LESSONS FROM NATURE

By

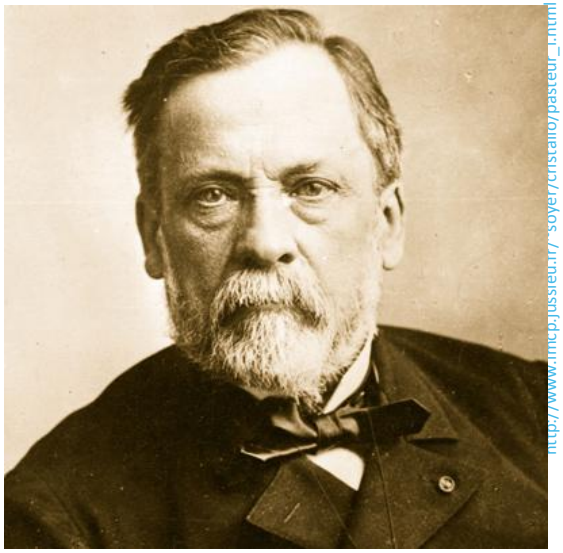
Ramakrishna G. Bhat

rgb@iiserpune.ac.in

IISER-Pune

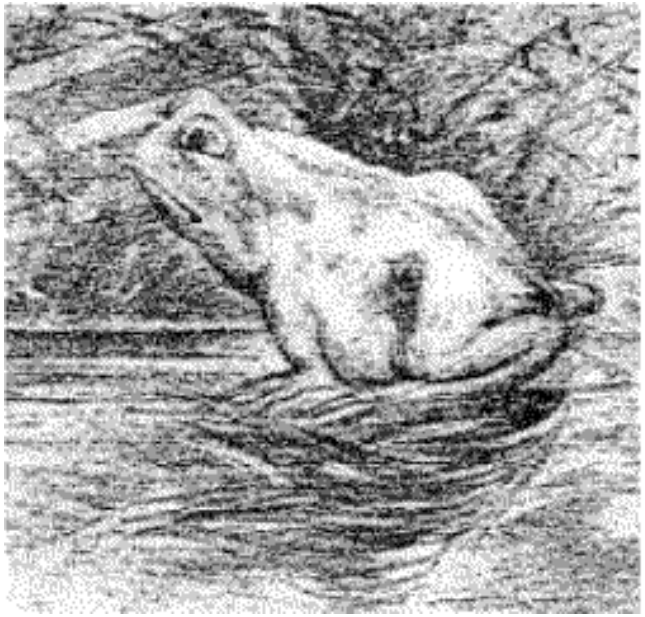
Avijnatam Vijnanatam Vijnatam Avijnatam
-Rigveda

"One who thinks he does not know, in fact knows lot and one who thinks knows lot knows not"



Knowing to be astonished by something is the mind's first step toward discovery.

- Learn enough about how chemistry works so that you know when to be astonished
- Develop good scientific taste
- Have fun



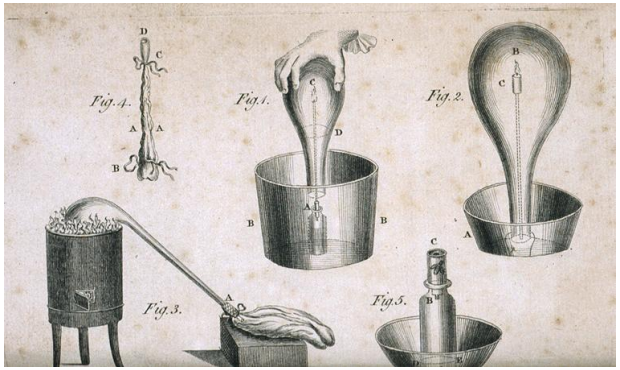
Alchemists to Chemists

- Predecessors of chemists-Not interested or know nothing about matter, energy, and reactions-They were interested in making Gold!
- Constant failure to produce Gold from cocktail lead to many questions
- Why did they fail? What caused the change in substance
- Heat/Energy released in the reactions observed-Can it be tapped?
- Observed chemical change of matter from one substance to another-Break down into smaller parts-
  First use of **"Common Sense Approach"** by First True Chemist!

