Now in the 58th year

Innovations for clean water: Science, technology and incubation

T. Pradeep

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Co-founder

InnoNano Research Pvt. Ltd.

InnoDI Water Technologies Pvt. Ltd.

VayuJAL Technologies Pvt. Ltd.

Aqueasy Innovations Pvt. Ltd.

IIT Madras Incubated Companies

Associate Editor

ACS Sustainable Chemistry & Engineering

THEMATIC UNIT OF EXCELLENCE

International Conference on Sustainable Solutions to Achieve Safe Drinking Water

Bhavan's College, Mumbai, December 11-12, 2017

http://www.un.org/sustainabledevelopment/blog/2015/12/sustainable-development-goals-kick-off-with-start-of-new-year/#prettyPhoto

ACS Sustainable Chemistry & Engineering Editorial, December 2016

Lab to market

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Founder
InnoNano Research Pvt. Ltd.
An IIT Madras Incubated Company

Co-founder
InnoDI Water Technologies Pvt. Ltd.
An IIT Madras Incubated Company

Partner agencies

Government of India
Department of Science and Technology
State Governments
West Bengal, Bihar, Uttar Pradesh, Punjab

DST Unit of Nanoscience and
Thematic Unit of Excellence, IIT Madras

inno NANO
Research Private Limited
Innovative Infinity through the Infinitesimal
An IIT Madras incubated company

PNAS PNAS PNAS

Biopolymer-re nanocomposit water purifica

Mohan Udhaya Sankar[1], Saha Kamalesh Chaudhari, and Tha

Unit of Nanoscience and Thematic Uni

Edited by Eric Hoek, University of Calif

Creation of affordable materials fo water is one of the most promising drinking water for all. Combinin composites to scavenge toxic sp other contaminants along with t affordable, all-inclusive drinking without electricity. The critical p synthesis of stable materials tha uously in the presence of comp drinking water that deposit and surfaces. Here we show that suc be synthesized in a simple and effe out the use of electrical power. T sand-like properties, such as highe forms. These materials have beer water purifier to deliver clean drin ily. The ability to prepare nanos ambient temperature has wide water purification.

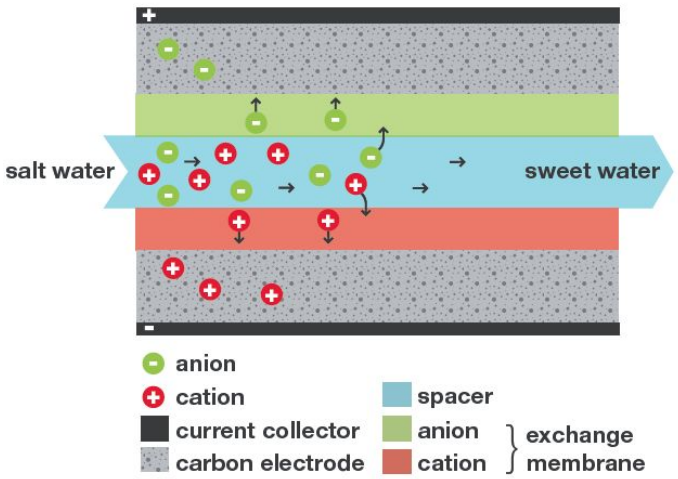
hybrid | green | appropriate technolog

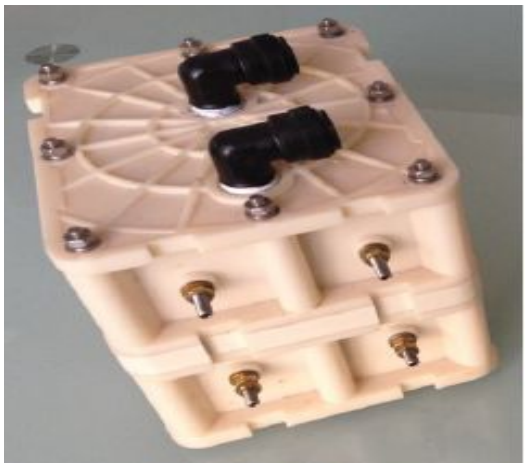
Featured in:
The Guardian, UK
The Hindu, Telegraph, Times of India, etc.
Scientific American
New Scientist
and many others

