begin with Ludwig Boltzmann definition of entropy as the measure of the degree of uniformity which includes the internal and external systems. In other words, the entropy is a measure of unusable energy when multiplied by the temperature  $T_o = 310^\circ K$ . For example, the rocks on mountain top have more degree of non-uniformity than erosion down to river beach sands, and thus more useful archeological information than uniform sand. Ludwig Boltzmann wrote down on his headstone (without the subscript **B**) and we shall adopt  $\text{Log} \equiv \text{Ln} \equiv \log_e$ ;  $e = 2.718, \dots$ ,

$$S = k_B \text{Log} W; \tag{6}$$

Probability measure is given as the inverse:

$$W = \exp\left(\frac{S}{k_B}\right) = \exp\left(\frac{(S_{\text{out}} + S_{\text{in}})T_o}{k_B T_o}\right) = \exp\left(-\frac{H_{\text{in}}}{k_B T_o}\right) \tag{7}$$

Where use is made of the  $T_o$  Homeostasis conservation law to introduce Helmholtz free energy:

$$\therefore S_{\text{out}} T_o + E_{\text{in}} = 0; \therefore S_{\text{out}} T_o = -E_{\text{in}}; \tag{8}$$

Replacing the outside unknown entropy with **internal expenditure of energy**, we have derived Herman Helmholtz “free to do work” energy at the constant body temperature  $T_o$

$$37^\circ C = 310^\circ K \cong \frac{1}{37} eV$$

$$H_{in} \equiv E_{in} - S_{in}T_0 \tag{9}$$

**Theorem Unsupervised Deep Learning for feature extraction:** Newtonian Equation of Motion of neuronal interconnect weight matrix  $[W]$

$$\bar{y}(t) = [W]\bar{x}(t); \bar{z}(t') = \sigma[\bar{y}(t)]$$

Deep learning is based on multiple layers,  $\bar{x}, \bar{y}, \bar{z}$

$$\frac{\Delta[W]}{\Delta t} = -\frac{\Delta H_{in}}{\Delta[W]} \tag{10}$$

We have proved the unsupervised learning in **Lyapunov** monotonic **convergence** in time,

$$\frac{dH_{in}}{dt} = \frac{\partial H_{in}}{\partial[W]} \frac{\Delta[W]}{\Delta t} = -\left(\frac{\partial H_{in}}{\partial[W]}\right)^2 \leq 0 \tag{11}$$

The threshold logic will be different for different applications

$$\left(\beta \equiv \frac{1}{k_B T_0}\right)$$

$$\frac{\exp(-\beta H_{in})}{\exp(-\beta H_{in}) + \exp(\beta H_{out})} = \frac{1}{1 + \exp(-\beta(H_{out} + H_{in}))} \equiv \sigma(x) \tag{12}$$

Of course this is not the only threshold logic, there is other rapid computation threshold logic, as well as **N-shaped**  $\sigma_N(x)$  that can generate a **chaotic logistic map** simulation did by Szu, and hardware has been built by **Charles Hsu and Mona Zaghloul** at GWU. This is the basic temporal dynamics we assert to govern most biological systems of Homo sapiens at isothermal brain equilibrium. Now we began with **Claude Shannon** information theory<sup>7</sup> of the fundamental laws of data compression and transmission with two main results in the **entropy S**, Eq. (1) for channel capacity. We generalize it into vector temporal flow so that we can apply the theorem of “**divide and conquer**” with orthogonal condition to become **loss-less** as proved in **Travelling Salesman Problems**. The original signal vector  $\bar{b}_n$  into multiple binary time segments  $\bar{b}_n; n = 0, 1, 2$  digital vectors information in recursively long time segments into 2 halves, and each half is further into 2 halves, etc. & so on, as each segment is replaced by smaller orthogonal triangles.

