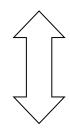
Title: Unified principle of existence

(Ando, T., Khrennikov, A., & Yamato, I.: Adaptive dynamics in physics and biology is the unified principle of our universe and existence. AJIS, 14, No. 3, 1-6 (2025). https://doi.org/10.36941/ajis-2025-0043;

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Adaptive dynamics by Ohya: Everything and everyone is interconnected; Nothing is isolated.

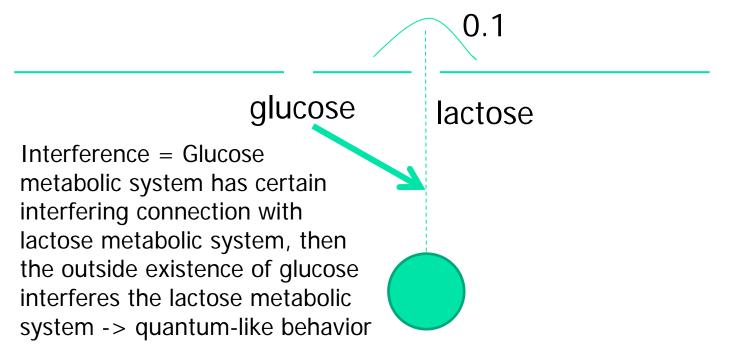


Buddha proposed: Unified principle of our universe is "Reincarnation and Causality". Everything recycles and is interconnected.

The boy shouted, "the king is naked".

Now, a microbiologist = Yamato claims "four century inertial systems, one century relativity theories and quantum mechanics are all naked = fakes".

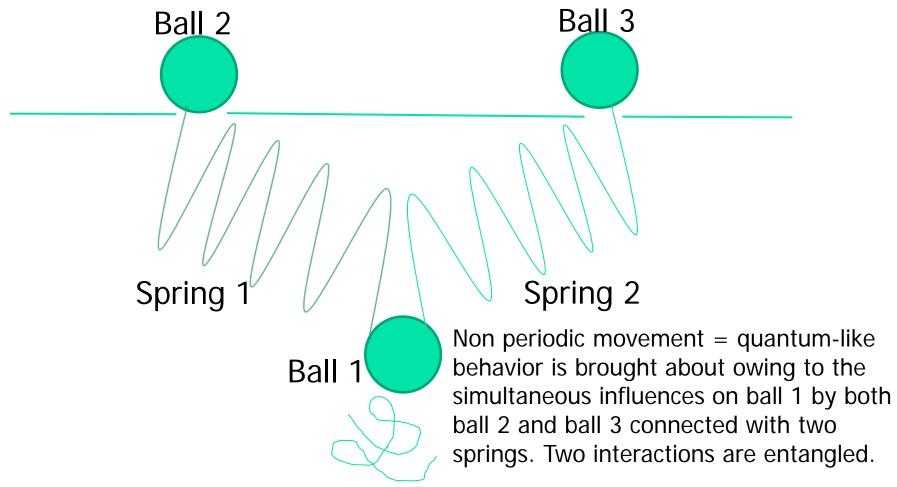
AD1/6. Biology. E. coli glucose-lactose system (wild type)



Expression of β -galactosidase

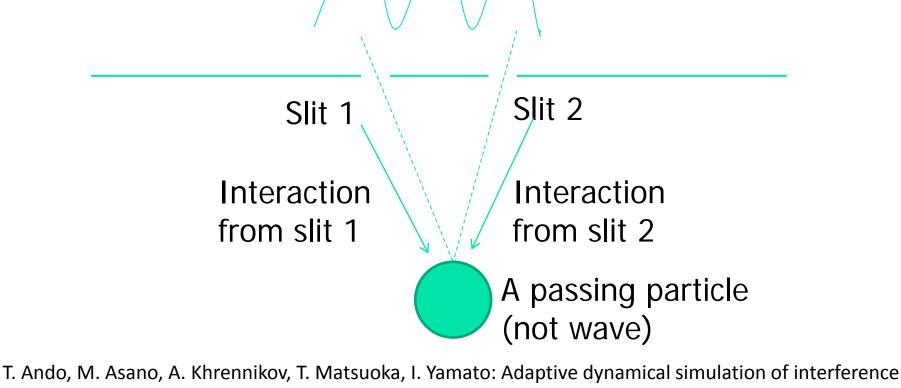
M. Asano, A. Khrennikov, M. Ohya, Y. Tanaka, I. Yamato: Quantum adaptivity in biology: From genetics to cognition. p.1-p.173 (Chapter 3, Fundamentals of molecular biology, p.41-p.56) (2015) Springer Netherlands, Dordrecht.

