Editorial

The Cosmos speaks in patterns: Importance of DNA Sequence

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Heraclites said 3000 years ago that, "Cosmos speaks in pattern." Now it is scientifically proven that everything in this world is arranged in some kind of pattern. In everything from the mood of crying baby to a running stream of water, pattern can be found. Wherever human eye can reach, there are patterns. It is obvious now, that patterns are important for human existence. Significance of this can be seen in human DNA.

In all living cells, DNA molecules are the store houses of information about heritable traits (Concepts and application 191).[1] Proteins in our bodies depend on the DNA codes. These proteins are responsible for all the traits we have. Proteins that DNA codes for perform all the vital functions in our bodies. Its functions include breaking the food in the form of enzyme, giving a unique shape to our tissues and combating with the invading substances in the form of antibodies. By 1949, Erwin Chargaff, a biochemist had shared vital phenomena about the structure of DNA. He said that, the amount of guanine (G) always equals to that of cytosine (C) and the amount of adenine (A) is always equal to that of thymine (T). Where guanine, cytosine, adenine and thymine are nitrogen containing bases.

Now it is very important to maintain this pattern of A-T and C-G. If A does not link with T in the DNA replication process or C loses G, than it could have a disastrous impact. If there is a substitution of the wrong nitrogen base then a point mutation can occur, which means that there could be a change in one amino acid. Still there is safety net that causes to code for same amino acid in most cases of point mutation in the set of three bases. But if there is addition or subtraction of nitrogen base then it has more drastic effects. In this case the entire chain is compromised. Since nitrogen bases code for the amino acid in the pairs of three, so in a sequence, if one new nitrogen base is added or subtracted it will change the entire sequence of all the amino acid coded by the nitrogen bases. This is called a frame shift mutation.

In short the pattern of base pairing between the two strands in DNA is constant for all species - A with T and G with C (Concepts and application 195). It is essential for organisms to maintain this consistency and the exact pattern to survive. It is important for the replication of DNA. Without replication, a germ cell cannot go through meiosis to produce gametes. If the gametes are not formed properly, than reproduction will be a huge issue. We would not see normal babies anymore. Each next generation would be carrying double the amount of DNA and will have completely different traits. They would not be able to perform the same functions as normal humans do because they will not be producing the same kind of protein as normal humans.

Hence we can see the importance of pattern in our lives. In the absence of pattern nothing works. Professor Muntoni, from Imperial College London and the Hammersmith Hospital comments: "Many genetic diseases are caused by the mutation of just one or two of the 3.2 billion base pairs of DNA"(PR Newswire European).[2] When enzymes do not catch the faulty nitrogen base from getting linked, the entire strand of DNA goes wrong. Also it is obvious now that, when there is an addition or subtraction then it is no less than a chaos. In simple words, everything has its own necessary pattern, order and rhythm. If it is broken, things can get out of control. Just like Heraclites said, this universe and everything in it follow its pattern. If the sun does not rise on time and if the moon stays in its position for six months straight, and for six straight months we have darkness all over, then we would not have enough sunlight to grow crops and human beings will start dying from drought.

Advances in technology have played a magnificent role. It is a gift given by the research done on DNA that today there is the possibility of gene therapy. Professor Muntoni also said, "The technique we have developed with our colleagues at the University of Leicester allows us to correct genetic mutations" (PR Newswire European).[2] Even though it is just a matter of one or two mistakes among base pairing out of 3.2 billion, it still makes a huge difference.

This tiny mistake can lead to many diseases. "Hereditary genetic mutations cause about 5% of breast cancers. Cancer results from sequences of genetic mutations that lead to a loss of control over cellular growth, differentiation, division and programmed cell death" (Clinical and Investigative Medicine).[3] Mutation could be rarely beneficial such as a mutation that increases the risk of hepatitis C but protects from HIV (AIDS Weekly).[4] In short, the significance of pattern cannot be neglected. It is something that is important in our lives, not only for our survival but also for the earth and this universe.

References

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