$$DO \ n = 1, 2, \text{ e.t.c. } |\bar{b}_n|^2 = |\bar{b}_{n+1} + \bar{b}_{n+2}|^2 = |\bar{b}_{n+1}|^2 + |\bar{b}_{n+2}|^2, \text{ iff } \bar{b}_{n+1} \perp \bar{b}_{n+2} \tag{13}$$

Nonetheless, each segment information can be digitized into pair signal vector will suffer the propagation spreading (envelope of wave front, known as Huygens wavelets law) as well as channel noises  $\bar{n}$  exerted upon every wave-fronts. As a result, the noise will be likewise amplified near the receive station with a weaken spread signal.

$$\text{Truncate after Amplification } \boxed{\bar{b}_i(t) + \bar{n}} \cong \bar{b}_i(t + \tau); \tau > 0 \tag{14}$$

Biologically speaking, Eq. (14) is replaced by error correction back tracking. That’s the same reason why the original information is orthogonally divided into bit stream, when degraded by channel propagation will be amplified and restored back bits by bits to a maximum possible upper limits of bits stream. Within a large error margin, we can exactly reproduce the original digital information. This is Shannon Information Theory. For example, an English message is represented into binary bits stream and then each bit may suffer with unavoidable channel spreading and noise but will be amplified and truncated into bits overcoming the noisy amplification before been re-combined into original English.

(iv) Can AI help Graceful Aging toward even the mythical Reverse Aging? This question implies that AI must enhance those 4 chances, namely 2 co-evolution species (Homo Sapiens & Mitochondria)

x 2 states (Young & Old). This capability is the most important for **WWII Baby Boomers** in order to utilize their **rich experiences** and **wisdoms** to help the Mankind. **As we said in the beginning there are three domains of life: Archaea, Bacteria, and Eukarya.** The Bacteria and Archaea are made up entirely of microorganisms; the Eukarya contains plants, animals, and microorganisms such as fungi and protists. The Bacteria and Archaea have been grouped together and called **Prokaryotes** because of their lack of a nucleus, but the Archaea are more closely related to the Eukaryotes than to the Bacteria and Eukaryotes. About 3~4 billion years ago, the Eukaryotes swallowed many bacteria. They become the ancestor of **Mitochondria organelle** with its own genome and develop a symbiotic relationship with Eukaryotes cells. The double membranes evolve with more wrinkles: the insides are rougher called Matrix and the outside called Christie. Most of the **Adenosine** (1 hexagon combined with 2 pentagons) **TriphosPhate (ATP)** synthesized efficiently by “motor rotation” during glucose & oxygenate metabolism is produced in the **mitochondria** through **Oxidative Phosphorylation** (the final step in cellular respiration. **It occurs** in the **Mitochondria**. It is linked to a process known as electron transport chain.

**ATP** become **ADP** like a chemical battery discharge for the energy required to pump for example the heart where the red blood cells **made from bone mellow having no Mitochondria organelle** with the further need to transport the essential water, oxygen and carbon dioxides. There are about 100 **Mitochondria organelle** per each of our cells. Our cells need to communicate with co-evolutional organelle. How do we do? We took food supplement\* like **Vitamin B** called Nicotinamide Mononucleotide(NMN) which is a precursor producing Nicotinamide Adenine Dinucleotide (NAD+) mediating the communication between our cells and mitochondria organelle. The pure chemical powder **NMN** can be absorbed easier under the **toque** through micro-capillaries than through acid stomach digestive organ. Each day one needs two baby spoons about 2 mini-gram. (**cf. YouTube: “The Role of Mitochondria in Aging and Disease”** - David Sinclair suggested\* that **NMN** as the precursor of communicator **NAD+** whose level can enhance for better communication between two genomes) used Nobel Laureate **Yamanaka** 3 of 4 factors IPG.

\*The Food and Drug Administration (FDA) has banned NMN for sale as a supplement, citing its status as under investigation as a drug.

**How do we know two species are not just one species?**

**Proof:** Homo sapiens species receive half genes from mother side and the other half from father side. This mixed fact allows the choice of healthy ones. On the contrary, Mitochondria are passing down only from the maternal side, not from the paternal side (less chance for Darwin-like evolution theory “the fittest, the survival”).