AD2/6. Macroscopic. Three body system



M. Asano, A. Khrennikov, M. Ohya, Y. Tanaka, I. Yamato: Three body system metaphor for two slit experiment and <u>E.coli</u> lactose-glucose metabolism. Philosoph. Transactions of The Royal Society A <u>374</u>, 20150243 (2016); DOI: 10.1098/rsta.2015.0243

AD3/6. Microscopic. Double slit interference

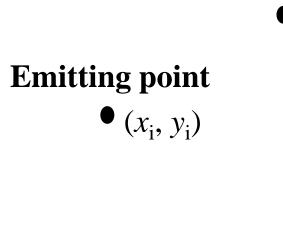


phenomenon for physical and biological systems. Entropy 2023, 25, 1487 (2023)

T. Ando, A. Khrennikov, I. Yamato: Refinement of adaptive dynamical simulation of quantum mechanical double slit interference phenomenon. J. Mod. Phys. 15, 239-249 (2024)

AD4/6. Simulation condition

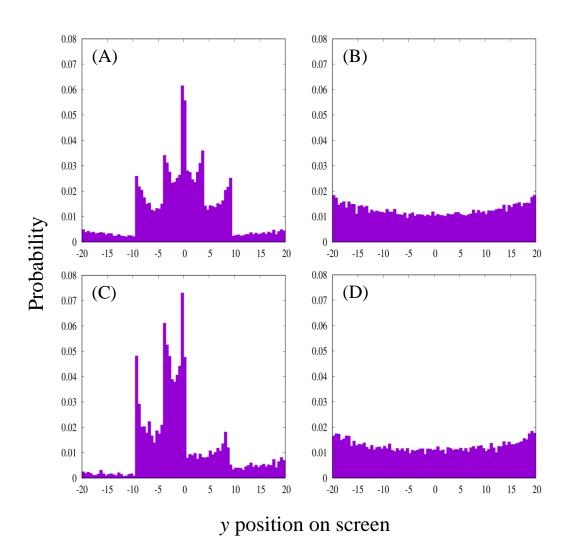




Slit
$$(0, e)$$
 $(0, b+c)$ $(0, b+c)$ $(0, -b)$ $(0, -b-c)$ $(0, -b-c)$

$$U(x_0,y_0) = \int_{-e}^{e} \frac{1}{\sqrt{x_0^2 + (y-y_0)^2}} dy - \int_{b}^{b+c} \frac{1}{\sqrt{x_0^2 + (y-y_0)^2}} dy - \int_{-b-c}^{-b} \frac{1}{\sqrt{x_0^2 + (y-y_0)^2}} dy \, (1)$$

AD5/6. Simulation results



Interference **Figure** pattern obtained with point emission particles. (a) The slit conditions are the same as in Figure 2a (slit width 0.1, slit spacing 0.6), with the point particle emission position at x_i = -9,000 and the degree of random motion $con = 10^{-6}$. Total numbers of emitted and arrived particles were 2,000,000 and 15,980, respectively. (b) 1-slit pattern with the condition as in (a). Total numbers of particles emitted and arrived were 4,000,000 and 25,634, respectively. (c) The pattern by counting arrived particles passing through only one of the 2-slits as for (a). Total number of arrived particles was 7,962. (d) Interference pattern with the point particle emission position at x_i = -8,999.985. Other conditions were the same as for (a). Total number of arrived particles was 19,134.

shows that the convensional particle recognizes the existence of the double slits and should be interpretation of quantum mechanics with wave/particle duality should be correct influenced with them. and that adaptive dynamics is not. Do not count the particle passed through slit 1 Slit 2 Slit 1 Interaction Interaction from slit 1 from slit 2

Interference comes from the

interactions with the two slits = the

Problem: If "which path" experiment has

been done properly and literally, then it

AD6/6. Microscopic. Adopt a particle model as photons and gravitons with collision interaction. The success does not deny wave/particle duality of quantum mechanism but proposes the probability of adaptive dynamics as its principle. Then we must reconsider "which path" experiment, where the experimental environment should be necessarily different.