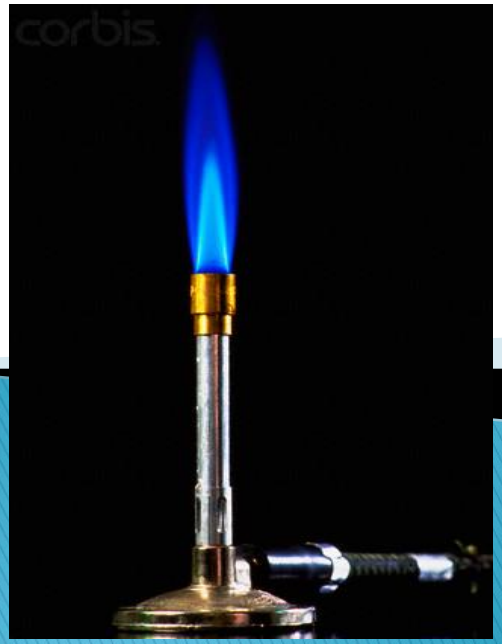
Library of Congress

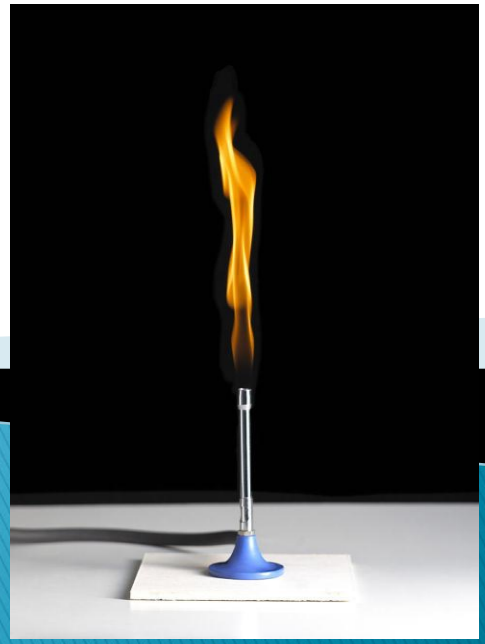
Karl Scheele
Died from tasting his discoveries

Scheele was a brilliant pharmaceutical chemist who discovered many chemical elements – the most notable of which were oxygen (though Joseph Priestley published his findings first), molybdenum, tungsten, manganese, and chlorine. He also discovered a process very similar to pasteurization. Scheele had the habit of taste testing his discoveries and, fortunately, managed to survive his taste-test of hydrogen cyanide. His his luck was to run out: he died of symptoms strongly resembling mercury poisoning.



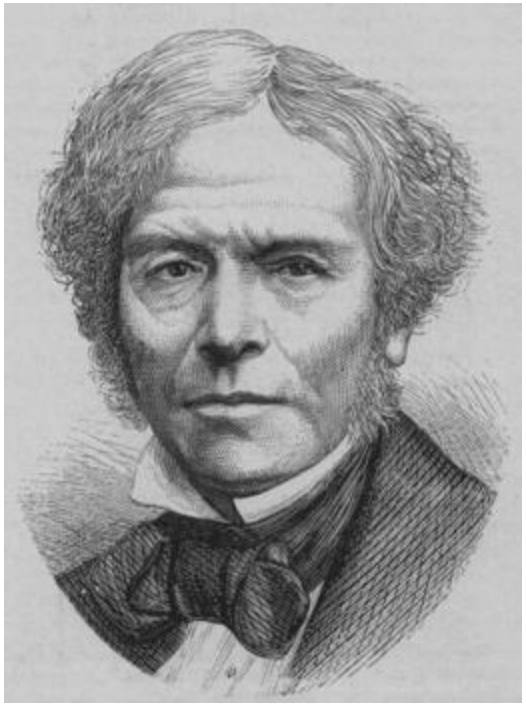
Robert Bunsen: Lost eye sight
Robert Bunsen is probably best known for having given his name to the bunsen burner which he helped to popularize. He started out his scientific career in organic chemistry but nearly died twice of arsenic poisoning. Shortly after his near-death experiences, he lost the sight in his right eye after an explosion of cacodyl cyanide. These being excellent reasons to change fields, he moved in to inorganic chemistry and went on to develop the field of spectroscopy.





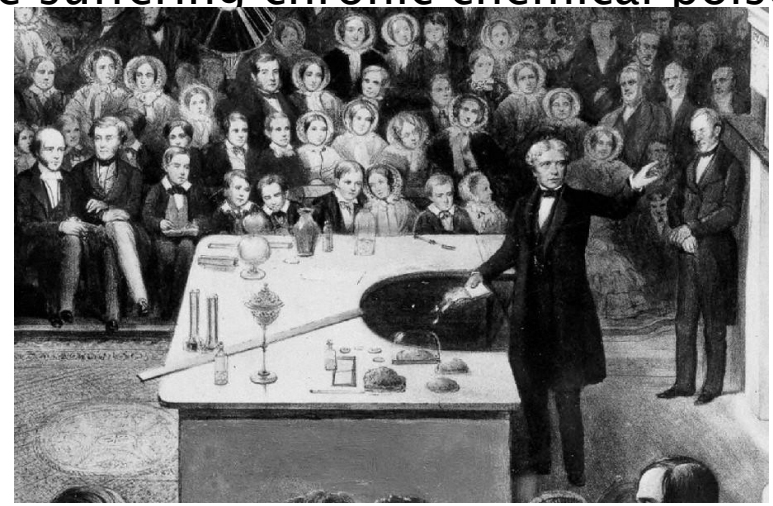
Sir Humphrey Davy: Damaged eyes and poisoning

The brilliant British chemist and inventor, got a very bumpy start to his science career. As a young apprentice he was fired from his job at an apothecary because he caused too many explosions! When he eventually took up the field of chemistry, he had a habit of inhaling the various gasses he was dealing with. Fortunately this bad habit led to his discovery of the anesthetic properties of nitrous oxide. But, unfortunately, this same habit led to him nearly killing himself on many occasions. The frequent poisonings left him an invalid for the remaining two decades of his life. During this o permanently damaged his eyes in trichloride explosion.