Note that male sperm does have mitochondria line up along its tail to power its wagging tail to seek & break into the egg, but once the sperm head enters a mother egg, immediately the egg cell will be closed up, to prevent a second sperm or even the first tails to enter. Only the mother egg can house 100 or so mitochondria and will pass on to the next generation.

Once we accept the fact of two species, then the reverse aging truth table will have 2x2=4 entries. We at least have to take 4 actions as follows: Given

(1) Metformin (made originally from French Lilac flowers, 1 gm per day in two pills according to the US FDA approved Protocol TAME (Target Aging Metformin) campaigned by Dr. Nir Barzilai, Albert Einstein Medical School to reduce blood sugar and henceforth our body fat reducing body weight;

(2) NMN can enhance NAD<sup>+</sup> to mediate communication between our cells and Mitochondria organelle partners. Furthermore, we need.

(3) to get rid of old cells by “intermittent fasting” for about 12 hours without food intakes, so that old senescence cells can be apoptosis: self-programming death;

(4) Exercise daily to “use them or loss them.” so that the inefficient Mitochondria will replenish themselves (we don’t know exactly how?)

Chinese Colloquium said well: Take ones breakfast like a king or queen, lunch as Prime Minister, dinner like a beggar. German Colloquium said that “The longer the belt is, the shorter, the life will be. “German said” The longer, the belt is; the shorter the life will be”.

### Conclusion

When this is” in”, there must be “out”. Nonetheless, the degree of uniformity in terms of so-called Entropy will increase, while the information will be reduced. We Homo sapiens have co-evolution partners about 3-4 billion years ago. Our cells swallow about 100 or so Mitochondria organelle. (MO: known as double membrane bacteria, but never come out). They stayed on to produce chemical energy from ATP to ADP losing a phosphate by water hydrolysis giving rise to 7 Cal molar heats. On the one hand, Mitochondria malfunction will produce several neurological disorders. On the other hand, cells keep differentiations and give birth to more cells until nowadays Homo sapiens mankind. Thus, whether we are young or old must be based on these 2 body problems with 1/4 probability for success or failure.

(1) Exercise daily by R.S.T.U.V. Ben Lo principles of CMC-37 Tai Chi Q’uan to replenish weak Mitochondria organelle; (2) Eat right by intermittent fasting about 12 hours to make senescent cells apoptosis; (3) Sleep tight to clean up 20% brain energy cloggy by-products to avoid Dementia Alzheimer Disorder; (4) Social Often wearing a smile meeting the others who may be in the same boat as you are, (5) Stimulate brains to use them or loss them, (6) Relax mind “Deep Breathing, Don’t Worry!” Do your best and God will do the rest” said by Mr. Wang C-S (王建瑄) who have influenced other leader to help built K-12 education in remote area of China.

Once we accept the fact of two co-evolutional species, then the reverse aging truth table will have 4 entries. We at least have to take 4 actions as follows: Given  $\frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$ . Useful guidance from graceful aging to revere aging are given.

**People have sought after medicines or food supplement to enhance the probability as follows:**

(1) **Metformin** (made originally from *Lilac flowers*, 1 gm per day in two pills according to the US **FDA** approved Protocol **TAME** (**T**arget **A**ging **M**E**t**formin) campaigned by Dr. **Nir Barzilai**, Prof. of Albert Einstein Medical School, to reduce blood sugar and henceforth our body fat body weight of senescent cells where the energetic Mitochondria Organelle (**MO**) will grow back;

(2) **NMN Nicotinamide MonoNucleotide**, made off with side chains around a pentagon & a hexagon similar to hormones (debatable as a food supplement without side effect or not within FDA), and how the powder shall be admitted under the toque capillaries in order to be by-passing acid stomach digestion. The fact of matter it is still a precursor that can enhance **NAD<sup>+</sup>** (Nicotinamide adenine dinucleotide) mediating the communication between our cells and co-evolution partners MO. Furthermore, we need

