Prof. Rex Li's Writings

Category:	Psychology
Sub-category:	Thinking and Learning
Code:	Psy 02-003
Title:	Entropy, Neural Network and Intelligence
Year Written:	2020
Summary/ Abstract:	This short paper tries to connect intelligence with natural network, evolution, DNA entropy, chaos out of order. It is my first attempt on this complicated subject

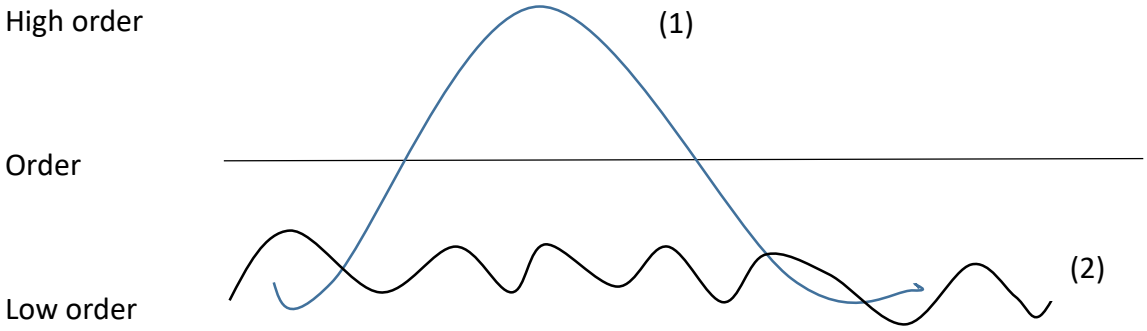
Prof. Li's Ideas 814 (21/11/2020) | **Revised (4/2/2021)**

Entropy, Neural Network and Intelligence

(A) Entropy

I have never thought of entropy deeply before.

(1) Think of an isolated island of Robison Crusoe. He landed there and built order. He lives for a long period with order. When he left, his farms became ruined and his house was overrun. So there's less order, represented:



(2) But in that disorder, wild plants and animals may proliferate. It will be a new order. It is because there is law of nature of the earth's environment working with (photosynthesis, evolution, water cycle, energy etc.)

Whenever there's law, there's order.

(3) Billions of years later, the sun dies and the earth dies, the island will be thrown into chaos: no more laws of nature of the earth's environment. But there is still laws of universe (motion, energy, matter, etc.)

(4) Heat flows from hot body to cool body. I'm not sure heat flow, hot, cool is a good description. Rather put I tag of temperature on bodies where the rule is equilibration of temperature

Mix two cups of water, 100℃, 0℃ = 50℃ (?)

Equilibration results.

If heat is energy in speed of movement of molecules, then equilibration is to equalize speed in a system.

(5) My Paradox:

1. Where there is law, there is order. 2. When there is no order (disorder), there is no law (contrapositive). 3. Implication of no law: anything is possible.

Is this a law?

Also, "anything is possible" doesn't hold inductively. How can it be possible for a civilization to suddenly spring up for a few minutes in a chaotic dying earth? It is impossible to think of lawless. The law of decay to entropy is working here.

(B) Neural Network

(1) Some history:

1854	George Boole started Boolean algebra (and, or, not) and binary functions.
1886	Charles Peirce described logical operations could be carried out by electrical currents (wiki – logic gate).
1900s	Engineers play with circuitry.
1900s	Logic and electricity combine to form logical circuitry (Logic gates: AND gate, OR gate, NOT gate).
1900s	Debate on nature of synapses (electric or chemical).
1930s	Concept of neural network formulated.
1940s	Turing machine / AI concept formulated and computers built.
1940s	Cybernetics / control theory.
1950s	Discovery of DNA and self-replication.

(2) It appears we use a logical invention to interpret the human brain. Does the brain really work that way?

(3) Statement to test:

When the firing of neurons correspond with basic logic (and, or, not), then the brain processing is said to be logical / a logic construct.

