THE HUMBLE HONOURABLES

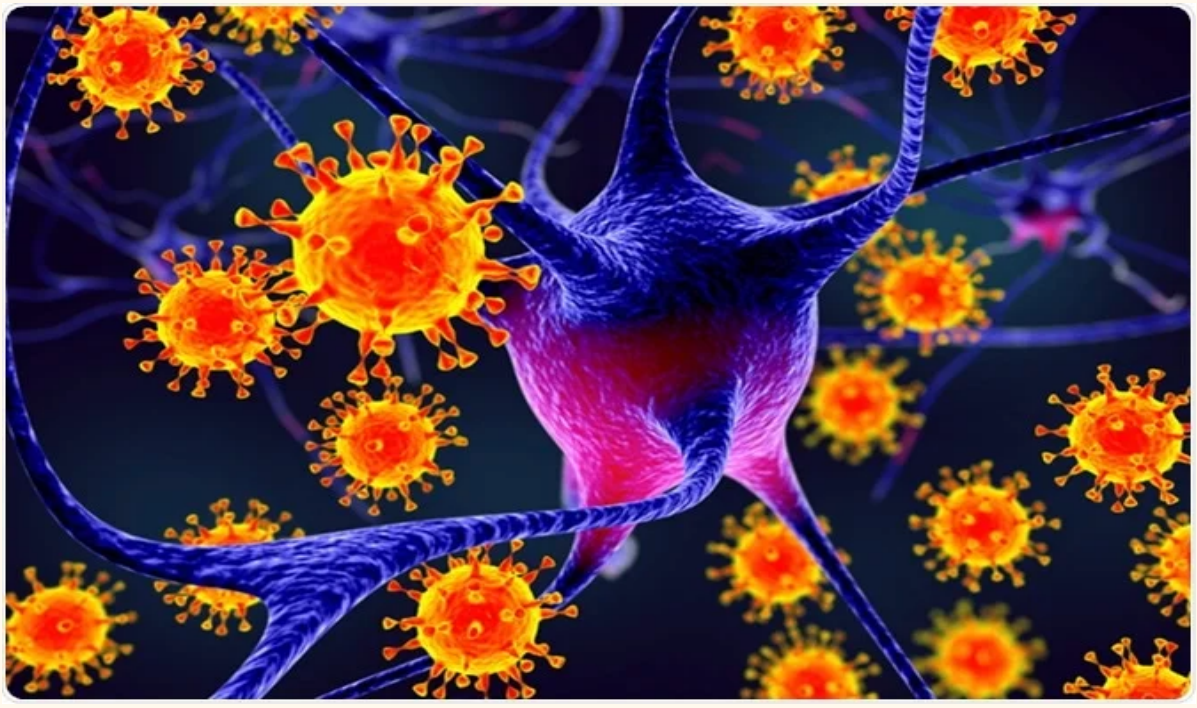
By Swarnendu Saha

INTRODUCTION

“ All things bright and beautiful and all creatures great and small ” .

We all have heard this line from our childhood. But, truly speaking, how many of us can actually ‘think’ our life beyond anthropogenic supremacy, where all creatures have their own right and dignity to live with ? But, let me assure you, they are no less .

VIRUSES



We have always thought that, let there be magic . Abracadabra !! And all viruses move away. Whooshh !! No ebola, no chicken pox, polio virus is gone, no third world citizen dying due to rabies - such a wonderful site !!

NOPE !! I DIFFER !!

Marilyn Roossinck, a professor at the Pennsylvania State University, published a review in the Journal of Virology summarizing scientific works proving viruses are benevolent. She says the situation is quite different from what we think it is.

Creating symbioses between the same virus-infected fungus and other plants, she pushed the soil temperature to 140 degrees. Result? The plants survived. The symbiosis with the virus enabled every plant surviving such elevated soil temperatures, including tomatoes.Additionally, the viruses also provide various services for plants - a voluntary service!!!

Many virologists say, constructing a wooden house without the nails is something what our earth without viruses would endup to be!

As noticed by Agricultural biologists the viruses are essential for species population control. If a particular species becomes overpopulated a virus comes through and wipes them out. "**Wipe the Winner"**- a very natural part of ecosystems and is common in many other species. Game of checks and balances. It follows the logical growth curve as well, with a definite carrying capacity, under given resources, place and time. As populations turn excessively high, viruses tend to replicate very rapidly and bring that population down, creating space for others to survive. If viruses cease to exist abruptly, competitive species likely would flourish destroying others .

Looks like they are the guardians of the natural world !!

Pseudomonas syringae & P. stewartii

Wait !! Not only viruses . Let me introduce you to some other gentleman too .

These 'notorious' gram-negative proteobacteria froze the crops at -2 to 4 degree Celsius, doing the job that was a strict accolade of the "refrigerator". When Paul Hoppe 'met' these bacteria in 1961, *Pseudomonas syringae* came into the limelight and its effects on biogeochemical cycles are thoroughly being studied .

Studying the bacteria,the presence of Inaz, an outer membrane ice-nucleating protein, is discovered as the main cause . *P. syringae* acts as an ice nuclei on plant surfaces – it helps water molecules condense and eventually form ice. The ice nucleation takes place at the interface of the protein and a few layers of water molecules and an ordered arrangement of water takes place very efficiently at temperatures near the "operating temperature" of the INPs. The low temperature increases the inclination of the protein and the surface area of the INA sites that interact with water Thus, more water molecules will get arranged in an ordered fashion locally, near the interface.

