chance trials, so now it all supposedly happened with 'breath-taking rapidity' in no time at all! However, the second problem is that the supposedly produced life-forms required oxygen, at a time when none was supposedly in the Earth's atmosphere. Being thermophilic and thus able to survive in the oceans supposedly heated by volcanoes, hot springs and bolide impacts would still not solve the problem if the required oxygen was not available. How then could life have arisen from lifeless molecules so rapidly under such impossible conditions when we can't duplicate the process in our laboratories today, even with the planned input of intelligent scientists?

What if further investigations confirm that this is organic material in these ancient rocks and it is indeed the remnants of life-forms (for example, algae)? The evolutionary generation of life from non-life will not have been proven, as the same obstacles to that supposed process will remain. No, such *non-nephesh* life-forms that display purposeful design were created according to the Genesis account, so their fossilised remnants could possibly attest to the rocks that entombed them having been deposited with other sediments in the ocean during the Creation Week.[17] Thus all such research data are welcomed, as they serve to aid creationist geologists in their effort to unravel the rock record within the biblical framework of Earth history.

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A. A. Snelling

Self-Replicating Enzymes?

Evolutionary origin-of-life theories have many hurdles to overcome.[1-3] To form a self-reproducing cell from non-living chemicals requires the generation of a large amount of information, or specified complexity. A cell must be able to perform many chemical reactions in the right order, place and degree, which requires a number of specific catalysts (enzymes). It must also be able to reproduce the information needed to produce these enzymes.

In all known cells, the specific catalysts are proteins, while the information storage/retrieval and reproduction tasks are carried out by the nucleic acids DNA and RNA. Proteins are polymers of amino acids, while nucleic acids are polymers of nucleotides. Nucleotides themselves are a combination of a sugar (deoxyribose for DNA, ribose for RNA), a nitrogenous base and a phosphate group.

But the DNA **itself** codes for the proteins, yet **requires** at least 50 proteins for the necessary decoding, and still others for replication. The noted philosopher of science, the late Sir Karl Popper, commented:

> *'What makes the origin of life and of the genetic code a disturbing riddle is this: the genetic code is without any biological function unless it is translated; that is, unless it leads to the synthesis of the proteins whose structure is laid down by the code. But . . . the machinery by which the cell (at least the non-primitive cell, which is the only one we know) translates the code consists of at least fifty macromolecular components* ***which are themselves coded in the DNA.*** *Thus the code cannot be translated except by using certain products of its translation. This constitutes a baffling circle; a really vicious circle, it seems, for any attempt to form a model or theory of the genesis of the genetic code.*
>
> *Thus we may be faced with the possibility that the origin of life (like the origin of physics) becomes an impenetrable barrier to science, and a residue to all attempts to reduce biology to chemistry and physics.'*[4]

The obvious conclusion is that both the DNA and proteins must have been functional from the beginning, otherwise life could not exist.

RNA WORLD?

To avoid this conclusion, some evolutionists have theorised that one

type of molecule could perform both catalytic and reproductive roles. A recent discovery of some catalytic functions in RNA has led many evolutionists to postulate an 'RNA world'. The idea is that the first life consisted mainly of RNA, which could not only reproduce but also carry out many of the functions now carried out by enzymes. But this model has several dubious postulates:

(1) A pool of exclusively 'right-handed' ribose molecules could be produced, separated from a jumble of other sugars, and remain stable long enough; the bases could be produced in large quantities; and a high concentration of phosphate (PO_4^{3-}) would be in solution rather than precipitated out.

(2) Ribose could combine with the bases and phosphate to produce ß-D-ribonucleotides.

(3) These ß-D-ribonucleotides could spontaneously produce RNA polymers of the proper form.

(4) That if such polymers form, they could replicate themselves.

(5) That such self-replicating RNA molecules would have all the functions needed to sustain an organism.

(6) That such an RNA organism could give rise to a modern organism with protein catalysts, coded on the reproducing material, and the means to decode them.

These postulates are all contrary to experimental evidence.[5,6] It is no wonder that one of the leading researchers into 'RNA world' models, Gerald Joyce, wrote:

> *'The most reasonable assumption is that life did not start with RNA .... The transition to an RNA world, like the origins of life in general, is fraught with uncertainty and is plagued by a lack of experimental data!*[1]

A SELF-REPLICATING MOLECULE

A group led by Julius Rebek synthesised a molecule called amino adenosine triacid ester (AATE), which itself consists of two components — pentafluorophenyl ester and amino adenosine. When AATE molecules are dissolved in chloroform with the two components, the AATE molecules act as templates for the two components to join up and form new AATE molecules[8] (see Figure 1). There are a number of reasons why this is irrelevant to an evolutionary origin of life:

(1) This system carries very little information, in contrast to even the simplest cell. *Mycoplasma genitalium* has the smallest known genome of any living organism, which contains 482 genes comprising 580,000 bases.[9] This organism is an obligate parasite. A free-living organism would need many more genes.

(2) The new AATE molecule binds too strongly to the parent, so no new reactants can come in and join, as Rebek himself admits.[10]

(3) Replication only occurred in highly artificial, unnatural conditions.[11] A reaction in chloroform is irrelevant to living organisms. In particular, chloroform would not hinder **condensation** reactions, that is, they eject a small molecule like water, as water does. Most polymerisation reactions in life are condensation reactions. If there is much water around as there is with all living things, the *reverse* reaction is favoured, that is, the **hydrolysis** (break-up) of polymers.

