population, actually had at least 2 types of mtDNA, a condition called 'heteroplasmy', also caused by mutations.[3] This, too, throws off the 'molecular clock' calibrations.

According to one review of the data, these recent results would mean that mitochondrial Eve

> *lived about 6,500 years ago — a figure clearly incompatible with current theories on human origins. Even if the last common mitochondrial ancestor is younger than the last common real ancestor, it remains enigmatic how the known distribution of human populations and genes could have arisen in the past few thousand years.*[4]

The review in **Science's** 'Research News' goes still further about Eve's date, saying that *'using the new clock, she would be a mere 6000 years old'.* The article says about one of the teams of scientists (the Parsons team[5]) that

> *'evolutionary studies led them to expect about one mutation in 600 generations . . . they were "stunned" to find 10 base-pair changes, which gave them a rate of one mutation every 40 generations.*[4]

Evolutionists have tried to evade the force of these results by countering that the high mutation rate only occurs in certain stretches of DNA called 'hot spots', and/or that the high (observed) rate causes back mutations which 'erase' the effects of this high rate. Therefore, conveniently, the rate is assumed to be high over a short timespan, but effectively low over a long timespan. However, this is special pleading to get out of a difficulty, and the burden of proof is on evolutionists to sustain the vast ages for 'Eve' in the face of these documented, modern-day mutation rates. These are indeed encouraging results for creationists.

In summary:

(1) The mitochondrial Eve findings were, in the first instance, in line with biblically-based expectations; while not proving the Biblical Eve, they were consistent with her reality, and were not predicted by evolutionary theory.

(2) The dates assigned to mitochondrial Eve were said by evolutionists to rule out the Biblical Eve. But these dates were based upon 'molecular clock' assumptions, which were calibrated by evolutionary beliefs about when certain evolutionary events occurred, supposedly millions of years ago.

(3) When these assumed rates were checked out against the real world, preliminary results indicate that the mitochondrial 'molecular clock' is ticking at a much faster rate than evolutionists believed possible. If correct, it means that mitochondrial Eve lived 6,000 to 6,500 years ago, right in the ballpark for the true 'mother of all living' (Genesis 3:20).

(4) These real-time findings also seriously weaken the case from mitochondrial DNA which argued (erroneously) that Neandertals were not true humans.

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C. Wieland

Design in Living Organisms: Motors

In our everyday experience, we can usually tell whether something has been designed. The main evidence is high **information content.** The information content of any arrangement is the size, in bits, of the shortest algorithm required to generate that arrangement. This means that repetitive structures, like crystals, have a low information content, because all that is needed is to specify a few positions, then the instructions 'more of the same'. The difference between a crystal and an enzyme or DNA is like the difference between a book containing nothing but ABCD repeated and a book of Shakespeare.

On a practical level, the information specifies the many parts needed to make machines work. Often, the removal of one part can disrupt the whole machine. Biochemist Michael Behe, in his book **Darwin's Black Box,** calls this **irreducible complexity.**[1] He gives the example of a very simple machine: a mousetrap. This would not work without a platform, holding bar, spring, hammer and catch, all in the right place. The thrust of Behe's book is that many structures in living organisms show irreducible complexity, far in excess of a mousetrap or indeed any man-made machine.

MOTORS: A CASE STUDY

Motors are irreducibly complex, because they need many parts working together to function. For example, an electric motor needs a power source, fixed stator, movable rotor, and a commutator or slip rings.

The more parts needed for a machine, the harder it is to make it smaller. Miniaturisation is such a vital part of the computer industry, and the

best human minds are constantly working at it. And though miniaturised motors would be very useful, for example, for unblocking clogged arteries and blood cleaning, the number of parts makes it difficult to make them below a certain size. But ingenious scientists are making them smaller all the time.[2]

However, the design in living organisms has far exceeded our most painstaking efforts. Bacteria propel themselves using **flagella,** filaments propelled by a true rotary motor (Figure 1). This motor is only the size of a virus, thus far smaller than anything man-made. Yet it can rotate at over 1,000 times per second.[3]

But even this impressively tiny motor is not the tiniest in God's creation. In a paper published in March 1997, Hiroyuki Noji *et al.* directly observed the rotation of the enzyme **F_1-ATPase,** a subunit of a larger enzyme, **ATP synthase** (see Figure l).[4-6] This had been suggested as the mechanism for the enzyme's operation by Paul Boyer.[7] Structural determination by X-ray diffraction by a team led by John Walker had supported this theory.[8,9] A few months after Noji *et al.* published their work, it was announced that Boyer and Walker had won a half share of the 1997 Nobel Prize for Chemistry for their discovery[10]

The F_1-ATPase motor has nine components — five different proteins with the stoichiometry of $3\alpha:3\beta:1\gamma:1\delta:1\varepsilon$. In bovine mitochondria, they contain 510, 482, 272, 146 and 50 amino acids respectively, so M_r = 371,000. F_1-ATPase is a flattened sphere about 10 nm across by 8 nm high — so tiny that 10^{17} would fill the volume of a pinhead. This has been shown to spin Tike a motor' to produce ATP, a chemical which is the 'energy currency' of life.[11] This motor produces an immense torque (turning force) for its size — it rotates a strand of another protein, **actin,** 100 times its own length. Also, when driving a heavy load, it probably changes to a lower gear, as any well-designed motor should.