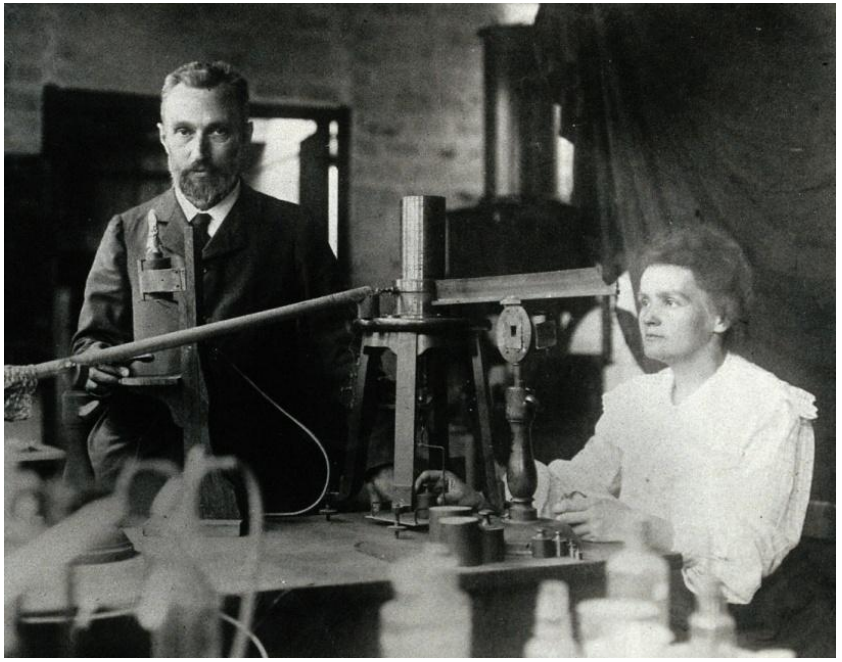
Michael Faraday: Suffered chronic poisoning

Thanks to the injury to Sir Humphrey Davy's eyes, Faraday became an apprentice to him. He went on to improve on Davy's methods of electrolysis and to make important discoveries in the field of electro-magnetics. Unfortunately for him, some of Davy's misfortune rubbed off and Faraday also suffered damage to his eyes in a nitrogen chloride explosion. He spent the remainder of his life suffering chronic chemical poisoning.



Marie Curie: Died of radiation exposure

In 1898, Curie and her husband, Pierre, discovered radium. She spent the remainder of her life performing radiation research and studying radiation therapy. Her constant exposure to radiation led to her contracting leukemia and she died in 1934. Curie is the first and only person to receive two Nobel prizes in science in two different fields: chemistry and physics. She was also the first female professor at the University of Paris.

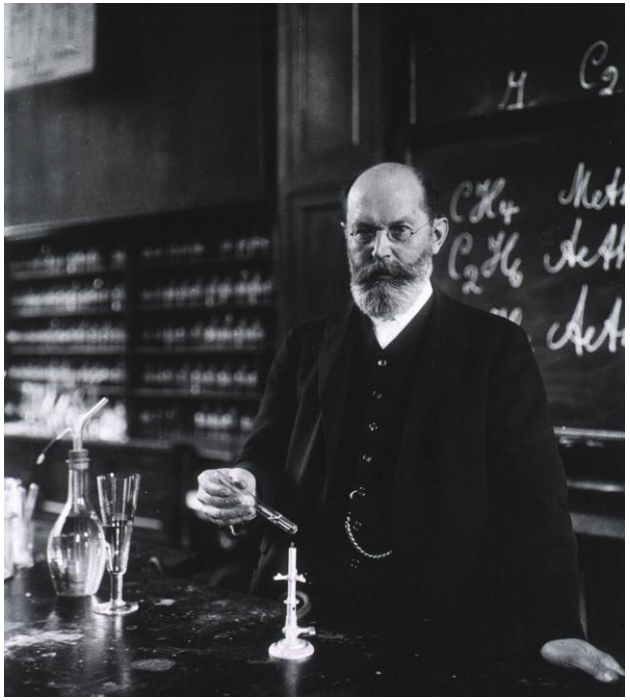


Louis Slotin: Killed himself with an accidental fission reaction

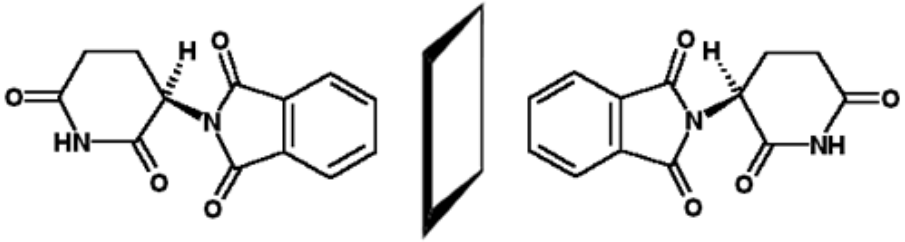
Canadian born Slotin worked on the Manhattan project (the US project to design the first nuclear bomb). In the process of his experimentation he accidentally dropped a sphere of beryllium on to a second sphere causing a prompt critical reaction (the spheres were wrapped around a plutonium core). Other scientists in the room witnessed a “blue glow” of air ionization and felt a “heat wave”. Slotin rushed outside. He was rushed to hospital and died nine days later. The amount of radiation he was exposed to was equivalent to standing 4800 feet away from an atomic bomb explosion. This accident prompted the end of all hands-on assembly work at Los Alamos.

