COMPILED AND EDITED BY THE **CONNECT TEAM** BASED ON INPUT FROM THE FEATURED **RESEARCHERS**

KAMANIO CHATTOPADHYAY (PROFESSOR, DEPARTMENT OF MATERIALS ENGINEERING) AND DEBIPROSAD ROY MAHAPATRA (PROFESSOR, DEPARTMENT OF AEROSPACE ENGINEERING)

(MANOJ SUDHAKARAN)

Design inspired by nature

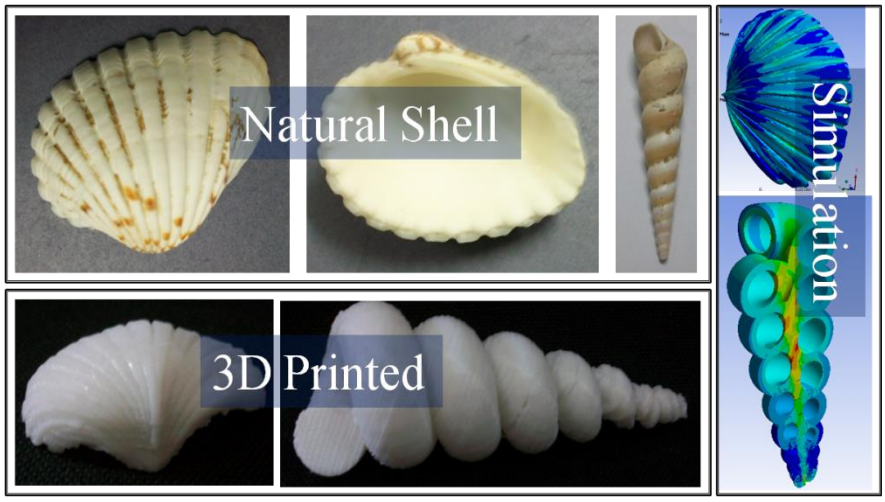
Kamonio Chattopadhyay, a materials engineer who has done pioneering work in the field of crystal structures, and Debiprosad Roy Mahapatra, an aeronautical engineer who works on engineering mechanics, were brought together by a mutual interest in designing futuristic materials inspired by nature.

By a process of trial and error over millions of years, natural selection has shaped evolutionary traits that help animals and plants survive, often in adverse environmental conditions. One such example is the shell of the mollusk. Many of these marine animals live in the deep seas and have to withstand

enormous pressure. How these animals protect themselves from stress and fracture was a question that intrigued Chandrasekhar Tiwary— a former PhD student with Chattopadhyay—when he stumbled upon them as he took a stroll on a beach in Pondicherry.

Chattopadhyay and Mahapatra decided to investigate this question with Tiwari and his new postdoctoral advisor, Pulickel Ajayan, a professor at Rice University in the US. With the help of mechanics theory and experiments, they found that these animals secrete shells with an optimal thickness to deal with their marine lifestyle. Also, they have complex shapes that enable them to transfer stress from the outer surface to particular locations of geometric concentrations. At great pressures deep in the sea, this design of the outer shell allows the soft-bodied animal inside to survive because even if there is a fracture, it occurs in these sturdy parts. Their hypothesis was confirmed by mechanical tests performed on models created using 3D printing.

Besides helping us understand how nature has driven the evolution of life forms, this study could have a wide range of implications in many diverse fields, from designing aircrafts that are safer and more damage tolerant to constructing buildings that protect against environmental calamities. Chattopadhyay and Mahapatra hope that their findings, along with information emerging from other such studies, could help us design and engineer a new generation of materials.



(Courtesy: K Chattopadhyay and DR Mohapatra

Other members of the team