So, perhaps , like me,many of you have the same question: what if these bacterias end up in the atmosphere-does they play an important role in cloud formation ?

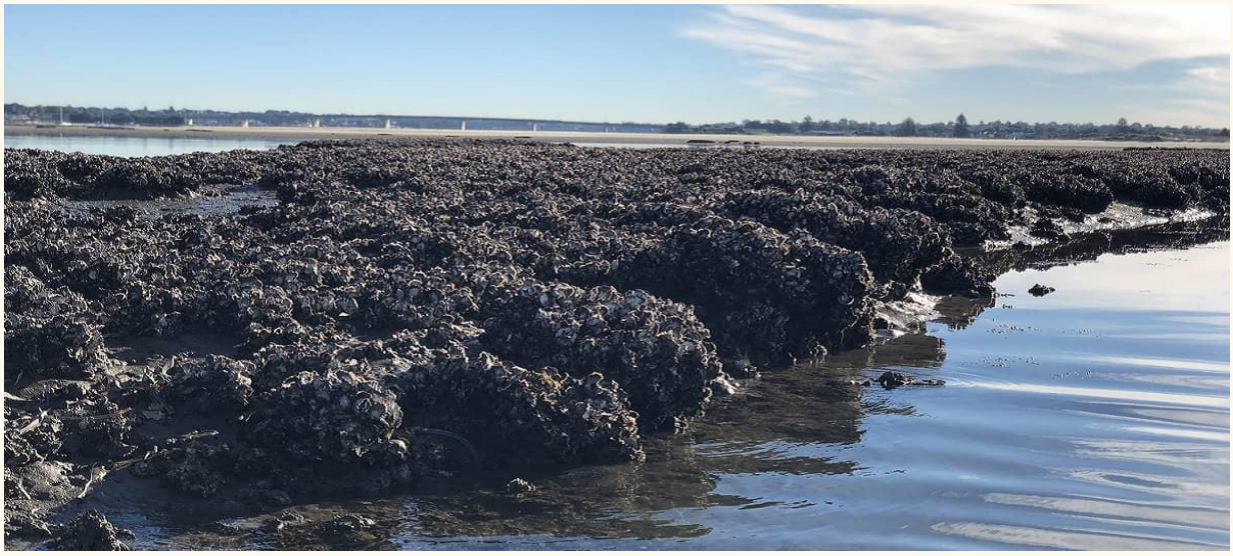
Searching for the answer, a group of researchers led by David Sands and Brent Christner found that of the 19 fresh snowfalls they analyzed, the 'bad boys' were everywhere. The samples collected came from seasons and locations devoid of deciduous plants indicating that the ice nucleators travelled long distances and maintained their activity in the atmosphere .

Moreover, Sands and other colleagues from MSU and Ohio State turned to hailstones collected from three northern Rocky Mountain storms in Montana. On careful study, they found the presence of bacteria, from the outer core to inner nuclei, with increase in complexities .Each of the hailstones contained 12-535 colonies forming units of bacteria. Testing a subset of the isolated bacteria, they found that one was an ice nucleator related to *Pantoea stewartii*, a known ice nucleator .

The researchers only tested 2% of all CFUs obtained during culturing, so it's therefore possible that there were many more ice nucleators in the hailstone samples. But besides *P. stewartii*, they found 21 other species of bacteria in just 2% of the samples.

So, did you ever think that the snow fall you enjoy in Tawang is actually a gift of Bacteria ? Don't forget to thank them, while enjoying your holidays next time !!

Oysters



Our nearest eastern neighbours have witnessed the wrath of the environment for quite a while in recent years . Bangladesh's climate migration, caused by sea level rise, is linked to climate change. By 2050, up to 13.3 million Bangladeshis may become displaced due to climate change.

Taking the case study of Kutubia islands where families are being constantly displaced by engulfing sea, the presence of oyster-encrusted reefs, a little away in the sea, shows hopes to Mohammed Shah Nawaz Chowdhury and his research associates that Oyster reefs can provide relief to a coast constantly buffeted by strong waves.

Dynamic natural forcings are being focused on to protect life from roaring waves . Kutubdia Island showed large clusters of oysters growing naturally on concrete pillars, especially near a jetty. As studies suggest, concrete is a successful alternative substrate after natural oyster shells – with reefs on concrete equalling or in some cases surpassing the size, biomass and density of oysters. The main key difference between Kutubia and other oyster reefs is that Kutubia reefs are being ‘engineered’ and growing naturally by the sea and not declining .

If the right conditions are provided, like being exposed to air and sun less than twenty percent of the time, the reef promises to grow upwards and keep pace with sea-level rise. Minor damage

to the reef by natural causes, would be self-repaired – the new population grows again to fill the space and account for any oysters lost.

Oysters engineer their environment by clustering on hard, submerged surfaces and fusing together to create reef structures .Their role in filtering and retaining nutrients in water, providing spawning and shelter for fish, and boosting biodiversity is well-documented. Oyster reefs provide a habitat for other animals, improve water quality and enhance seagrass growth.

Thus, oysters have shown some light in the path of sustainable development, controlling the screeching sees and some hope for the future .

CONCLUSION

So, we saw throughout, how our life is being taken care of by these ‘small’ and ‘humble’ life forms . Let’s all chant

“ ALL THINGS BRIGHT AND BEAUTIFUL

ALL CREATURES GREAT AND SMALL”