Emil Fischer

Chronic phenyl hydrazine poisoning that led to cancer



Thalidomide- A Nightmare



R-Thalidomide
(sleep-inducing)

S-Thalidomide
(teratogenic)

FDA ordered for "racemic switch"-Make Drug enantiomerically pure

Chameleon

Conscious Emulation of Nature

Sustainable Living

- ✓Make sure there's enough food and fuel for future generations
- ✓Don't use up precious resources faster than the earth can produce them
- ✓Don't damage the environment

How Does Life Make Things?

Without Heat, Beat and Treat?

- How does the Nature Gives Information to Structure and Shape?

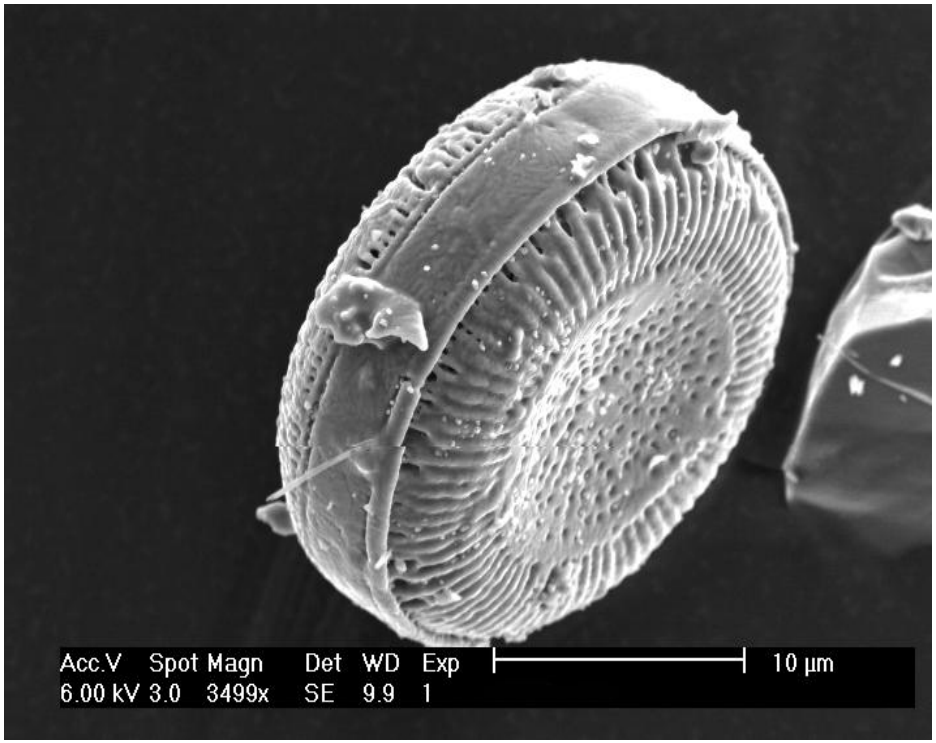
- How does the Nature makes Things disappear in to System?

Self Assembly

Making Hard Materials!

Frinker, Sandia National Laboratory

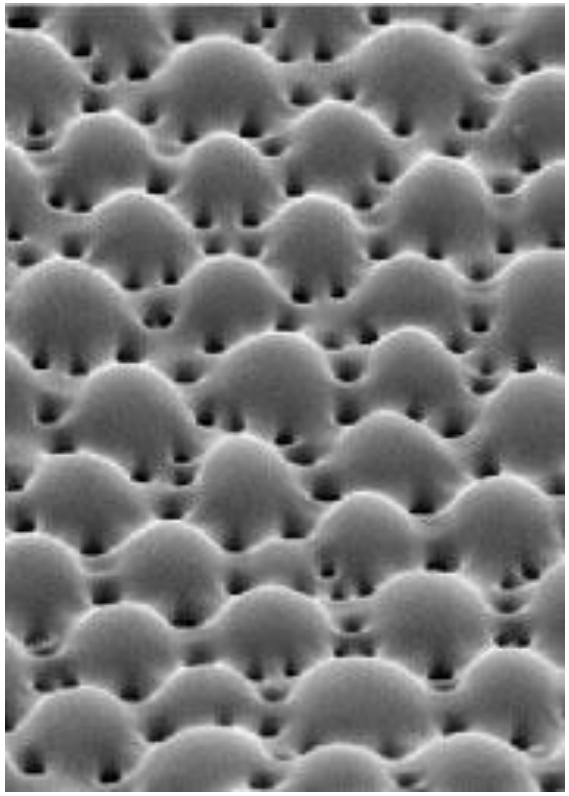
Self Assembly:Biosilica for IT next?