(3) “**Intermittent Fasting**” about 12 ~18 hours, so that old **senescence cells** can be **apoptosis**: self-programming death (we

don’t know yet the other methodology to enhance the replenishment; except recently scientists have demonstrated that more bone mellow producing **T-cells** from **Thymus gland** (lower; not upper Thyroid near throat) can kill senescent cells as if bacteria;

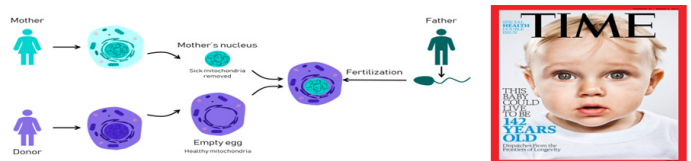
(4) **Exercise daily** to “.” so that the inefficient **Mitochondria Organelle** will be used or loss it by replenish themselves.

(5) We need to **sleep tight** (with the help of warm sucks, ear plugs, knee pillow) longer **than 8 hours** to clean up energy byproducts from our brains *that have used up 20% whole body daily energy consumption and the entropy by-products have no cleaning system except blood capillaries, (like every big city the trash collector always come in the night without traffic jams, where we have no kidney etc. dedicated pathways but slowly squeeze through crowded colchicum deposited blood capillaries. Otherwise, we might suffer **Dementia** Alzheimer Disorder (DAD) due to the junk left in the brain (cf. “**Brain Drain**,” (not about talent loss but physiology cleansing,) Maiken Nedergaard and Steven A. Goldman Scientific American (Sci. Am). 2016 Mar; 314(3): 44-49. doi: 10.1038/ 0316-44).* Moreover, if we exercise 30 min. daily our spinal cord muscles and preventing bathroom slippery, in order to prevent accidental falling down crippling ourselves.

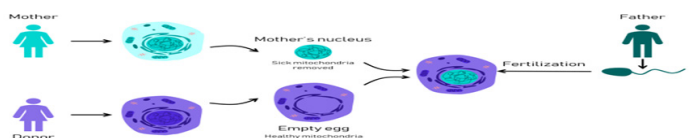
(6) Lastly, we need to relax mind: Don’t Worry: While in the East, we have motto: “Do your best and God will do the rest”; in the West, we have Sound of Music “Que So la, So la, whatever will be, will be. The future is not ours to see.” (Quote from Sound of Music Sister Maria & Captain von Trout).

Besides the wealthy Executive Chairman of *Amazon Jeff Bezos*, who has invested \$3B on **Altos Lab** for reverse aging in animal toward Homo sapiens experiments. Should that know-how become patented, then we will loss the equal chance of healthy span matching a longer lifespan, so that millions WWII Baby Boomers about 80 years old with their experience and wisdom can be beneficial to the greater society.

As a matter of fact, if the mother’s inheriting mitochondria were sick, physician will adopt foster mother egg’s mitochondria, as if 3 parents offspring’s, but replace its egg nucleus with the mother nucleus, cf. (Figure 9).



**Figure 9** Surrogate Mother with healthy Mitochondria.



**Figure 10** Surrogate Mother with healthy Mitochondria.



**Figure 11** Your thymus gland (not Thyroid at throat) is located just in front of and above your heart.

<https://www.forbes.com/sites/calcmchace/2022/11/01/regerating-the-thymus-pofile-of-greg-fahy/?sh=3f48d445d2eb>

Since there are two partners that require both to replenish themselves by (a) reducing the wasteful old cell by *intermittent fasting* (12 ~18 hours) and (b) Mitochondria to replenish themselves by we *exercise daily* to demand more energy output and to grow new organelle to be possible to achieve the reverse aging. Question remains whether WWII BB can live up to the healthy longevity expectation, so that their experiences and wisdoms can be beneficially utilized by mankind without terribly wasted.

