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Review: Charles Thaxton et al., *Mystery of Life's Origin: The Continuing Controversy*, Discovery Institute Press, Seattle, 2020

Pages: 486

Masterclass in Abiogenesis

This is a technically-heavy but rewarding analysis of the naturalistic idea of chemical evolution (CE). By no means are the authors 'fundamentalist Christians' which makes it difficult for sceptics to use *ad hominem*, which, after absorbing the book, is the only argument available to them to avoid Intelligent Design.

Of special note are the chapters on entropy and thermodynamics, both for their complexity and knock-down arguments. They destroy chance as an option for CE, and more importantly merely having an open system and energy supply. CE requires in effect reversal of time's arrow, a *decrease* in entropy by somehow coupling the energy and changing a system into a more ordered (information-containing) state.

The 'secrets' of how CE researchers experiment to recreate 'primitive' Earth and simulate 'millions of years' are exposed; there is huge investigator interference rendering any findings dubious at best. They simply buy and mix purified and isolated organic molecules because they are assumed to have already evolved at some point!

A combined work of eight minds, this stands as a worthy expansion of the 1984 edition.

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Foreword (pp. 7-9)

You can't get information out of negative thermal entropy.

Introduction (pp. 10-33)

You can't get information out of negative thermal entropy.

Foreword (Dean Kenyon) (pp. 34-41)

The goal of chemical evolution (CE) is to find plausible unifromitarian mechanisms to generate living matter from relatively simple molecules abundant on primitive Earth.

Interfering cross reactions are fatal to any spontaneously-formed chemicals like AAs.

Like uses L, not D AAs, but D, not L sugars in nucleic acids.

Preface (Charles Thaxton) (pp. 42-45)

I) Crisis in the Chemistry of Origins (pp. 46-49)

The "pure chance" view of OOL is simply extreme faith.

Science is 'weak' in examining historical events, yet denies *a priori* any supernatural entity entering and withdrawing in past events.

"It is our opinion that modern CE theories of the origin of life are in a state of crisis." [p56]

II) The Theory of Biochemical Evolution (pp. 50-66)

Heterogenesis: idea of life arising from dead organic matter.

J. B. S. Haldane thought UV light (<2,000Å) in the primitive Earth atmosphere could break down chemicals to collect in the ocean, eventually concentrating sugars and AAs.

III) Simulation of Prebiotic Monomer Synthesis (pp. 67-89)

Millions of years of simulation might be required for any detectable progress. In order to overcome this limitation, OOL researchers select and purify chemicals conceived to have been the probable precursors and subjecting them in a mixture to heat, light, temperature, and pH concentrations ''mimicking' the early atmosphere.

After AAs are isolated, purified and concentrated, they're reacted and concentrated to form polymers.

Heat sources like sparks are used to simulate lightning in the atmosphere, and rain washes the non-VOCs into the ocean basin.

In 1974, Miller heated a 500ml flask for two days and got a pale yellow liquid. As long as O_2 was excluded organic compounds arose; ten of the twenty AAs, plus thirty of the non-proteinaceous ones.

Spark discharge is optimal for making HCN and AAs.

Sidney Fox replaced electrodes with a furnace at 900-1000ºC to simulate "flow of volcanic gases through fissures of hot igneous rocks of lava". Gases remain in the hot zone for a fraction of a second then cool quickly.

"There would have been many millions of years for the small amount of energy from sunlight to have had a cumulative effect."

Irradiating formaldehyde with UV produces ribose and deoxyribose.

Using Hg (g) as a photosensitising agent induces absorption and transfer of energy.

Many high-energy compounds would have had double (ethylenes, aldehydes, ketones) or triple (acetylenes,nitriles) C-bonds.

Addition reactions build organic compounds are are claimed to have played a large role in CE.

Strecker synthesis adds NH3 to an aldehyde carbonyl group (RCHO) to form α-aminonitrile. This is claimed to be able to have formed twenty AAs.

Heating CN (acq.) at 90ºC for a few days makes adenine. This is the easiest nucleoside to make and the most stable.

Pyrimidine cytosine is made by heating cyanoacetylene with cyanate for one day at 100ºC. Heating malic acid, urea, and polyphosphoric acid at 130ºC for an hour makes uracil.

This chemistry provides the major foundation for CE theory.

Gas chromotography and mass spectrometry is used to identify AA products.