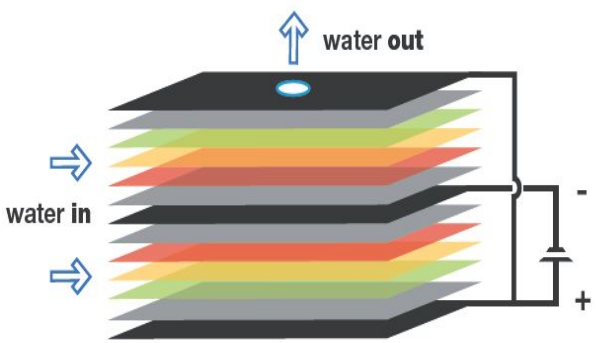
Work was featured in several journals

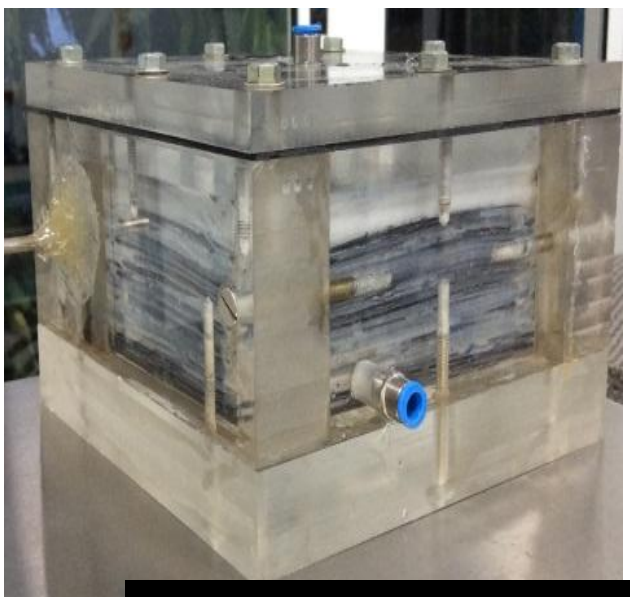
Nature Nanotechnology, July 2014 issue

Capacitive Desalination (CDI)