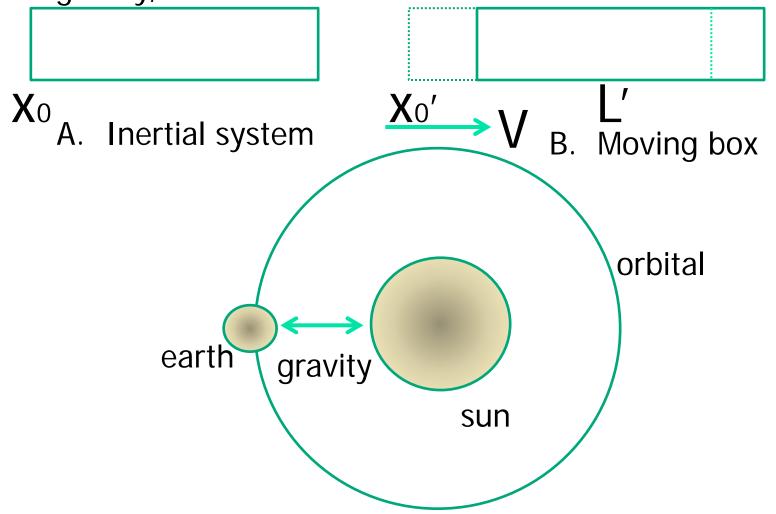
Passing particle

Time/space and inertical system1/2

Inertial rule by Galilei

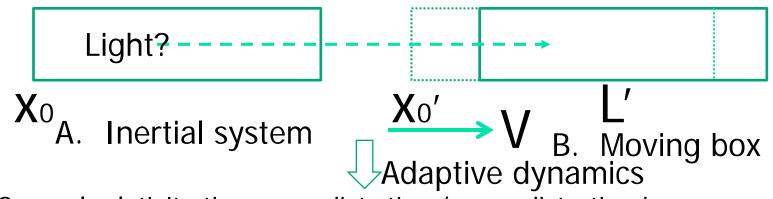
1. Without force, a substance moves straight with constant velocity

2. With gravity, two substances move around each other



Time/space and inertial system 2/2

Galilei and Einstein assumed that any signal (information) does not give any influences on the other systems. 1. Galilei transformation assumed infinite speed, then t = t'. 2. Lorentz transformation assumed finite speed of light.



General relativity theory predicts time/space distortion by mass, producing gravity lens. Light forceps can exert forces on mass.

$$\rightarrow$$

Are there any signals which do not interact thus give no influence on the target?; that cannot be light at least.

$$\rightarrow$$

Meaning no other inertial system than our unique universe.

- T. Ando, I. Yamato: Relativity theory by Einstein revisited. Qeios ID: SHG4Y5. https://doi.org/10.32388/SHG4 Y5 (2024); T. Ando, I. Yamato: Time/space and inertial system reconsidered based on the adaptive dynamical view. J. Mod. Phys., 15, 1621-1631 (2024)
- T. Ando, I. Yamato: Time/space distortion predicted based on adaptive dynamics. J. Mod. Phys., 16, 587-593 (2025)

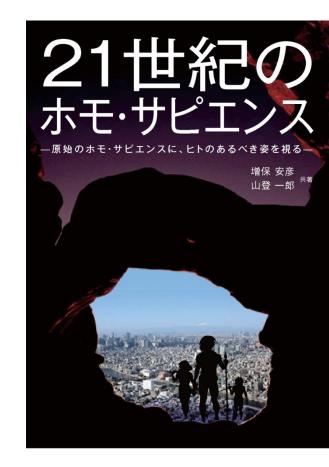
New Sciences (our universe follows "reincarnation and causality" by Buddha)

- Unification vs. diversification
 - Social sciences, arts, literature are all from human activities, then should be reconsidered and unified based on human sciences including modern life sciences/evolution (ex. Socio-biology by Wilson)
- Three fields in life sciences (materials, energy, information)
 - The same in physics and other sciences. Next new research field would be the unified fields on complex systems.

Humans; where come from and where to go

(Masuho & Yamato; *Homo sapiens* in 21st century)

Human nature derived from its evolution, contradictions between the nature and the modern society, then how should we live? (Unification of sciences: Towards social sciences based on natural sciences)



Chapters

- What is happiness
- Three basic desires of living organisms (food, escape from danger, sex)
- 3. Human evolution and his cooperativity (the fourth desire)
- 4. Prisoner's dilemman
- Human history and culture (poor/rich, money, globalization, desire for fame/power/money)
- 6. Happiness function
- Future prospect

1. Desires fulfilled then feel happy

- Emotion; accepting various information from internal/external environment and combining them with so far memorized information (experiences and learnings), we produce certain emotion. (Damasio (2003) Looking for Spinoza)
- Happiness; following desires among such emotions, we feel happy.
- Then, what kind of desires?

