The Creator's Origin of Life - 13

As we return to following the progress of the energy flow which began as a pulse of sunlight, the Primary Electron Acceptor then passes the electron to plastoquinone, a complex 135 atom molecule, which is the first stage in what is called the Electron Transport Chain. An electron then moves from the plastoquinone to a complex of two cytochromes, iron-containing proteins, each a complex structure of 100+ atoms.

At this point we stop again to see the amazing side-process within the pancake-shaped thylakoids referred to earlier, which receives ADP "discharged batteries" from the sugar-producing phase, recharges them and sends them back as "recharged" ATP. It took a lot of work for scientists to discover how this process works.

Embedded in the otherwise impervious membrane which surrounds the thylakoid is a protein molecule called ATP synthase, whose astonishing complexity is portrayed as "a molecular mill". One scientist described it as resembling a lollipop, the "candy head" located next to the membrane outside the thylakoid. The thinner end like the stick goes through the membrane. The ATP synthase molecule is a large complex of many thousands of atoms, organized into three protein subunits -

(1) A tube called the rotor, which is stuck through the membrane, (2) the head of the lollipop called the knob, and (3) the rod which connects the rotor to the knob. The ATP synthase is evidently designed to pass only hydrogen ions through the membrane. It appears that when the hydrogen ions (which had been released from the water) move through the rotor, they cause the rotor and rod to spin.

That energy catalyzes or accelerates the formation of a bond between the ADP "discharged batteries" which came from the sugar-producing phase, and a phosphate group to produce "recharged" ATP. The ATP is used to power the next stage which is called the Calvin cycle in which carbon dioxide is used to produce carbohydrate. The used ATP becomes ADP which cycles back to the "lollipop" to be re-energized into ATP.

Again we return to following the energy flow. An electron leaves the cytochrome proteins and passes to a plastocyanin, also a complex protein. From there it lands on the final chlorophyll of the alternate Photosystem, and that chlorophyll sends it to its own Primary Electron Acceptor. That acceptor then passes the electron down another electron transport chain to a ferrdoxin protein - another very complex molecule.

An electron leaves the ferrrodoxin, and a special enzyme called NADP+ reductase transfers this high energy electron and stores it in NADPH, the molecule that will be used to synthesize sugar in the next stage of photosynthesis, called the Calvin cycle.

The Calvin cycle brings in carbon dioxide and sends out sugar, a carbohydrate. This is where the ATP provides the energy to drive the chemical process, while the NADPH adds the high-energy electrons to make the sugar.

You may be wondering what the point can be of following the process in this way. The objective is to show that the closer we examine living things, the more complex they are seen to be - so complex that they could not have occurred by random forces. This was earlier seen with the living cell, but the message is greatly emphasized in the process of photosynthesis.