Your thymus gland (not Thyroid at throat) is about an ounce, and located just in front of and above your heart. Thymus gland can secrete immune T-cells to kill bacteria, virus, etc. Recently, scientists found that T-cells can eliminate our aging senescent cells.

**Summary**

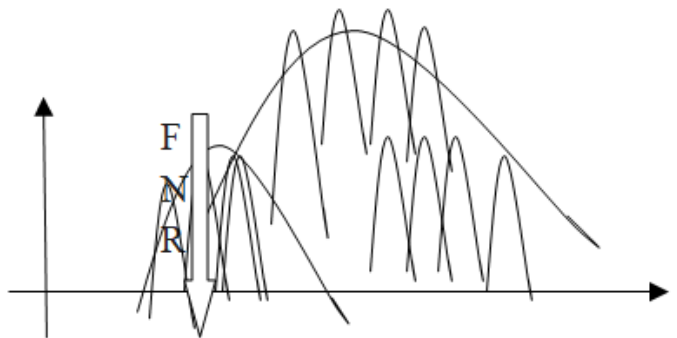
**Background:** Almost 4 billion years ago, when the *Eukaryotes* cells swallowed 100 or so *bacteria* known as *Mitochondria Organelle (MO: 37 genes in a ring of 16,500 DNA)*. Efficiently *MO* can add back the *phosphate: ADP+P→ ATP; where the hydrolysis of Eukaryotes cells ATP ADP can produce 7 k Cal per molar chemical energy* to share with *MO*'s in order for all to build up more copies of cells. Then, we began with the fittest survival *evolution* to all life forms, *Achaea, Bacteria* and *Eukaryotes*, beyond *Charles Darwin* Galápagos Island and Peas-Plant *experimentation by Fr. Gregor Mendel*. According to a best-sell book "*Lifespan, Why We Age and Why We Don't Have To*" by *David A. Sinclair* (translated in Chinese, as well). We get old because *MO* and *Eukaryotes* cells have lost of their original vitality information (digital genome and analog phoneme (epi-genome) as well as mutual communication ability).

*Marc W. Kirschner, Harvard Sys. Biology* emphasized cellular dynamics including the treadmill dynamics in "*Cells, Embryos, and Evolution;*" and "*Plausibility of Life: Resolving Darwin's Dilemma*". Meanwhile, *John J. Hopfield* of Princeton exposed the *Kinetic proofreading that allows enzymes to discriminate between two possible reaction pathways*. Moreover, *Mark P. Mattson* NIH/NIA has *advocated intermittent fasting* to encourage that replenishment aging brain and body due to senescent cells without apoptosis. We shall take these insights to keep a minimum loss of information for gracefully aging toward possible information retrieval for reverse aging from simpler species all the way to *Homo sapiens*.

In conclusion, we must explore all possible info retrieval mechanism; we need to execute *John McCarthy* Stanford Artificial Intelligence as well as the modern day *Deep Learning* of Yann LeCun, et al. as demonstrated matrix-matrix efficiently by Stanford *Andrew Ng*, so that we can generalize *Claude Shannon* IT to include possible biological/analog information as well.

**Appendix A**

(1) to make nursing home *humanoids robots* processing all sensory data inputs, including voice tone & body language, in order to perceive the emotion of *Home Alone Seniors, since the empathy humanoids will sell better*; (2) Applying machine AI to help physician to screening say diabetics type II patient's data in comparison to the accumulated medical diagnosis experience data (grouped age, race, sex, body-mass ratio), accordingly by AI. Step#1: every data point is under an s narrow uncertainty Gaussian envelop; Step#2 Then we construct an overall Gaussian envelop over smaller Gaussian envelops. #Step3 we shall minimize the left shoulder of Gaussian envelop as the False Negative Rates (FNR) that could inadvertently delay seeing a physician.