2. Three basic desires

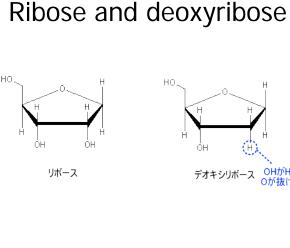
- Appetite (self-conservation)
- Escape from dangers
- Sex (proliferation)

2-1. Origin of life (RNA) -→ Liberty and equality are the justice of existence

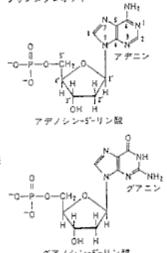
- Meteorite contains bases and amino acids
- RNA catalyzes the fission/fusion of covalent bonds -→ RNA world

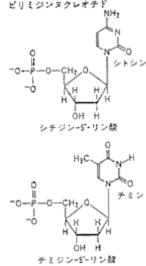
Nucleotides

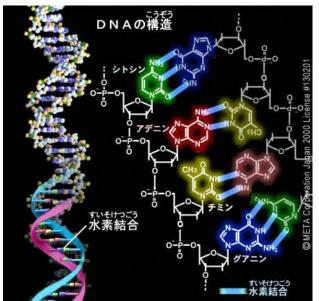
Double strands (DNA/RNA)





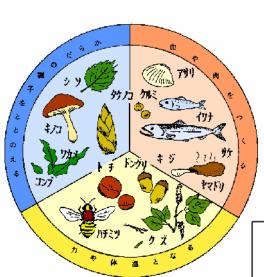






2-2. Appetite

 Living organisms eat to supply their energy and constituents



Food at Jomon era

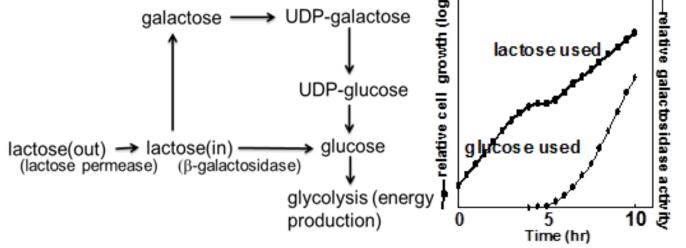


Figure 1 Two Stage Growth of *E.coli* (Glucose / Lactose Culture). In the left figure, lactose in the culture medium is taken into cells by lactose transport proteins, broken down by the degrading enzyme B galactosidase located in the cytoplasm, and becomes galactose and glucose. Galactose is converted into glucose by multiple enzyme reactions, broken down by the glycolytic system, and produces energy necessary for a living body. The right figure is a growth curve of *E.coli* in a mixed glucose - lactose culture. The vertical axis shows growth (bacteria growth logarithm) and the horizontal axis shows time. At first, the *E.coli* grows in number while only consuming glucose (thick line). When glucose runs out, this information is transmitted to the inside of the cell. With the desirable glucose having run out, the bacteria have no choice but to use lactose. B galactosidase is produced (thin line) and preparations are made to use lactose. At this time, the bacteria stop multiplying in order to adapt to their environment. They then begin using the lactose in the culture, and start multiplying again.

2-3. Sex

- Desire for auto-proliferation (Dawkins, Selfish gene)
- Conjugation, producing diversity (ex. diversity of immune system)

Demerit of intermarriage (homozygote of inferior genes)

Daughter does not take her father as a male (MHC is a marker for such recognition) Survival strategy of Aphids -→
(Any individuals have respective meaning of their existences equally for survival of "lives" or "mankind", as long as they are not clones)

2-4. Has living organism suicide system?

- (Dictionary of Napoleon does not have a word "impossible")
- Dictionary of living organism does not have a word "suicide"
 - For, such living organism having the word "suicide" in its dictionary cannot survive during this long history of evolution

3. Cooperativity; human specific nature

- The fourth desire, cooperativity producing the fairness feeling
- Recognition size is about 50-400

Evalution of living organi

Great

extinction

collision) occurred.

Use of fire and tools.

Aridification of Africa.

North America and Eurasia merge.

Europe or Siberia uninhabited by people.

Beginning of agriculture (until then: hunting and

Last Ice Age.

gathering).

possible

(e.g.,

Formation of the large continent of Pangaea.

Some sort of large change on Earth's surface.

meteorite

3-1. Evolution of living organisms			
Years ago	Evolution of Living Things	Changes Relating to Earth and Society	
4.6 Billion		Earth is created.	
3.5 Billion	Birth of life in the ocean (prokaryotic mono-cellular organisms).		
2.7 Billion	Appearance of stromatolites.	Oxygen molecules increase in the atmosphere due to stromatolite photosynthesis.	
1.8 Billion	Birth of eukaryotes.		
1.2 Billion	Animals and plants split off.		
1 Billion		Creation of ozone due to oxygen and radiation from the sun.	
900 Million	Birth of protista.		
500 Million	Cambrian Explosion. End of Cambrian period: basic fish (Agnatha), which were the first vertebrates.		
420 Million	Ferns and insects appear on land.	UV is blocked by the ozone layer's formation, and organisms were able to live on land.	
410 Million	Birth of vertebrates. Evolution took on a rapid pace. Wide variety of fish.		