IV) <u>The Myth of the Prebiotic Soup</u> (pp. 90-120)

In general, dilution processes dominate, making concentration of essential CE ingredients too small.

Raw energy is claimed to organise molecules into more complex arrangements. Sub-2,000Å light actually photodissociates such molecules.

There should have been a 1-10m hydrocarbon ocean blanket.

99% of formaldehyde would degrade to CO and H_2 by photolysis. Likewise the N in NH_3.

H_2S would degrade to S and H_2 in under 10,000 years.

Solar effects of Earth's surface are thought to provide atmospheric O_2, not photosynthesis.

Any O_3 screen would block light <3,000Å which is meant to be necessary to break up chemicals. However, without a screen, deadly UV would destroy any CE pre-life up to ten metre's depth (and all the ocean water eventually cycles to the surface).

The Sun was 40% dimmer '4bya'.

-21°C is meant to be CE's ideal temperature! Such a freezing temperature would reduce required lightning a hundred fold.

Two AAs which combine release an H_2O molecule ("dehydration-condensation" reaction).

Growing polypeptides will be terminated by amines, aldehydes, ketones, sugars, and carboxyliic acids.

Formaldehyde hardens proteins, lowers H_2O-sensitivity and increases enzymatic and chemical reagent resistance.
Polypeptide half life is only days.

“Primitive seas were deficient in P”.

Pentose sugars have 8 isomers.

Abiogenesists think early oceans had huge organic material quantities ,up to 10% solution. Carl Sagan said it was 0.3-3% and assumed, “no destruction of synthesised material”. Wolman et al. 0.002M for AAs (“decomposition of AAs after synthesis was minimal”).

Today’s North Atlantic Ocean AA concentration is just 10^{-7}M.

Nissenbaum et al: “It is difficult to see how … the ‘primordial soup’ could have existed at all.” [p110]

Any primordial ocean would have been an extremely dilute ‘soup’.

Evaporation is one concentrating mechanism:

1. A suitable reservoir.
2. A local heat source.
3. Repeated ingress of oceanic ‘soup’.
4. UV light protection.

Such a scenario is envisaged with an ocean-side cave and a smoking fumarole nearby.

“No geological evidence indicates … an organic soup … ever existed on this planet … the usually conceived notion that life emerged from a soup of organic chemicals is a most implausible hypothesis. We may … call this scenario ‘the myth of the prebiotic soup’.” [p116]

V) <u>The Early Earth and Its Atmosphere</u> (pp. 121-151)

James Pollock of NASA hypothesises on its origin:

1. Primary Atmosphere Hypothesis: gases are residual from a pre-solar nebula.

2. External Source Hypothesis: gases were brought on volatile-rich comets. However, solar system planets all have different rare gas concentrations.

3. Grain Accretion Hypothesis.

Central to CE is the primitive atmosphere could not have any O_2 since all organic compounds quickly decompose in its presence.

Fox and Dose conclude, "The 'strongest evidence' for an atmosphere without oxygen is that we know chemical evolution took place." [!] [p129]

PAL: Present Atmospheric Level.

An O_3 layer requires 1-10% PAL of O_2.

Today's 21% atmospheric O_2 is assumed to derive from photosynthesis.

Iron oxides in rocks implies high ancient O_2 levels.

VI) <u>Plausibility and Investigation Interference</u> (pp. 152-168)

H_2S could protect AAs against UV in the 2000-2600Å range.

The "Law of Mass Action" holds a chemical reaction ratio is proportional to concentration of the reacting substance.

Mixtures do not obey a law of addition; they behave uniquely.

Brooks and Shaw: "These experiments … claim abiotic synthesis for what has in fact been produced and designed by highly intelligent and very much biotic man." [p166]

VII) <u>Thermodynamics of Living Systems</u> (pp. 169-183)

$\Delta E = \Delta Q + \Delta W$

$\Delta S >= \Delta Q/T$

Heated objects gradually cool till T approaches the local environment.
The universe's energy is becoming increasingly uniform (i.e., the most random form).

Increasing entropy corresponds to increasing random matter and energy arrangements.

High entropy corresponds to high probability, and random arrangements are highly probable. Low entropy however means highly ordered and thus low probability.

Clausius: "The energy of the universe is constant; the entropy of the universe tends toward a maximum." [p172]

Thermodynamically a system may be ope, closed, or isolated.