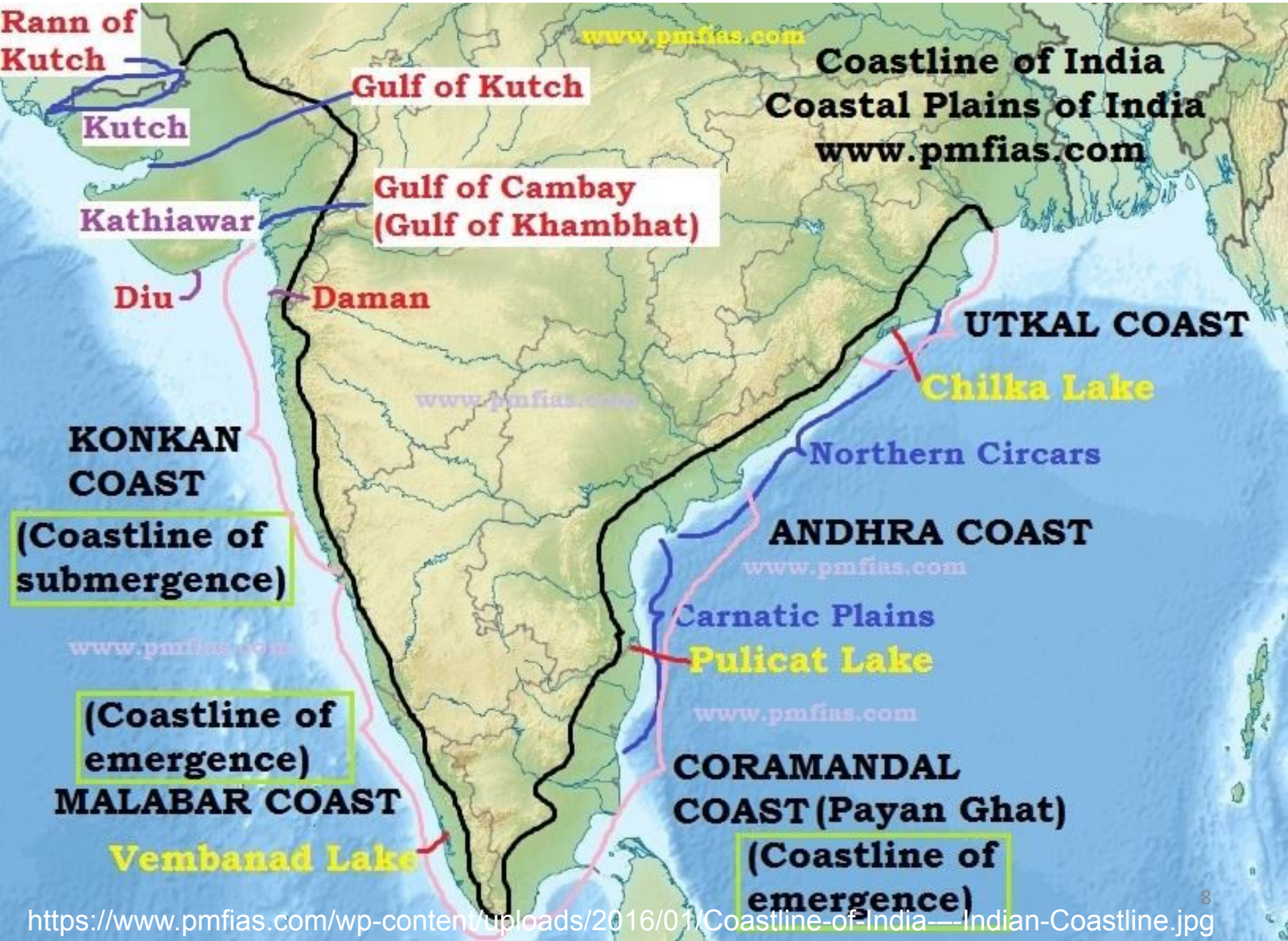




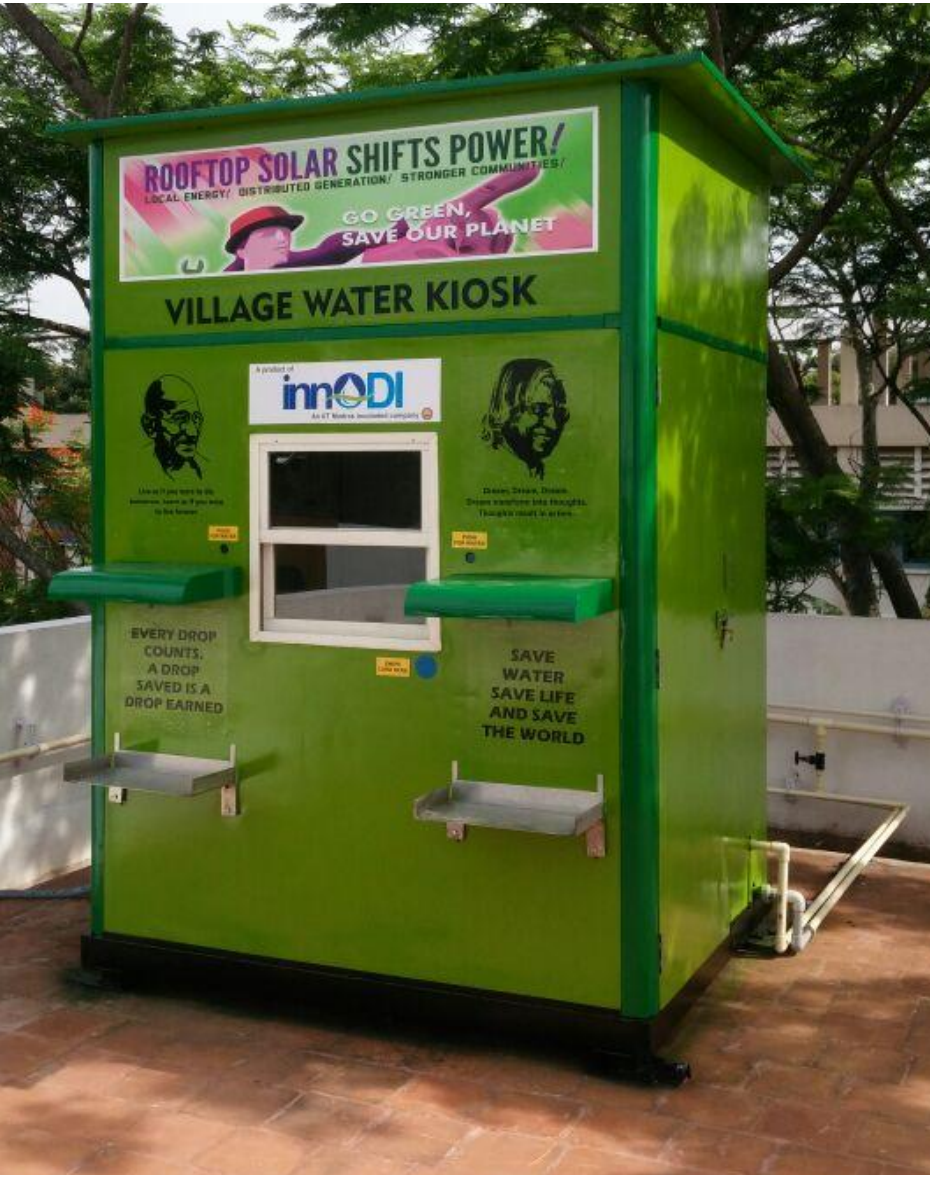
innODI

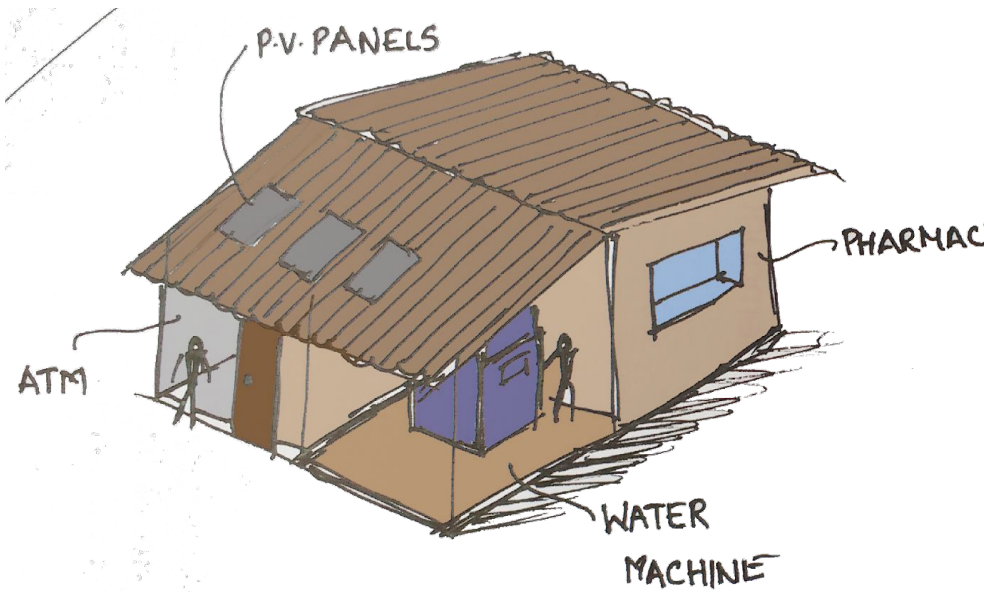
Our new company

Soujit Sengupta, Rabiul Islam and others



https://www.pmfias.com/wp-content/uploads/2016/01/Coastline-of-India---Indian-Coastline.jpg