**Figure A1** Min. Negative Rate that may inadvertently delay the patients to see physicians.

National Library Medicine (National Library of Medicine - National Institutes of Health (nih.gov)) make in ARS (age, race, sex), in NIH Bethesda Campus of 27 Institutes shared a Network of informed decisions about their health to reduce **False Neg. Rate** that may inadvertently delay the patient treatment time;



**Figure A2** General Chairman Steve Grossberg of the first IEEE International Conference on Neural Networks (ICNN) in 1987 and played a key role in organizing the first INNS annual meeting in 1988, H. Szu has served as the Founding Secretary and Treasurer of INNS offered by Steve Grossberg during SPIE Optical and hybrid computing : 24-27 March 1986, cf. Appendix A, Dr. Harold H. Szu, Editor; Dr. Roy F. Potter, (v. 634., SPIE, National Library of New Zealand) at Xerox International Center for Training and Management Development, Leesburg, Virginia where Dr. Robert Hecht-Nielsen (ASU in math) with the financial support of DARPA Dr. Helena Wisniewski in 1987 he co-founded the *International Joint Conference on Neural Networks* (IJCNN).

**Appendix B attendances**

PROCEEDINGS VOLUME 634 Dr. Harold H. Szu, Editor; Dr. Roy F. Potter, | 24-27 MARCH 1986 at Xerox International Center for Training and Management Development, Leesburg, Virginia

- A. James Ionson
- B. J. P. Boris

- C. John A. Neff
- D. Satoshi Ishihara
- E. VanderLugt
- F. William T. Rhodes
- G. William Stoner

Francis T. S. Yu

A. H. J. Caulfield; Mustafa A. G. Abushagur

B. Ravindra A. Athale

C. S. Desmond Smith; Andrew C. Walker; Brian S. Wherrett; Frank A. P. Tooley

D. H. M. Gibbs; N. Peyghambarian

E. A. W. Lohmann; J. Weigelt

F. Toyohiko Yatagai

G. Steven C. Gustafson; Steven L. Cartwright; David L. Flannery; Gordon R. Little; John S. Loomis; L. Maugh Vail

H. Forrest L. Carter

I. B. Simic-Glavaski

J. Teuvo Kohonen

K. James A. Anderson; Richard M. Golden; Gregory L. Murphy

L. Nabil H. Farhat

M. Sam Horvitz

N. Bill Miceli

O. Arthur D. Fisher; John N. Lee

P. William S. C. Chang; H. H. Wieder; T. E. Van Eck; A. L. Kellner; P. Chu

Q. Y. Fainman; Sing H. Lee

R. R. P. Kenan; C. M. Verber

S. Chen S. Tsai

T. P. D. Henshaw; A. B. Todtenkopf

U. David Casasent

V. Thomas F. Krile; John F. Walkup

## Appendix B Key Papers abstracts

### Three Layers Of Vector Outer Product Neural Networks For Optical Pattern Recognition

Author(s): Harold Szu

A single homogeneous layer of neural network is reviewed. For optical computing, a vector outer product model of neural network is fully explored and is characterized to be quasi-linear (QL). The relationships among the hetero-associative memory [AM], the ill-posed inverse association (solved by annealing algorithm Boltzmann machine (BM)), and the symmetric interconnect [T] of Hopfield's model E(N) are found by applying Wiener's criterion to the output feature  $f$  and setting [EQUATION].

### Nonlinear Signal Processing Using Fiber-Optics Neurograms

Author(s): Harold Szu

A novel optical device for nonlinear signal processing is described based upon the following observations: (a) A phase space for signal processing is identified with a time-frequency joint representation (TFJR) that appears almost everywhere naturally, for example in bats, in music, etc. (b) A sudden slow down mechanism is responsible for the transition from a phase coherent-to-incoherent wave front and provides us the sharpest tone transduction from a Bekesy traveling wave in a model of the inner ear.