(4) Another way to put it:

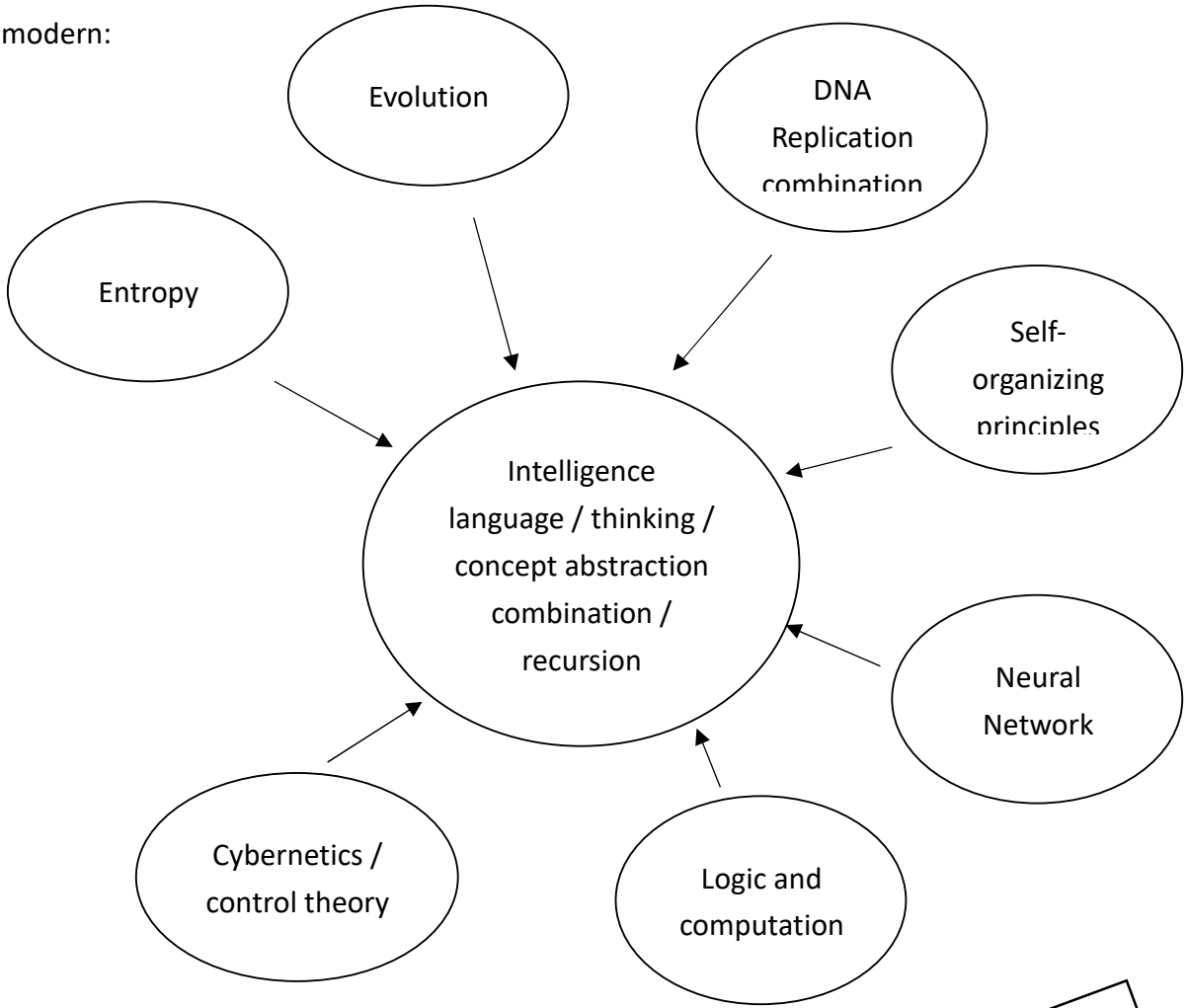
Modern scientists try to understand the brain by the metaphor of basic logic.

(5) If brain creates knowledge and brain works according to basic logic, then knowledge (created) should follow (reducible to) basic logic. However, this reduction may not be helpful (may not enhance more understanding!)

(6) Even if the brain works with basic logic, it does not stop humans from thinking illogically on higher-level processing / understanding. Inference can go wrong. Higher-order logic is another thing. But basic logic will not go wrong.