360 Million

270 Million 250 Million

60 Million

7 Million

0.5 Million

Thousand

100

Vertebrates came to live on land.

Explosive evolution of mammals.

Appearance of Australopithecine.

Homo sapiens leave Africa.

15 Thousand Settled communities created in Middle East.

Upright bipedalism.

murals, burial items.

95% of living things on Earth go extinct.

Humanity arrives on Australian continent.

10 Thousand The world human population is approximately 10 million.

Homo sapiens ("Wise Human"); no major changes.

Neanderthals (distributed widely throughout Europe).

20 Thousand The "Great Leap Forward": Development of language and tools, Lascaux cave Cold period.

It rapidly increases due to agriculture, reaching 100 million about 5,000 years ago.

3-2. Evolution of humans

(5~7 million years ago, evolved from the common ancestor with chimpanzees)

- Chimpanzee: group size 50, gathering life in jungle -→ polyamory (length vs. size of male organ)
- Gorilla: big male and small several females, gathering life in jungle → polygamy
- Homo sapiens: group size 50, hunting and gathering life on savannah → monogamy

3-3. Cooperativity of lion

 Lions live on savannah: Hunting on savannah by forming a few member group of mainly family, where their cooperative behaviors are essential.

A group of lions



3-4. Human cooperativity

The Core Desire for Cooperation
(Originating from Genes)

Instinctual Desire for Cooperation

Reciprocal Altruism (Unique to Humans, Who Run Societies)

- 1. Core: Coming from selfish genes, where the genes try to multiply themselves, mainly protecting those who are close to them. (ex. Mantis male and a parent bird protecting their chicks)
- 2. Instinctual cooperativity: Like lions, instinctively built-in for efficient life of hunting and gathering on savannah, watching, growing and taking care of small babies due to the bipedal structure, etc.
- 3. Utilitarian reciprocal altruism as cultures based on information-based learning

3-5. Humans cannot live alone

- We feel happy when we can cooperate for others
- We feel happy when we are appreciated as cooperative by others
- Recognition size is 50-400, so we see such members. Ex. Tora-san, the Futen, in Katsushika Shibamata in the movie of "Otoko-ha Tsurai yo".

4. Prisoner's dilemma

- Rule (next page)
- A bookie and two players: \$5 for a game. Two cards, "Cooperate" or "betray"
- Cooperate/cooperate: Bookie pays \$10 to both players
- Betray/cooperate: "Cooperate" player is judged too good-natured, thus has to pay \$15 to the "betray" player
- Betray/betray: As punishment bookie takes the two \$5 for the game

Prisoner's dilemma

Partner		
	Cooperation	Betrayal
Cooperation	Reward (For Mutual Cooperation) ¥2000	Money Cheated Out Of ¥500 Payment
Betrayal	Gain (Skillful Deception) ¥3000	Fine (For Mutual Betrayal) ¥100 Payment

Darthar

Me

- Remuneration & Payment Based on Results of Prisoner's Dilemma Game (Seen from the Perspective of "Me"). Here, I (Yamatō) will explain the prisoner's dilemma wager game in a simplified fashion. Imagine there is a bookie that judges two players and pays them their winnings. The two players each have two cards: "cooperate" and "betray." In silence, they simultaneously present one at a time to each other. When both present their "cooperate" card, the bookie gives them a large reward (¥2000 each). When both present their "betrayal" card, the bookie takes money (¥100 each) as a fine. In the case that one person presents their "cooperate" card and the other presents their "betrayal" card, the former is judged to have been tricked because he or she is too good-natured, and made to pay ¥500. However, the latter, who announced that they were going to behave selfishly, is given a large reward (¥3000). If this game is played repeatedly, the players come to understand that a way of playing in which both benefit and the bookie loses—in other words, both present their "cooperate" card—is the most beneficial. They build a trusting relationship, and continue to present their "cooperate" card. In practice, this strategy is the best. Similarly, when living beings are surviving and evolving in an ecosystem, they generally increase in number with this kind of "cooperative" (or "good-natured") strategy. In other words, when the Earth (bookie) has in its environment a lot of unrestricted resources (money), insofar as the various living beings (players) adopt a "good-natured" modus operandi in which they cooperate with each other, or do not interfere and act selfishly with regard to one another, everyone benefits. I think that as a result of this, living beings have diversified through evolution and been able to prosper.
- •On the other hand, if in a restricted environment an established wager game is carried out multiple times, since it is of course uncertain whether players will cooperate with each other, they will grow suspicious and avoid presenting their "cooperate" card. When this happens, the tendency to present the "betray" card ("selfish" strategy) will grow stronger. In other words, a lot of selfish people tend to appear. This is why when the game is under restricted conditions (in other words, when the bookie does not have a lot of money) and only played a limited number of times, the players end up operating in a way that benefits only themselves; the "selfish strategy" becomes predominant. In such a situation, "good-natured" people are betrayed and therefore end stop trusting each other.
- •There are various degrees to this behavior, including how "good-natured" companions end up acting. In practice, people adopt various strategies. Furthermore, the game's conditions can vary; for example, the reward and fine amounts can be higher or lower. Depending on these conditions, the results of the game can vary greatly. Here, I have presented in a simple fashion the way players typically behave.