$\Delta G = \Delta E + P\Delta S - T\Delta S$ where G = Gibbs free energy.

$\Delta G/\Delta t <= 0$ in a closed system.

Entropy is measured in euK^{-1}. It always increases.

Organic monomers like AAs resist combining at any T.

L. Prigogine: "The probability that at ordinary temperatures a macroscopic number of molecules is assembled to give rise to the highly ordered structures … characterising living organisms is vanishingly small … even on the scale of billions of years." [p177]

CE must somehow "reverse time's arrow" to reduce entropy of molecules.

$\Delta S = \Delta Se$ [energy entropy flux] + ΔSt [system entropy flux]

Maintenance of living systems requires $|\Delta Se| > \Delta St$

VIII) <u>Thermodynamics and the Origin of Life</u> (pp. 184-202)

Periodic structures have order but not complexity as aperiodic ones do.

Leslie Orgel: “Living organisms are distinguished by their *specified* complexity. Crystals fail to qualify as living because they lack complexity; mixtures of random polymers fail to qualify because they lack specificity.” [p188]

$S=k\ln\Omega$ where Ω = Boltzmann’s constant, the ways in which energy and mass in a system may be arranged.

IX) Specifying How Work Is to Be Done (pp. 203-229)

An estimated 10^{72} polypeptides have formed during Earth’s assumed history making “chance” as a solution to CE impossible.

If intra-AA chemical bonds played a part in arrangement then we would expect proteins to form crystals.

A functional protein must have all L-AAs, all α-links, and a specified sequence.

CE simply assumes an open system supplied with energy is sufficient.

Mycoplasma genitalium requires 483 proteins, although it is a parasite.

Pelagibacter ubique needs 1300+ proteins to survive.`

X) Protocells (pp. 230-247)

Nucleic acids and proteins mixed in H_2O for spherical droplets 2-670 microns in diameter.

Phospholipids are fatty acids, glycerol, and glycerol phosphate precursors.

XI) Summary and Conclusion (pp. 248-255)

“Chemical evolution is a spectacular reconstruction of a unique past event, and cannot therefore be tested against recurring nature … [it] is not science … but this conclusion is too hasty.” [p254]

XII) Epilogue (pp. 256-291)

On panspermia, 0.1-0.3 microns can escape solar gravity, and if coated with thin graphite layers could survive cosmic radiation.

Crick thought that sudden appearance of organisms was proof of directed panspermia.

Hoyle and Wickramasinghe: "The advantage of looking to the whole universe … offers the possibility of high intelligence … that is not God … we have to say that the intelligence which assembled the enzymes did not itself contain them … that carbonaceous life was invented by a noncarbonaceous intelligence, which by no means need be *God*, however." [p269]

Origins science is concerned with a sample size of one!

L. Orgel: "Any 'living' system must come into existence either as a consequence of a long evolutionary process or a miracle … Since, as scientists, we must not postulate miracles, we must suppose that the appearance of 'life' is necessarily preceded by a period of evolution." [p276]

<u>Appendices</u> (pp. 292-319)

Specified complexity derived from whirlpools and oil hexagonal patterns is merely complexity like that of crystal structures.

XIII) <u>We're Still Clueless About the Origin of Life</u> (pp. 320-357)

CE hurdles:

1. Homochirality.

2. Pre-RNA/DNA.

3. Selectors.

4. Redesigns: if a prebiotic and mindless reaction erred, it would have no way to go back other than start again 'millions of years' back.
5. Stopping point.

6. Purification of inhibitors and contaminants.

7. Order of reagent addition.

8. Activation steps.

9. Environmental factors.

10. Isolation.

11. Mass transfer

XIV) <u>Thermodynamics Challenges to the Origin of Life</u> (pp. 358-374)

XV) <u>What Astrobiology Teaches About the Origin of Life</u> (pp. 375-392)

The Oklo-Gabon natural nuclear fission reactor runs from water flooding U-ore acting as N moderators.

XVI) <u>Textbooks Still Misrepresent the Origin of Life</u> (pp. 393-414)

XVII) <u>Evidence of Intelligent Design in the Origin of Life</u> (pp. 415-470)

“Prebiotic natural selection” is a contradiction in terms.

Abductive inference by nature affirms the consequence.