Cellular Cognition and the Volitional Turing Machine

Perry Marshall
Founder, Evolution 2.0 Prize
Author, Evolution 2.0
Why Cancer is Still Beating us:

We were told Evolution is blind.

Evolution and Cancer are *Purposeful* and *Volitional*.
Unsolved Problems in Biology

1. Origin of the Genetic Code

- Chemicals don’t control Information. Information controls chemicals.

- The rules of codes cannot be derived from the laws of physics

**Conflict of Interest Disclosure:** Author is founder of Natural Code LLC, which offers $100,000 for discovery of a natural process that generates code from non-living material without direct human agency. Its investors offer $10 million to secure patent rights to said process. The prize specification is at [www.naturalcode.org](http://www.naturalcode.org).
Unsolved Problems in Biology

2. Evolution

• *Barbara McClintock* damaged corn DNA. It re-arranged its genome immediately - without thousands or millions of failed trials

• *John Torday UCLA*: Granddaughter inherits asthma via epigenetics from smoking grandmother

• Therefore organisms anticipate the future and evolve proactively
3. Consciousness & Agency

• Sexual Selection = agency and choice

• All Living Cells are Cognitive* (Shapiro 2020)

*Cognition Definition: “The mechanisms by which animals acquire, process, store, and act on information from the environment. These include perception, learning, memory, and decision making.” (Shuttleworth 2010)
Unsolved Problems in Biology

4. All Artificial Intelligence is... *artificial*

- *Turing Test not solved*
- *Animals have Universal Adaptive Learning. Computers don’t.*
- *Genetic Algorithms require goals from humans; not a major tool for software developers; do not rival biology*
- *If we understood biology, we could give our computers agency*
Unsolved Problems in Biology

5. Cancer

- Stage 4 precious little progress
- Schrödinger’s “What Is Life” as mysterious now as in 1943
- Genome Chaos
- After 16 years…
Convention:

Cognition

↓

Code

↓

Physico-Chemical

Observation:

Cognition

↓

Code

↓

Physico-Chemical

No documented exceptions to date.
Three Levels of Causation:

Bottom: Physico-Chemical (LAWS)

- **Universal** laws of physics and chemistry: matter, energy, light, heat, fields & waves, weather, stars, planets.

- Change over time is Order $\rightarrow$ Disorder (entropy)
Three Levels of Causation:

**Middle: Code (LOGIC)**

- Symbols, communication, computation, languages, machines, algorithms, genetics.
- Freely chosen *local* rules.
- Computation is deductive and deterministic: one output for given input.
- Codes are subject to noise (information entropy).
Three Levels of Causation:

Top: Cognition (CHOICE)

• Agency; action of self interest; meaning; creating codes.

• Cognition is inductive reasoning (choice within uncertainty).

• Change over time is Disorder $\rightarrow$ Order (negentropy) (Schrödinger 1943).
We’ve gotten cause and effect backwards
Equivalency of Choice Theorem

Within Gödel’s Incompleteness Theorem, the following are isomorphic* in information theory:

- Evolution
- Goals
- Choices
- Inductive reasoning
- Assigning meaning to symbols
- Axioms in mathematics
- Consensus on scientific laws
- Negative information entropy

They are undecidable propositions which require goals.

Normal Cells and Cancer Cells make decisions that are impossible to compute

*corresponding or similar in form and relations
Cognition Model

AI TODAY

TURING MACHINE

A computer only obeys its program
(DEDUCTION)

WHAT AI ASPIRES TO BE

VOLITIONAL TURING MACHINE

Chooses whether to obey the program or reverse the decision
(INDUCTION)

Program

Program

INPUT

10010

OUTPUT

00101

INPUT

10010

OUTPUT

00101

INPUT

10010

OUTPUT

?????
How to Falsify the Cellular Cognition Model

- Any experiment that demonstrates chemicals $\rightarrow$ code with no assistance from biology.
- Any experiment that demonstrates code $\rightarrow$ cognition with no assistance from biology.
CONVERGENCE:

What if…

• Origin of Life
• Evolution
• Consciousness
• AI
• Cancer

…are not FIVE problems, but ONE?

What is the origin and nature of cognition?
Cancer is not an algorithm

Cancer is a disease of identity and volition
Live Q&A

Monday October 19

1-3pm Eastern Time
on Zoom

To consult references
or comment on my paper:
evolution@evo2.org
“Any system you can draw a circle around relies on an axiom outside the system that you must assume but cannot prove.”