innODI

Products under implementation

Vijay Sampath, Tullio Servida

Plan for immediate future

ARSENIC TOXIC WATER

India Mark II hand water pump – most common water pump used globally

InnoNano Research's in-line arsenic removal filtration system

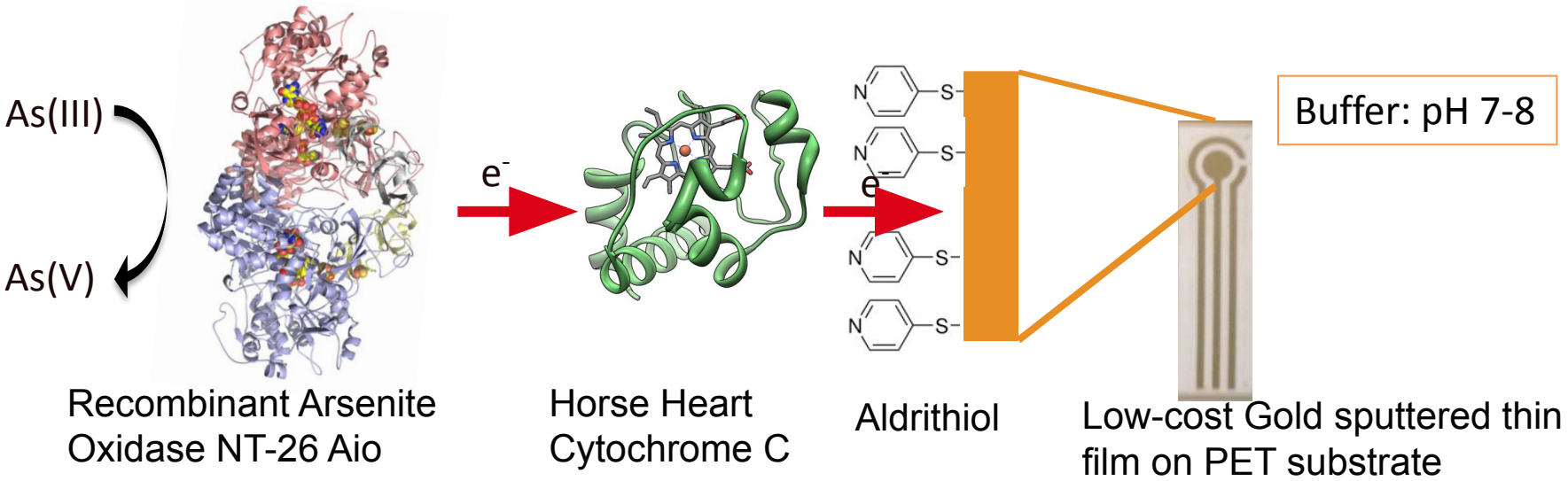
In-line arsenic sensor and remote data management – indicates when filtration systems require maintenance. **IMPROVED FILTER SUSTAINABILITY**

SUSTAINABLE SOURCE OF ARSENIC FREE SAFE DRINKING WATER

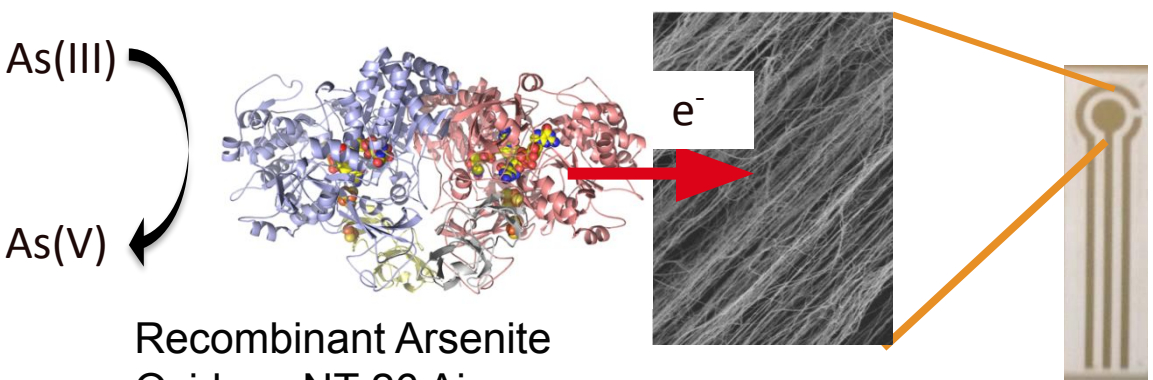
Anshup, Udhaya Sakar and Amrita

Biosensor Design

1st Generation Design (Mediated Electrochemistry)

