

Nature Inspired Innovations

□ **Ram Sharan Dass**

There is a continuous cycle of creation and destruction in nature. What comes into being is sure to become non-existent, but at the same time to re appear again in a different more stable form. Crude forces of nature give rise to crude, large but simpler structures. Subtle forces of nature create smaller, but more finer, more complex structure.

Biosphere is a big community in which various biotic and abiotic components continuously interact to create and resolve problems arising in their co-existence. Adaptation is a very slow but highly efficient method through which nature resolves the problems faced by living organisms to adjust to their environment. Each species of organisms may adapt to its environment in its own unique way, therefore one problem faced by different species may find different solutions, each suiting best to their forms, functions and life styles. So the millions of years of process of evolution has worked out to almost every problem encountered by living organisms. Man has developed the ability to learn ways of nature and use them to gain dominance on all other species. The story of the area of innovations is not very long but growing with amazing outcomes.

Birds inspired flying machines

Though man has observed the flight of birds with awe and appreciation for centuries, the practical feasibility of man's flight like birds was explored in the beginning of sixteenth century by Leonardo da vinci. Vinci produced a number of works and more than 500 sketches dealing with the machines of flying and the nature of air. He drew the attention of inventors towards this wonderful possibility but no actual breakthrough was realised till 1903 when Wright brothers heavier than air machine stayed air borne for about a minute in Kitti Hawk, North Carolina. It took just another decade for the first commercial passenger flight to become a reality.

Crystal plane inspired by a leaf of a water lily

The first nature inspired design was created by Joseph Paxton who built 990,000 square feet crystal palace for the great

exhibition, using criss-crossed girders to support nearly 300,000 glass panes over a vast, open space. Paxton got the inspiration for building such a massive but strong and durable structure from the leaf of a water lily in which interconnecting ribs help it to support huge weights in water.

Velcro inspired by Burdock Burrs

The most commonly used example of a nature inspired man-made product is Velcro which was got patented by Swiss engineer George de Mestral in 1955. After



Burdock



Velcro



Janine Benyus

returning from a hunting trip in Alps, Mestral found his dog covered with burdock burrs. When put under a microscope he found that there were hook shaped structure on the seed which got entangled in the loops of the fur. He designed Velcro which in 1960s NASA used in its space shuttle to prevent objects from floating in zero gravity conditions.

The name bio-mimetic to bio-inspired technologies was given by American bio physicist Otto Schmitt in a paper presented at the Biophysics congress, Boston.

Other Nature inspired innovations

Small innovations continued over the time: In aviation industry taking cue from shark skin NASA and 3M succeeded in reducing drag on jet planes by fixing small indentations on its surface with the help of glue. Lufthansa could achieve the same effect with the help of paint. Architect Mick Pearce taking cues from the self cooling mounds of African termites designed East gate centre in Hazare, Zimbabwe in which Chimneys are installed in such a way that a temperate environment is maintained inside without any need of conventional cooling/heating systems.

But nature inspired innovations were brought to centre stage of scientific inventions by Janine Benyus, when in 1997 she published her book Biomimicry: Innovations inspired by nature. Since then the number of bio-inspired innovation patents is increasing in leaps and bound.

Janine Benyus now educates and gives consultations to big corporations to design, create and incorporate nature

inspired innovation into their practices. In 2010, she founded Biomimicry 3.8 an institution through which she teaches the basic principles involved in bio inspired innovations and how to use them. Benyus says nature knows what works, what is appropriate and what lasts here on earth. According to her, in its 3.8 billion years of evolutionary practice nature has already found marvelous solutions to most of the challenges we face. Her solutions are not only benevolent but also sustainable. This is so, because, biomimicry is governed by the nine basic principles given by Janine Benyus.

Nine-basic principle of Biomimicry

1. Nature runs on sunlight.
2. Nature fits only the energy it needs.
3. Nature fits form to function.
4. Nature recycles everything.
5. Nature rewards cooperation.
6. Nature banks on diversity.
7. Nature demands local expertise.
8. Nature curbs excesses from within.
9. Nature taps the power of limits.

So, whenever we are challenged by a problem, let us look towards nature for an advice. Just find out an organism living in similar situations and what special changes nature has brought to its form and functions and you are sure to see a ray of light for your problem too.

We will carry on this story and talk of examples of Nature Inspired Innovations in different fields in the coming issues of Innovate India.

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