ATP synthase also contains the membrane-embedded F_0 subunit functioning as a proton (hydrogen ion) channel. Protons flowing through F_0 provide the driving force of the F_1-ATPase motor. They turn a wheel-like structure as water turns a water wheel, but researchers are still trying to determine precisely how. This rotation changes the conformation of the three active sites on the enzyme. Then each in turn can attach ADP and inorganic phosphate to form ATP. Unlike most enzymes, where energy is needed to link the building blocks, ATP synthase uses energy to link them to the

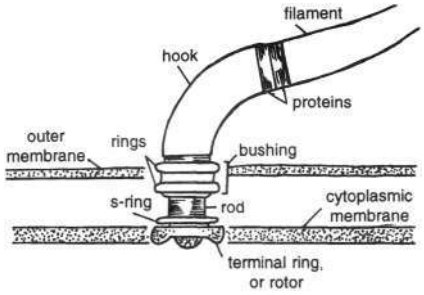

Figure 1. *Diagram of a rotary motor analogous to how a bacterium propels one of its flagella.*

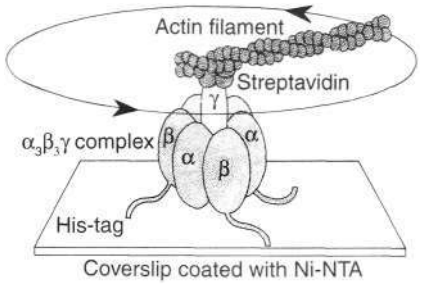

Figure 2. *The system used for observation of the rotation of the y-subunit in the $\alpha_3\beta_3\gamma$ subcomplex. Only a part of the structure near the nucieotide-binding site is shown. The observed direction of the rotation of the y-subunit is indicated by arrows.*

enzyme, and throw off the newly-formed ATP molecules. Separating the ATP from the enzyme needs much energy.

ATP synthase is the central enzyme in energy conversion in mitochondria, chloroplasts and bacteria. Since energy is required for life, and all life uses ATP as its energy currency, life could not have evolved before this motor was fully functional. Natural selection by definition is differential reproduction, so requires self-reproducing entities to start with. So even if a series of gradual steps could be imagined up this peak of 'Mount Improbable', there would be no natural selection to enable that climb.

One of the **Nature** articles was appropriately entitled 'Real engines of creation'.[5] Unfortunately, despite the evidence for exquisite design, many scientists (including the editor of **Nature)** still have a blind faith that mutations and natural selection could build such machines.

WOULD ANY EVIDENCE CONVINCE EVOLUTIONISTS?

The famous British evolutionist (and communist) J. B. S. Haldane claimed in 1949 that evolution could never produce

> *'various mechanisms, such as the wheel and magnet, which would be useless till fairly perfect'.*[12]

Therefore such machines in organisms would, in his opinion, prove evolution false. These molecular motors have indeed fulfilled one of Haldane's criteria. Also, turtles[13], monarch butterflies[14] and bacteria[15] which use magnetic sensors for navigation fulfil Haldane's other criterion. I wonder whether Haldane would have had a change of heart if he had been alive to see these discoveries. Many evolutionists rule out intelligent design *a priori,* so the evidence, overwhelming as it is, would probably have no effect.

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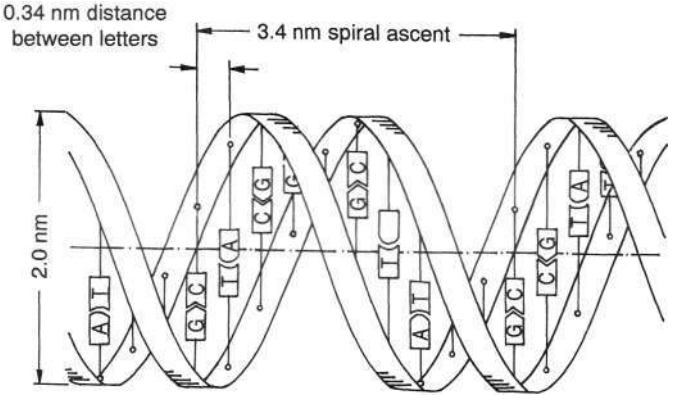
J. D. Sarfati

'Junk' DNA (Again)

When introns were discovered, some evolutionists suggested that these represented 'junk' DNA. Introns, as well as other sequences which did not code for protein, were considered to be left-overs of evolutionary ancestry — 'vestigial' DNA.

History has shown the foolishness of rushing to the 'vestigial' argument. Well over 100 organs in the human body were pronounced as useless left-overs of evolution at one stage, but the list has shrunk to almost zero as research has revealed the functions.[1]

Little by little, the so-called 'junk' DNA is revealing its functions.[2] In a further revelation, researchers have found that mutations in an intron interfere with imprinting, the process by which only certain maternal or paternal genes are expressed, not both. Expression of both genes results in a variety of diseases and cancers.[3,4] The discovered intron segment in some way promotes the transcription of an antisense-RNA sequence which is involved in suppressing the expression of the paternal gene in this case.



The structure and dimensions of the DNA molecule.

The burgeoning field of molecular biology continues to reveal unimagined complexity in the biochemistry of cells. It would be foolish indeed to pronounce anything as 'junk'. Like the 'vestigial organs' idea, it seems that evolutionary ideas about the molecular machines in cells feed on lack of knowledge.

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D. J. Batten

Bird-Dinosaur Link Challenged

Most palaeontologists not only believe that birds evolved from dinosaurs, they have also convinced themselves that *'Birds are dinosaurs'*.[1] Kevin Padian and Paul Olsen assert:

> *'The footprints of ratites should be of special interest to dinosaurian paleontologists because birds are living dinosaurs. Their origin from Mesozoic coelurosaurian theropods is now beyond reasonable dispute. . . . By cladistic convention, birds must be classified as theropod dinosaurs because they evolved from theropod dinosaurs.'*[2]

Theropods are small, bipedal carnivorous dinosaurs. This conventional view has reinforced the belief that *Archaeopteryx* is a feathered dinosaur. Cladistics has shown a number of morphological similarities between birds and theropod dinosaurs, such as the similarity in limb structure,