Silaffin polypeptides from diatoms catalyze the formation of silica *in vitro* at neutral pH and ambient temperature and pressure

UC Santa Barbara

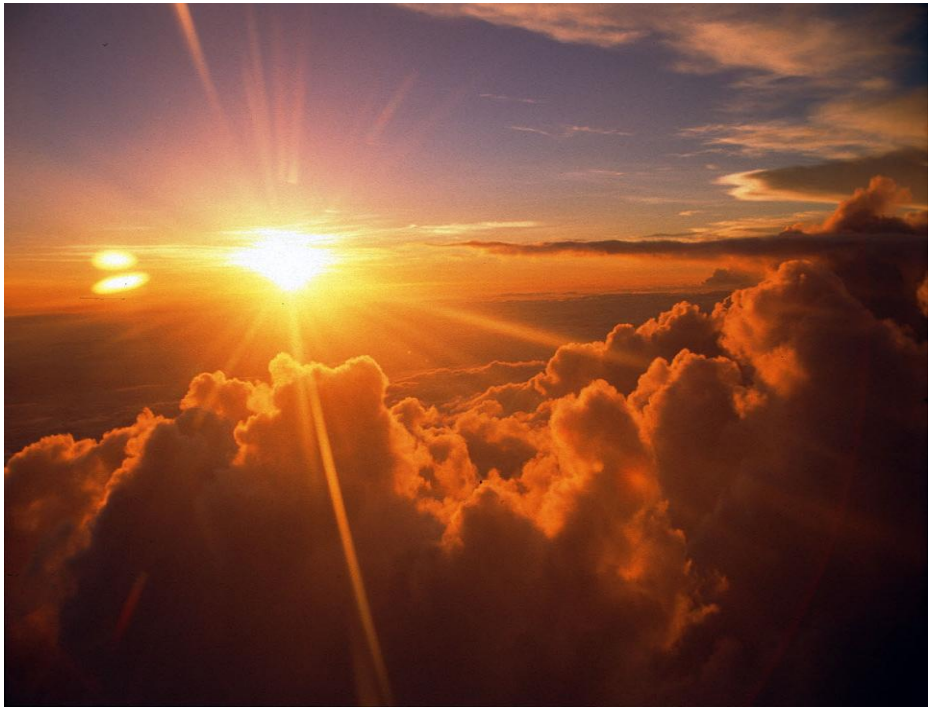
Lenses and Fibres



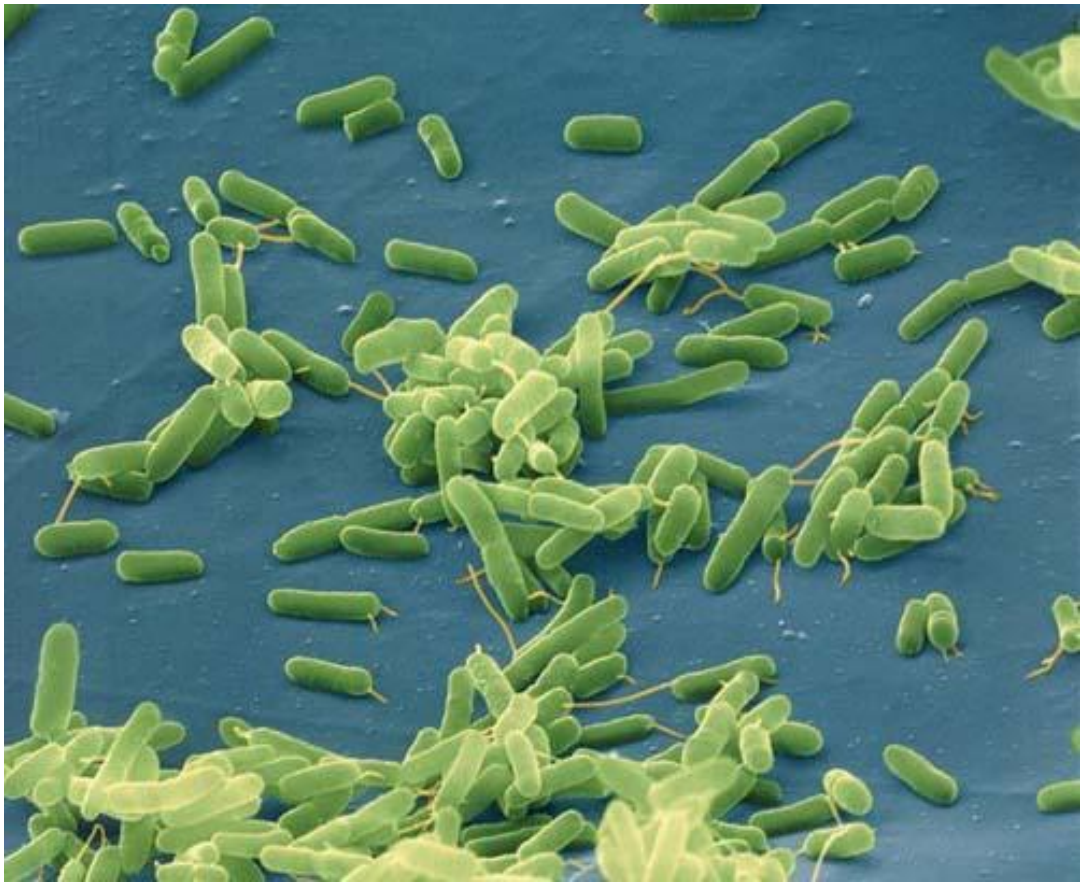
2. CO_2 as Feedstock

Geof Coates, Cornel

Solar Energy Harvesting



Metals without mining