4-1. Repeated vs. only a few times games

- Repeated (unrestricted environment): The bookie is very rich, then two players can trust each other to show "cooperate" card always; bookie alone loses = good-natured strategy -> Evolution at ancient time and from the Age of discovery to French revolution "liberty, equality, and love" (towards civilized society in capitalism)
- Once or a few times (restricted environment): The players cannot trust each other and they want to get benefit selfishly by showing "betray" card; bookie has limited resources = selfish strategy -> they want to acquire benefits among others, which happened many times so far. Each time they are cancelled by wars or others. But now we cannot make wars.

5. Human history

- Hunting and gathering life of size 50 (5~7 million years ago; or 0.4 million years ago, Homo sapiens)
- 15 thousand years ago, settled life with agricultural revolution causes rapid increase of population: Division of labor, multi-layer society with poor/rich (-> toward slavery)
- BC 400: Silver coins in Greece
- Feudal system (serf), Renaissance (civilization, French revolution, Age of discovery), mercantilism, industrial revolution & capitalism, colonialism, imperialism
- Free competition under capitalism, then globalization

5-1. Disparity (poor/rich)

- Contribution to his own belonging group of about 50 -> Must be happy. Since "enemy" was clear, then he could fight for his group's survival thus his contribution was clear. (They had to highly struggle to survive.)
- By settling down for agriculture, productivity increased. Population increased producing multilayer society (division of labors). "Money, fame, power" appeared. -> However, belonging group was clear and "enemy", too. Therefore, must be happy as above.
- As substitution of appreciation of cooperativity, "money, fame, power" were established.

5-2. Money

- Bartering age
- Division of labor stimulated money/coins system: They are precious and does not decay (no depreciation). -> They are not equal to matters, so earn interest.
- Marx vs. Gesell: Capitalists exploited labor class -> Free land and free money having depreciation system, as being equal to matters.

5-3-1. Globalization (1)

Especially, in modern Japan,

- Ultimate labor division system + knowledge of human beings being all relatives.
- Owing to high productivity, we can live all alone, such as by buying food at a convenience store. Furthermore, all over safe in Japan. So fundamentally three basic desires of living organisms are mostly fulfilled, thus, no need to cooperate. -> Belonging group to which we cooperate and contribute disappears (but we keep the fourth desire for cooperativity genetically).

5-3-2. Globalization (2)

 Severe competition under restricted environment with prevailing selfish strategy: Bigger size is advantageous, and crossbreeds/mutants increase under the severe environment going near extinction (Before, belonging groups were clear and cooperativity were essential. Furthermore, whenever near extinction, fighting and wars took place to cancel out the severe environment producing new condition near unrestricted environment, where competition with goodnatured strategy resumed. Therefore, people could compete and feel happy by performing free and good-natured competition consistent with the fourth desire for cooperativity, because they did not have to be selfish.

5-3-3. Globalization (3)

At present, we cannot perform fighting/wars: But the situation is near extinction with prevailing selfish strategy -> People tend to be isolated, doubtful, feeling unfair, and finally become unhappy unable to fulfill the fourth desire, cooperativity. (Especially more young people in Japan or Korea may feel unhappy. In America, the living environment may be more dangerous, thus the belonging group such as family may be essential bringing about happiness feeling with cooperation/contribution. Or in Africa, they have to struggle to acquire food for survival necessitating their belonging groups.)

6. Towards being happy

- Happiness: Fulfillment of 4 basic desires (for food, sex, escape from danger, and cooperativity). Nowadays desires for food, sex, and escape from danger are almost fulfilled and the necessity for cooperation lowers. But we keep the fourth desire for cooperativity.
- Under unrestricted environment, the fourth desire for cooperativity can be easily fulfilled with the good-natured strategy.
- But under the modern restricted environment, belonging group becomes obscure and chances for cooperation decrease. -> On the contrary, the desire for cooperativity seems to be inversely proportional to the desires for "money, fame, and power".