(C) Steven Pinker's Theory of Intelligence

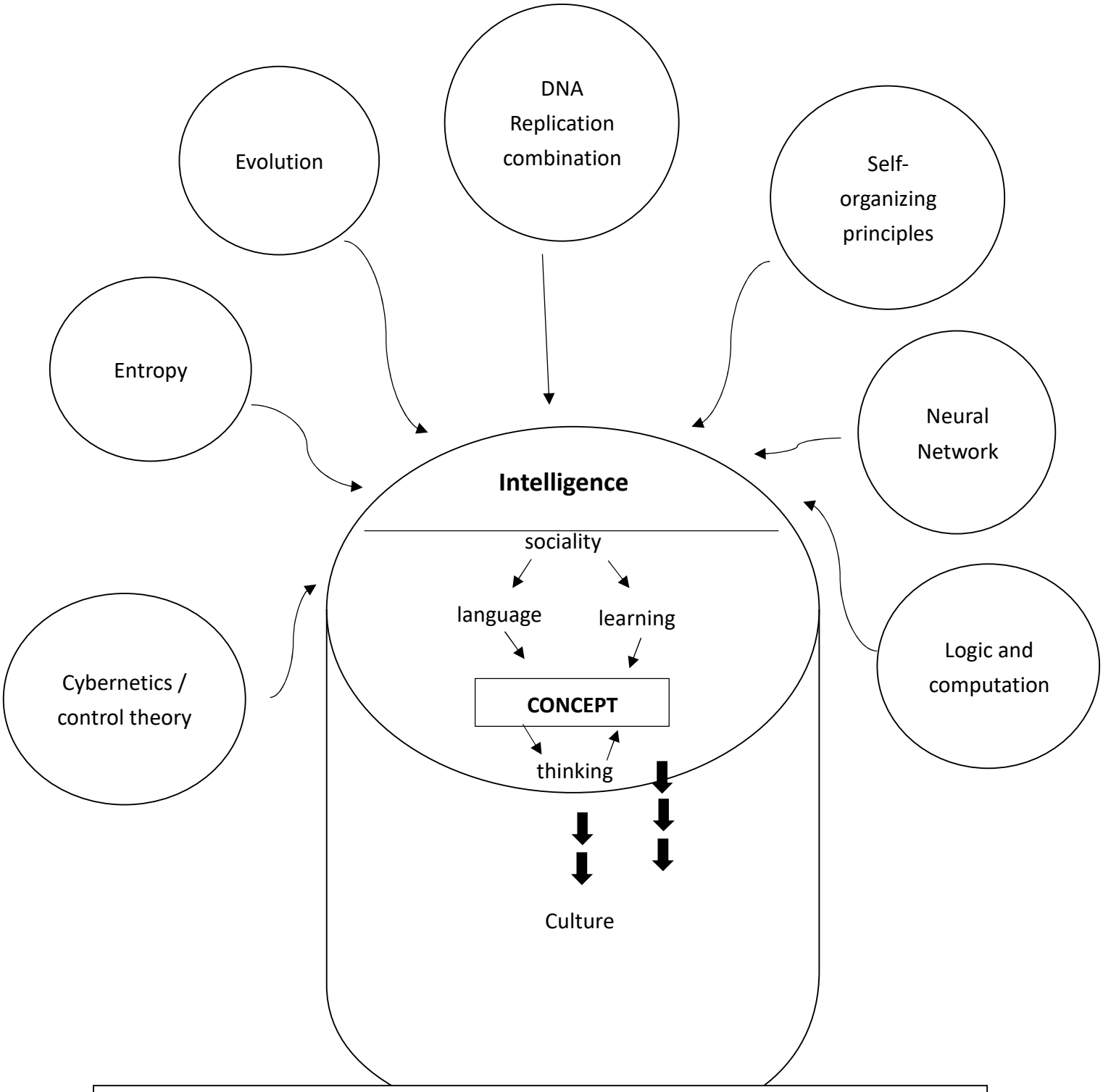
Steven Pinker tries to muster many 20th century concepts to explain intelligence. It's quite modern:



(1) Creating order out of choas
(2) Resisting disorder
(3) Energy transmission
(4) Evolution / growth = information transmission

Thank you, Steven.
I learn a lot

(D) My Theory of Intelligence after Integrating Pinker's



My understanding of emergence of life after related readings:

ions → chemicals → light → food/ energy → imprinted sequence → DNA replication → life

survival of
specific sequence