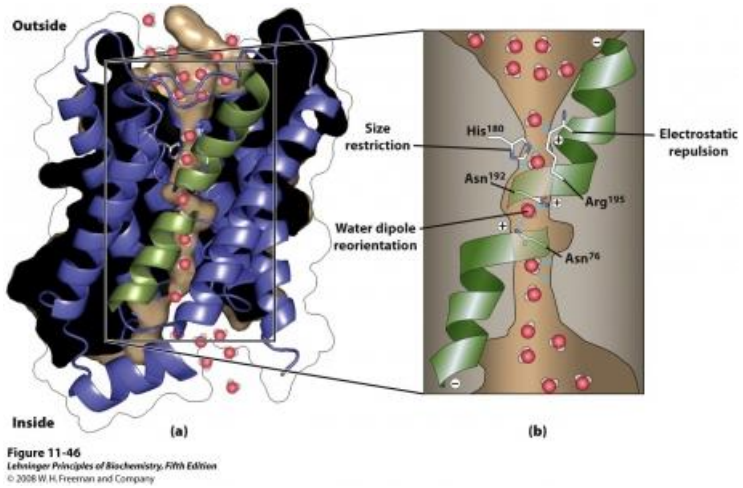
MR3

Thirst Quenching

Thirsty Cacti Collect Fog on Spines

Fresh Water!!

- Aquaporins-Proteins allow only water molecules
- Hour Glass Shaped Proteins



Aquaporin

Glue- Stick…No Stick…

One of the strongest bioadhesives known to humans

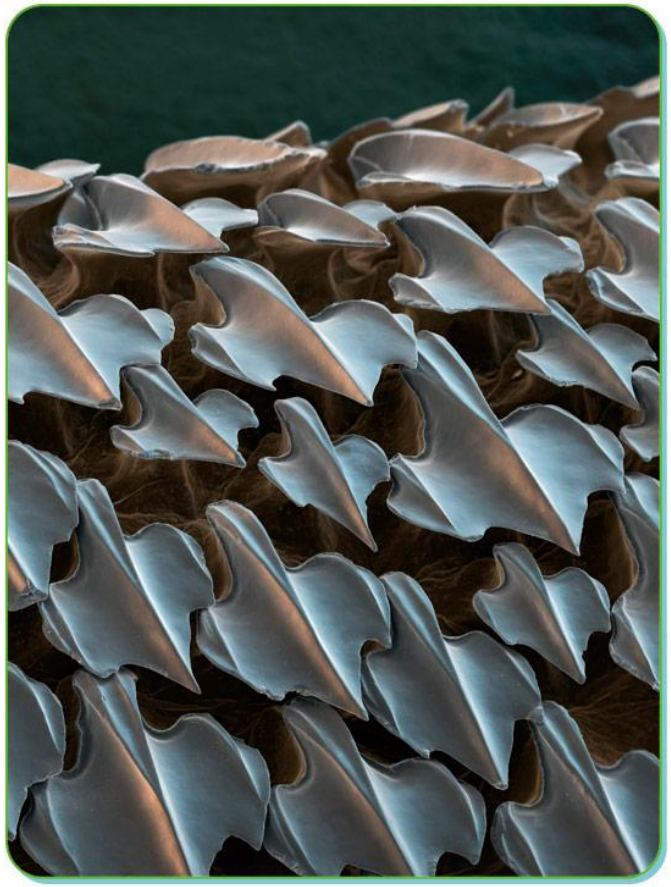
Solution to the Vaccine Storing!