### Computed Tomography For Optical Computing

Author(s): Harold Szu

All known methods of computed tomography (CT) for image reconstruction from parallel projections have been derived from Fourier transform (the central slice theorem) and inverse Fourier transform, and the present Hankel transform tomography being an angular slice theorem is of no exception. Such a simplified viewpoint and unified theory is expected to serve the reader of optical computing and to pool interdisciplinary knowledge from a broader scientific community. The community can apply CT to optical computing or innovate novel approaches to solve the problem of real time and safe dosage computed tomography.

### Holographic Coordinate Transformations And Optical Computing

Author(s): Harold Szu

The alignment problem among an object  $o$  (7), the OFT lens and a phase hologram  $\exp(i\varphi(r))$  is investigated for holographic coordinate transformations, both theoretically and numerically, using FFT replacing OFT for two interesting examples in human visual systems. The optimum alignment is found to be at a specific saddle point  $r = r_0$  of the phase hologram defined by  $\Delta\varphi(r_0) = k = 0$  and  $\Delta^2\varphi = 0$  where the OFT lens axis  $k = 0$  (D.C.) and the object origin  $r = 0$  must be overlaid. The result of such a D.C.-saddle point alignment can be understood in terms of the minimization of high order (cubic and above) contributions of the Fourier phase integral from a general viewpoint of a stationary phase approximation. the slowdown is physically identified to be due to three forces. This has been used to derive a cubic deceleration polynomial responsible for a cusp bifurcation phenomenon which occur for every tone transduced along the nonuniform elastic membrane. The liquid-filled inner ear cochlea channel is divided by the membrane into an upper duct that has hair cells for the forward sound-generated flow and the lower duct for the backward balance-return flow.

### Iterative Restoration Algorithms For Nonlinear Constraint Computing

Author(s): Harold Szu

We sometimes wish to undo what has been done to optical data using repeatedly identical nonlinear optical processors, such as nonlinear imaging devices, matrix-vector multipliers with threshold logic, etc. This undoing is mathematically, equivalent to finding the inverse operator  $D^{-1}$ , if the direct operator  $D$  represents the nonlinear optical processor in repeated usage.

### Nonlinear Signal Processing Using Fiber-Optics Neurograms

Author(s): Harold Szu

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cochlea channel is divided by the membrane into an upper duct that has hair cells for the forward sound-generated flow and the lower duct for the backward balance-return flow. We sometimes wish to undo what has been done to optical data using repeatedly identical nonlinear optical processors, such as non-linear imaging devices, matrix-vector multipliers with threshold logic, etc. This undoing is mathematically equivalent to finding the inverse operator  $D^{-1}$ , if the direct operator  $D$  represents the nonlinear optical processor in repeated usage.

### Panel Discussion

Author(s): Harold H. Szu

In introduction, we have Sam Horvitz who is in charge of this panel and who will produce the report. Our purpose is to review the state of the art in neural network computing as well as the connection with optical computing in the future. I'm sure there is a lot of controversy and interesting projections of the future that will come out of this meeting. Here is Mr. Horvitz.

### Computed Tomography For Optical Computing

Author(s): Harold Szu

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### Associative Learning, Adaptive Pattern Recognition, And Cooperative-Competitive Decision Making By Neural Networks

Author(s): Gail A. Carpenter; Stephen Grossberg

This article describes models of associative pattern learning, adaptive pattern recognition, and parallel decision-making by neural networks. It is shown that a small set of real-time non-linear neural equations within a larger set of specialized neural circuits can be used to study a wide variety of such problems. Models of energy minimization, cooperative-competitive decision making, competitive learning, adaptive resonance, interactive activation, and back propagation are discussed and compared.

### Performance Limits Of Optical, Electro-Optical, And Electronic Neurocomputers

Author(s): Robert Hecht-Nielsen

The performance limits of optical, electro-optical, and electronic artificial neural systems (ANS) processors (also known as neurocomputers) are discussed. After a brief introduction, an overview is provided of the recently revived field of ANS. Next, ANS performance measures are defined and neurocomputer taxonomy is presented. Finally, the designs and performance limits of the various types of neurocomputers are discussed.

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### Conflicts of interest

The author declares no conflicts of interest.

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