(4) The molecule reproduced **too** accurately — there is no possibility of neo-Darwinian evolution by mutation and natural selection.[12]

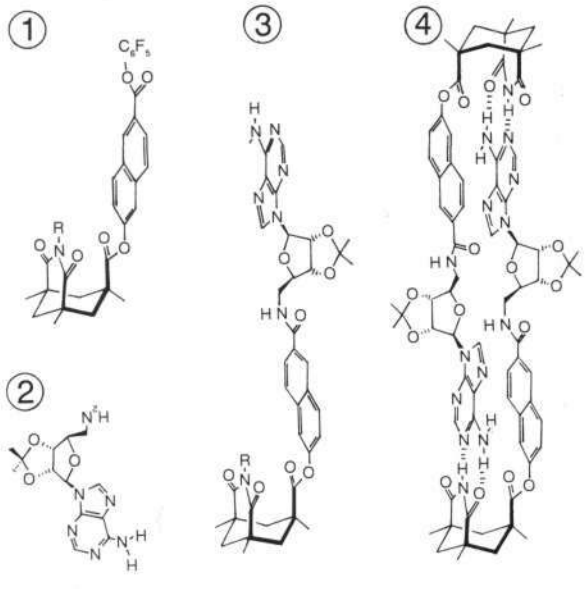

Figure 1. *Steps toward self-replication in a laboratory-made molecule. The researchers assembled one of the system's two reactants, pentafluorophenyl ester, by covalently bounding it to one arm of a U-shaped molecular frame (1). With weaker hydrogen bonds, the second reactant — amino adenosine (2) — temporarily sticks to the frame's other arm. Thus positioned on the U-shaped frame, the reactants readily link to form an amine bond. The newly formed molecule, at first joined to both arms of the frame, jackknifes upward as the amino adenosine severs its hydrogen bonds with the frame and snaps in place over the ester. This yields an upright assembly (3) whose chemical features form a template that attracts, positions and helps bond another pair of reactants (4).*

SELF-REPLICATING PEPTIDES?

Amino acids can be formed (with difficulty[13]) in Miller-type experiments where reducing gases are sparked, unlike ribose and the nitrogenous bases. Thus some evolutionists are investigating protein-first rather than nucleic-acid-first theories of the origin of life. But proteins do not have anything analogous to the base-pairing in nucleic acids. So there was a surprise in August 1996, when some newspapers and science journals reported a peptide that can reproduce itself. David Lee *et al.* reported that a short peptide derived from part of a yeast

enzyme can catalyse its own formation.[14,15]

Lee *et al.* made a 32-unit-long α-helical peptide based on the leucine-zipper domain of the yeast transcription factor GCN4. They found that it catalysed its own synthesis in a neutral, dilute water solution of 15 and 17-unit fragments. This was an ingenious experiment, but it does not help the evolutionary cause because:

(1) Where would the first 32-unit long chain of 100 per cent left-handed amino acid residues come from? Amino acids are not formed as easily as Lee *et al.* claim. If they form at all, they are extremely dilute and impure, as well as racemic (50-50 mix of left and right-handed forms). Such amino acids do not spontaneously polymerise in water.

(2) Where would a supply of the matching 15 and 17-unit chains come from? Not only does the objection above apply, but what mechanism is supposed to produce the right sequences? Even if we had a mixture of the right homochiral (all the same handedness) amino acids, the chance of getting one 15-unit peptide right is one in 20^{15} (which equals one in 3×10^{19}). If it is not necessary to get the sequences exactly right, then it would mean that the 'replication' is not specific, and would thus allow many errors.

(3) The 15 and 17-unit peptides must be activated, because condensation of ordinary amino acids is not spontaneous in water. Lee *et al.* used a thiobenzyl ester derivative of one peptide. As they say, this also circumvents potential side reactions. The hypothetical primordial soup would not have had intelligent chemists adding the right chemicals to prevent wrong reactions!

(4) The particular 32-unit chain was an a-helix, where hydrogen bonds between different amino acid residues cause the chain to helicise. This common structure is more likely to be able to act as a template under artificial conditions. Lee *et al.* claim that ß-sheets, which also depend on hydrogen bonding, might also be able to act as templates. This seems plausible, α-helices and ß-sheets are known as the **secondary structure** of the protein.[16]

The exact way in which the protein folds is called the ***tertiary structure,*** and this determines its specific properties. Although Lee *et al.* say:

> *'we suggest the possibility of protein self-replication in which the catalytic activity of the protein could be conserved',*

they present no experimental proof.

COMPLEXITY THEORY

This has been promoted by Stuart Kauffman.[17] It claims that large numbers of interacting components spontaneously organise themselves into ordered patterns. Sometimes a small perturbation of a system could cause it to switch from one pattern to another. Kauffman proposes that his idea could account for the origin of life, body shapes, and even cultural patterns and economics. Complexity theorists point to computer simulations of the patterns of clam shells and other shapes found in nature.

But this has little relevance to the real world of chemicals. Chemicals obey the Second Law of Thermodynamics, and do not arrange themselves into self-sustaining metabolic pathways. Living cells have molecular machinery to channel the chemistry in the right direction and amounts. If the clam shell pattern on the computer screen was enlarged, there would be no traces of cells with cilia, mitochondria, DNA, etc.[18]

It is small wonder that even most sections of the evolutionary establishment are sceptical of complexity theory. The cover of the June 1995 issue of **Scientific American** asked 'Is Complexity Theory a Sham?' This issue contained an article called 'From Complexity to Perplexity', which said:

> *'Artificial life, a major subfield of complexity studies, is "fact-free science", according to one critic. But it excels at generating computer graphics.'*[19]

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