Tardigrade-Biostability-Sugar Capsule

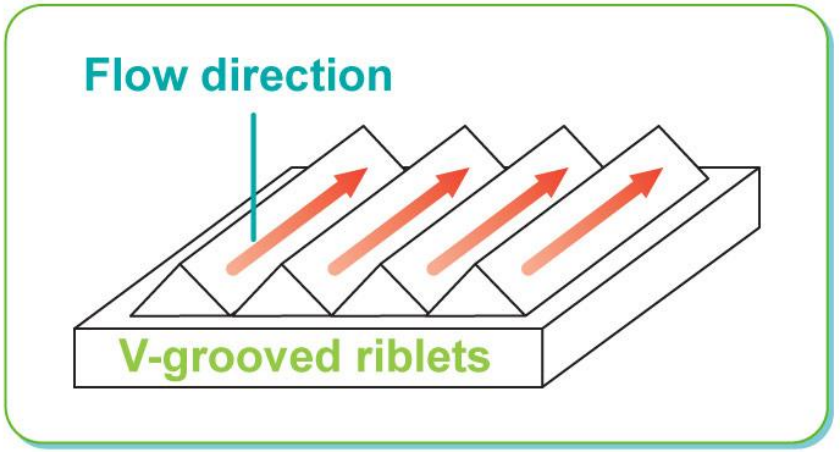
Bruce, Cambridge

Prof. RGB, IISER Pune

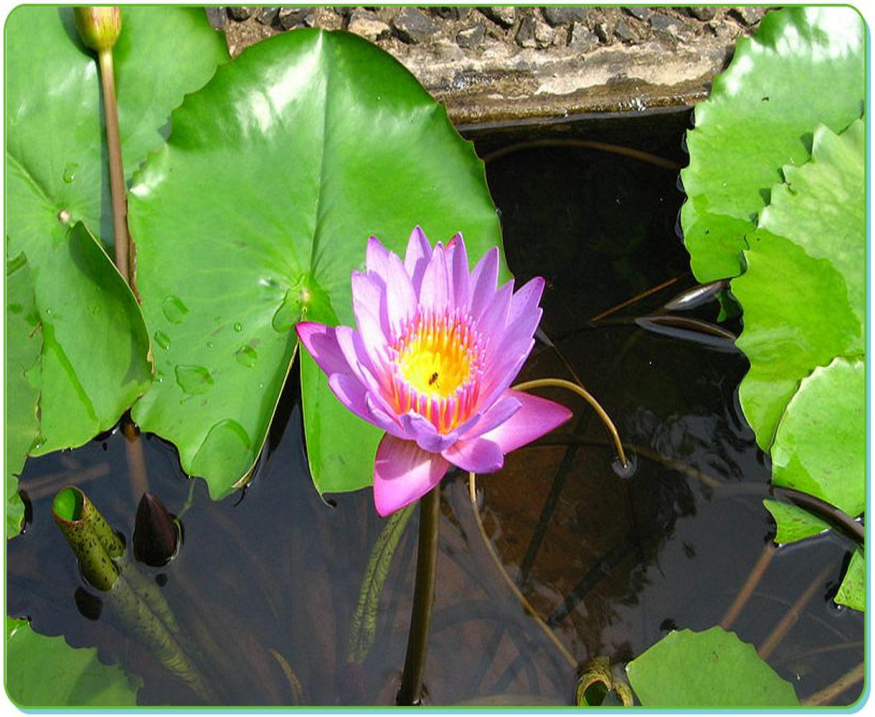
What Can we learn from Shark?