6-1. Decrease of the necessity for cooperation

- Three basic desires are mostly fulfilled. Therefore, "enemy" and fighting to acquire them are not necessary anymore, then the belonging group becomes obscure.
- In the competitive capitalism society under restricted environment, competition with selfish strategy becomes prevailing for the efficiency of division of labor, making all others look like enemies. People cannot behave cooperative, instead become isolated and doubtful, feeling unfair. -> Causing loss of feeling interconnected -> Maybe the primary reason for the decrease of population and the number of new-borns.

6-2. Happiness function

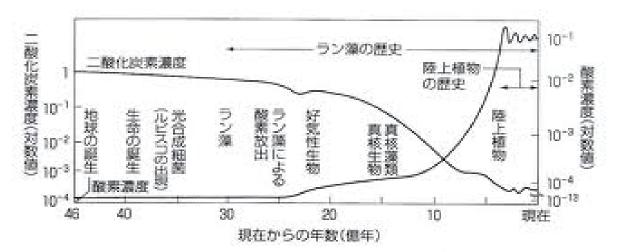
- Happiness (H) is thought a product of the satisfaction ratios (0~1) of basic desires (Appetite, Sex, and Escape from danger) and the fourth desire (Cooperation). However, under restricted environment, C should be inversely proportional to the desires (1~∞) for Money, Honor, and Power.
- Under unrestricted environment, C has nothing to do with or is least related to M, H, and P.

6-3. Examples of the happiness function

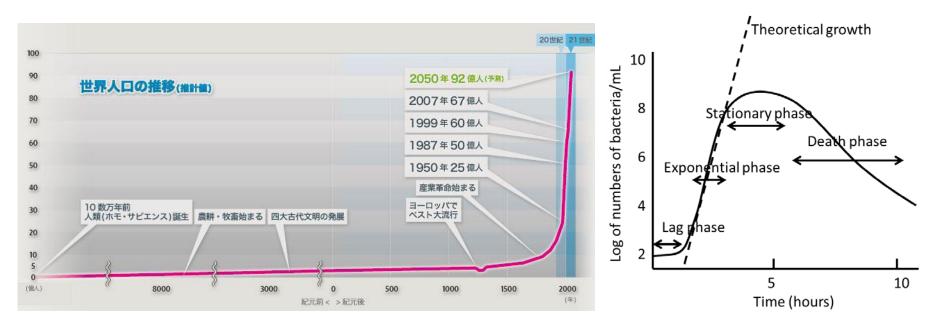
- Ancient days: A, E, S can be 0.1, 0.1, 0.5, respectively, and when we consider M, H, P are 1, C=1/1^3 makes H=AESC=0.005.
- Now: A, E, S can be 0.9, 0.9, 0.6, respectively, and when we consider M, H, P are 10, C=1/10²
 3 makes H=AESC=0.0005.
- At Roman period: Slaves were not admitted as humans. Citizens were all independent and they admitted Emperor as responsible for a hard task. Then, A, E, S can be 0.5, 0.6, 0.6, respectively, and when we consider M, H, P are 2, C=1/2^3 makes H=AESC=0.023

7. Where to go

- Try unrestricted environment again = Space development?
- Limit the free competition = try network system of many self-sufficient and self-support societies of 50~5000 members.
- Reconsider substituted appreciation system of cooperativity. Introduce free land/free money system or high tax/high welfare system in northern Europe.



Population on earth vs. E. coli growth curve (similar?)



Left. Changes in the World's Population. When we evolved into *Homo sapiens*, 50-person groups appeared. Forty thousand years ago, when we left Africa, there were probably 100- person groups. The population increased due to the invention of agriculture 10,000 years ago. In recent times, population increase has been explosive. (From the United Nations Population Fund's Tokyo Office Homepage. Only Japanese language version was available.)

Right. Growth curve of $E.\ coli$. After inoculation into new medium, cells start growing slowly to adapt the new environment. Then they grow exponentially. If there is infinite new medium around, they grow infinitely as exponential phase. But nutrients in the medium go consumed and wastes begin accumulated, then the growth slows down (stationary phase). Finally they start dying.

Which phase does the left-hand population graph now correspond to in the bacterial growth curve?

