**SCIENCE IN TEN MINUTES**

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**The Book of Life is within us**

Did you ever visualize yourself as a carrier of an instruction manual that contains the precise instructions to make you? And did you know the language in which that book is written has only four alphabets namely, A, C, G and T? Well, let’s see how to decipher this seemingly puzzling information I just threw at you. For starters, if you look at yourself, you can see that you are skin, muscle, blood and bones, all of which are called tissues. These tissues are made of what are called cells. The name cell itself has an interesting origin. Way back in 1665, an English natural philosopher and architect, Robert Hooke, looked at a piece of cork in an instrument he invented called microscope and saw many honeycomb like structures that he thought resembled rooms of monks with no windows. In Latin, the monk rooms are called “cellula”, so Hooke named these structures “cells”. Now, inside these cells is a structure called nucleus and inside the nucleus, are sausage shaped structures called chromosomes. A human cell has 23 of these chromosomes. If you can visualize the nucleus as a book, then the 23 chromosomes are like 23 chapters within the book. Packed into these chromosomes is a substance called DNA (Deoxyribo Nucleic Acid) which is a helical shaped thread that is made of four units called nucleotides, namely, Adenine (A), Cytosine(C), Guanine(G) and Thymine (T). The order of the A, C, G and T on the DNA thread is a chemical code that makes everything in you. So the “words” that make up the alphabet code are what we know as “genes”. So, our instruction manual is our nucleus, a book of 23 chapters that has recipes made of words known as genes and these are what make every bit of you. In all, we have nearly one trillion cells in our body and so what if we could determine the ACGTs in all of them?

In 1985, the scientist who deciphered the DNA structure, Jim Watson, organized a workshop at his Cold Spring Harbor Laboratory in New York where he proposed a project that seeks to document every one of the 3.3 billion letters in us. This would enable us to decipher all the genes in us, the collection of the genes is known as GENOME and thus the idea for a HUMAN GENOME PROJECT was kindled. Watson offered to head the project and the idea was taken to the Ronald Reagan administration by the Department of Energy’s Office of Health and Environmental Research, and a startup for $16 million was approved for a project that was planned for the next 15 years. In 1993, the project was taken over by National Institute of Health’s Francis Collins, and together with a company called Celera Genomics headed by Craig Venter, and scientists and research groups spread across United Kingdom, France, Australia, Japan and myriad other spontaneous relationships, the project was completed in 2000. On June 25th, 2000, Bill Clinton flanked by Francis Collins and Craig Venter with Jim Watson in the audience and Tony Blair on satellite TV announced to the world about the HUMAN GENE MAP by comparing it to the map that Meriwether Lewis had unfolded in front of President Thomas Jefferson in that very room nearly two hundred years earlier. Clinton said, “Without a doubt, this is the most important, most wondrous map ever produced by humankind.” The speech then shifted from the scientific perspective to the spiritual. "Today," Clinton continued, "we are learning the language in which God created life. We are gaining ever more awe for the complexity, the beauty, and the wonder of God's most divine and sacred gift."

Francis Collins wrote a book recounting his life’s work including the human genome project called THE LANGUAGE OF GOD and he summed up the importance of the landmark achievement in both eloquent as well as trivia-based humorous accounts. In the book, recalling the momentous day, he wrote “It's a happy day for the world. It is humbling for me, and awe-inspiring, to realize that we have caught the first glimpse of our own instruction book, previously known only to God." And then came the humorous trivia. At 3.3 billion letters and the proposed costs of $3 per letter, the project would have cost nearly $10 billion, but the technologies that the project evolved, enabled finishing the project at $3 billion, two years ahead of schedule. The shortest word in a human book is 76 alphabets long and can go TGCCTGA…and so on for a specific order of 76 ACGTs and this makes up the instructions to make a gene called tRNA that helps make proteins in our body. The largest word is 80,781 letters long and it makes what is called “Titin” the substance that maintains the elastic nature of our muscles. And we have only 21,000 words that make everything inside us. If the sequence obtained were to be stored in a typed form in books and if each page contains 1000 letters and each book contains 1000 pages, then 3300 such books would be needed to store the complete information. If we stack up all the books one on top of the other, they would go as high as the Washington monument. So thank God for computers, we can digitize that into an 825 MB file, the size of a music CD and if compressed further, it can be stored as a 20 MB file in a small USB drive. So, there you have it. Your instruction manual in a music CD or your pen drive containing everything that makes you. And right now, we have Life Science researchers and doctors around the world poring over the book that has all the recipes for everything in a human starting with his skin, muscle and bones to the toxins involved dreaded diseases such as cancer, Alzheimer’s and AIDS to the more mundane allergies and common cold. We now can practically “read” and “understand” ourselves better.

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