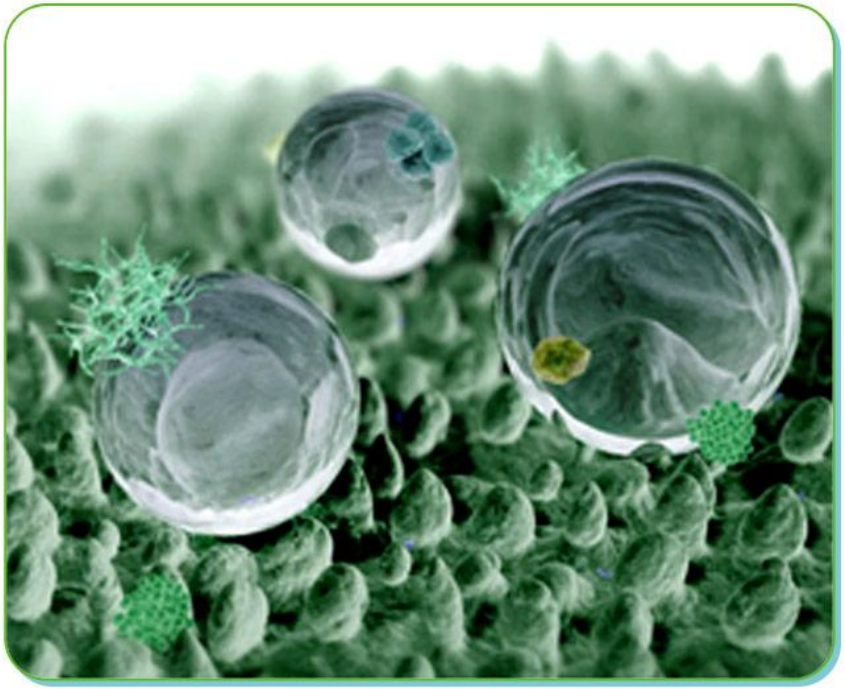
Sharklet



Self Cleaning: Power of Shape

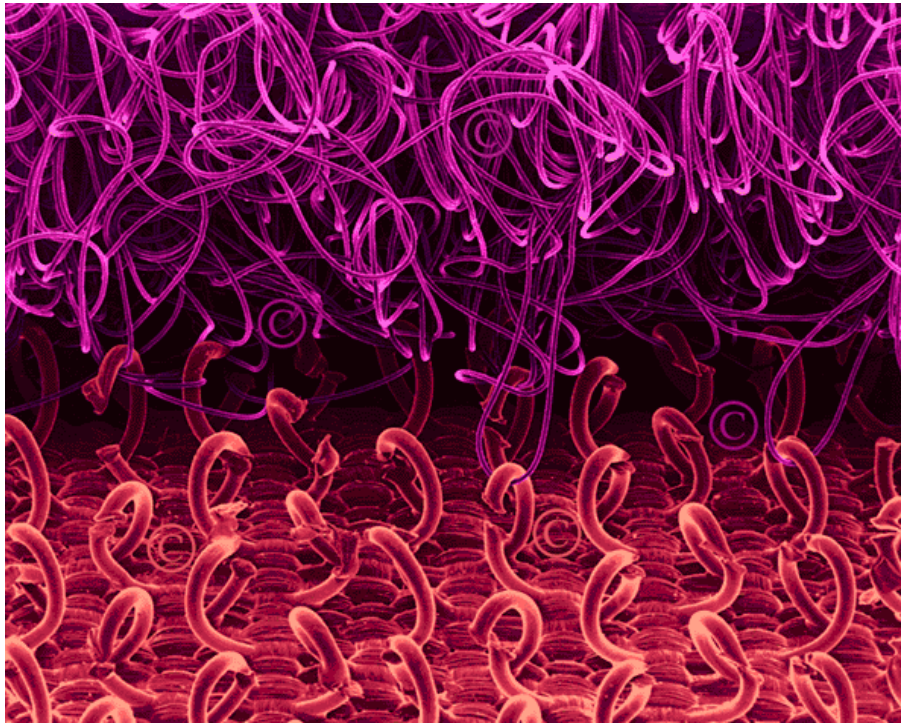


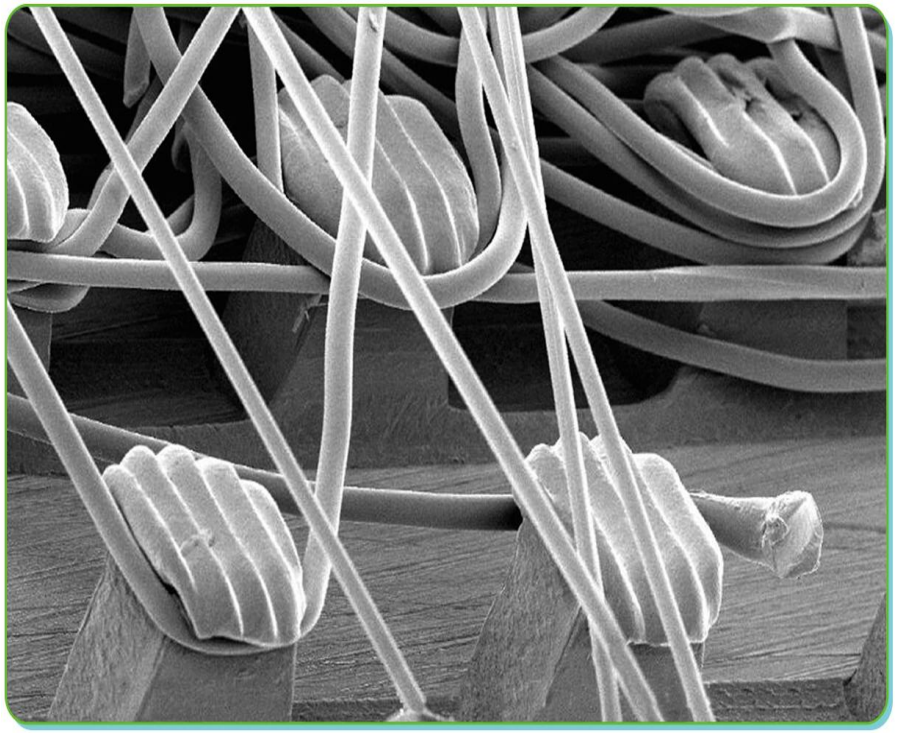
What can we learn from Lotus Leaf?



Lotus Effect

Velcro





Burrs (seeds) of burdock

Swiss engineer, George de Mestral

Nature's Solution: Kingfisher

Electric Eel-Harnessing Electricity

Nature's Solution

Great Geko

water fern

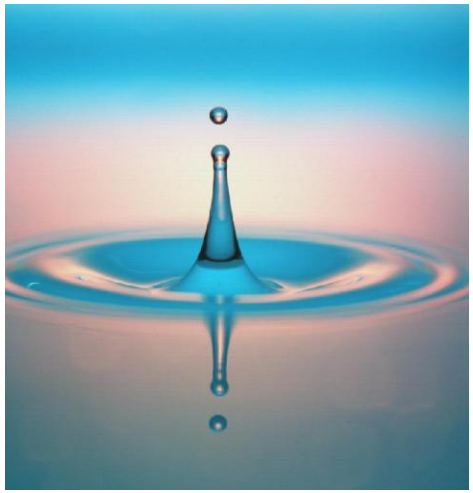
Ship

Salvinia Effect

"After almost 4.6 billion years of innovation and testing, failures are fossils, and what surrounds us is the secret to thriving here on earth"

The story of Teflon™ Jackson Laboratory in New Jersey. Dr. Roy J. Plunkett, was working with gases related to Freon™ refrigerants. Upon checking a frozen, compressed sample of tetrafluoroethylene, he and his associates discovered that the sample had polymerized spontaneously into a white, waxy solid to form polytetrafluoroethylene (PTFE).

Life Creates Conditions Conducive to Life



Nature has an important role in life. Everyday science is about us, and everyday we use and practice it. Without it we would not be able to survive.

RGB

Thanks

Works Cited

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