Summary (principle is reincarnation and causality)

- Living organisms have no suicide system
- Every individual has its living meaning equally for lives, as long as they are not clones (justice of being free and equal)
- Humans cannot live alone (the fourth desire for cooperativity)
- Good-natured strategy under unrestricted environment and selfish strategy under restricted environment
- Then free land/free money and/or somehow limiting free competition under restricted environment
- Usefulness of the approach by quantum bioinformatics theory

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Research targets in life science (3 flows)

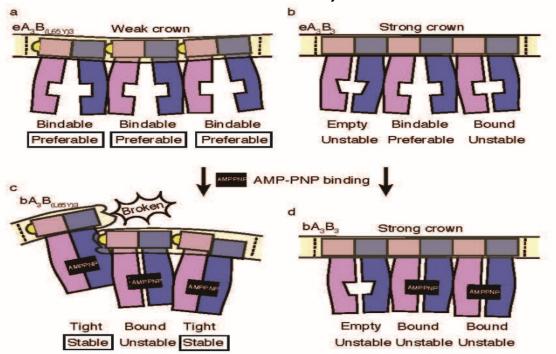
(Yamato's view of Biological Science)

- matter → biochemistry (metabolism; Calvin, 1945)
- energy → biophysics (muscle; affinity & Brownian)
- information → molecular biology (*genetic code, signal transduction, nerve/brain system, etc)
 - ⇒ information biology (new research field!)
 - *Genetic code (Bioinformatics)
 - DNA to RNA to amino acid sequence and regulation
 - Amino acid sequence to protein (protein folding)

Drop-in: Affinity-change model (recycling of energy)

I. Yamato: Ordered binding model as a general tight coupling mechanism for bioenergy transduction --- A hypothesis. Proc. Japan Acad. 69, No. 8, 218-223 (1993)

E. hirae Na+-ATPase (A₃B₃)

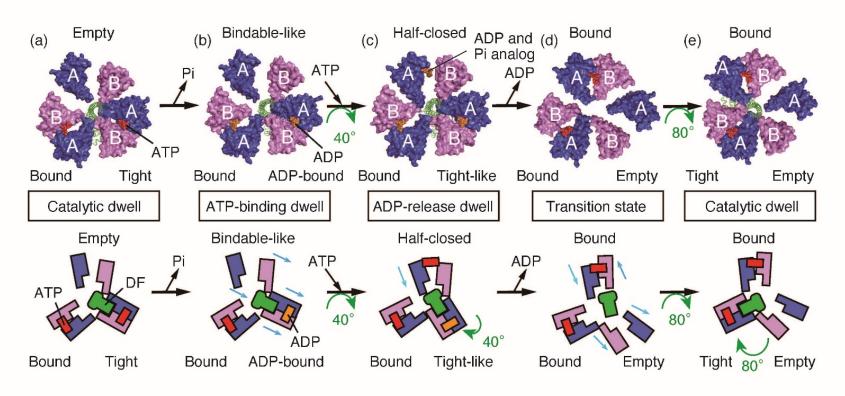


Four-dimensional structure should be asymmetric. Because, finite/multiple interactions between subunits necessarily break symmetry (Haemoglobin $\alpha 2\beta 2$ of Pertz should be asymmetrical).

S. Maruyama, K. Suzuki, M. Imamura, H. Sasaki, H. Matsunami, K. Mizutani, Y. Saito, F. L. Imai, Y. Ishizuka-Katsura, T. Kimura-Someya, M. Shirouzu, T. Uchihashi, T. Ando, I. Yamato, T. Murata: Metastable asymmetrical structure of shaftless V_1 motor. Science Advances 5: eaau8149 (2019)

Drop-in: Affinity change model (recycling of energy)

E. hirae Na+-ATPase (A3B3DF)



Each unit hydrolyzes ATP in order to utilize the energy to decrease the affinity for axisDF and to release it. The released axisDF rotates thermally to land on and to attach the next unit.

S. Arai, S. Maruyama, M. Shiroishi, I. Yamato, T. Murata: An affinity change model to elucidate the rotation mechanism of V₁-ATPase. Biochem. Biophys. Res. Commun. 533, 1413-1418 (2020)

Unification of sciences

Information biology (causality) to understand information transduction in living organisms

- Interconnected system
- Violation of classical total probability law (= quantum-like behavior or non-Kolmogorovian)
- Adaptive dynamics
- Quantum entanglement
 - Schrödinger's cat
 - Proteins (prion etc), cells, differentiation, evolution, ecological system, cognition, etc, all biological phenomena can be described
 - Bio-information processing follows the same principle of quantum computer

Coclutions

From micro to macro, biology, humans, societies, world/universe

- Everything recycles & interconnected.
- Every member as a particle is free and equal independently and forms multilayer structure due to the symmetry breaking owing to the finiteness of the number.
- —>Knowing the principle, we can solve any problems.

Hope (2024. 10)

Everyone in the world including every leader in every country should learn, for

- •We are all one species, Homo sapiens
- •On our earth under this strictly restricted environment, any fighting or wars as Ukraine and Gaza are now betrayal against us living organisms and should be stopped
- Now justice of liberty/equality/love and the principle of existence as reincarnation and causality are scientifically and clearly shown
- Now it is time for us to cooperate for saving our mother earth