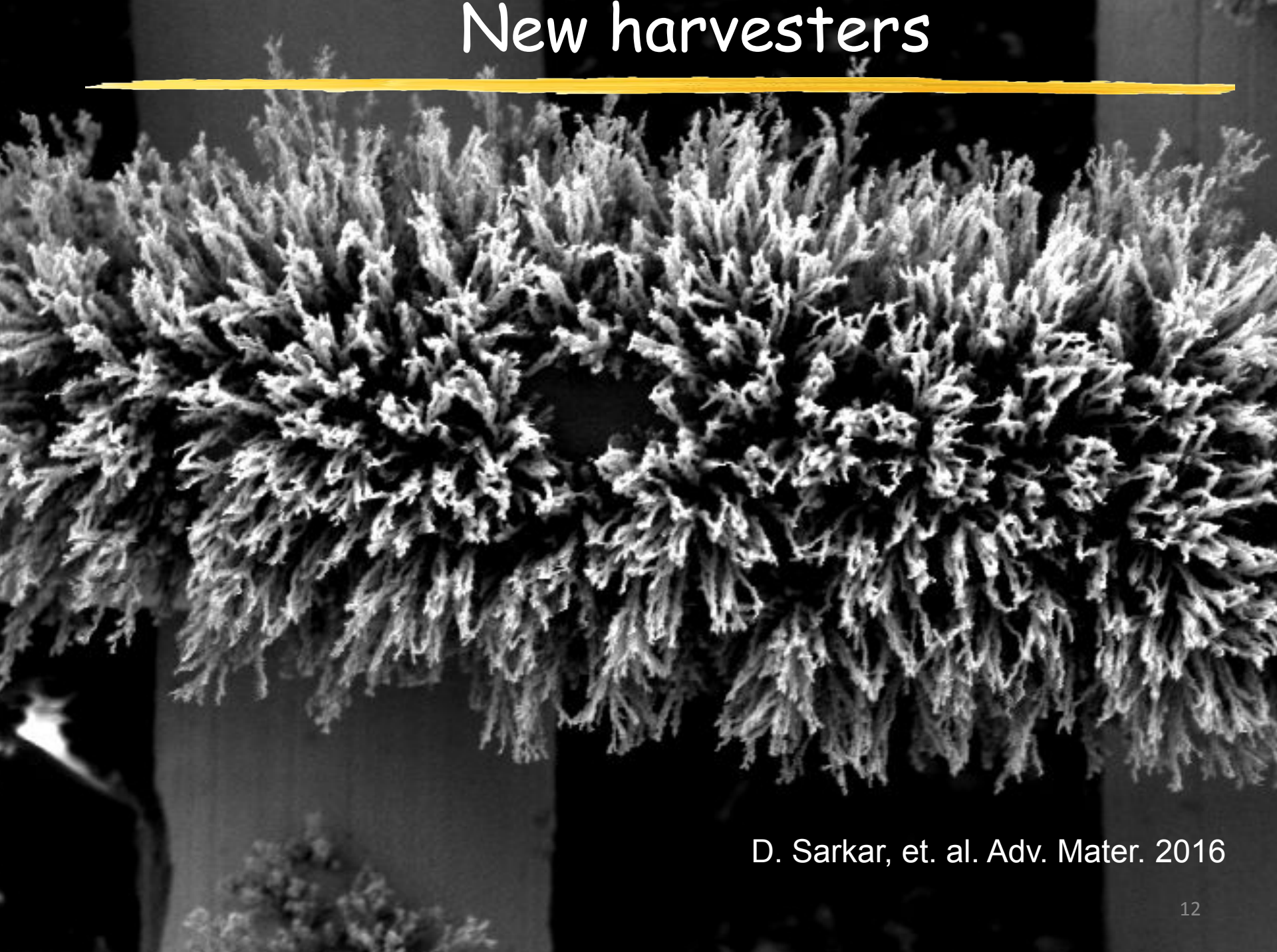


2nd Generation Design (Direct Electron Transfer)

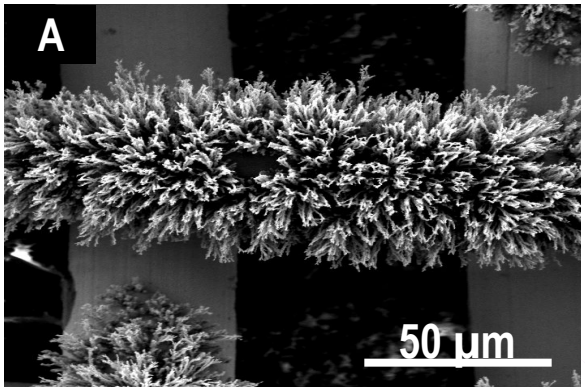


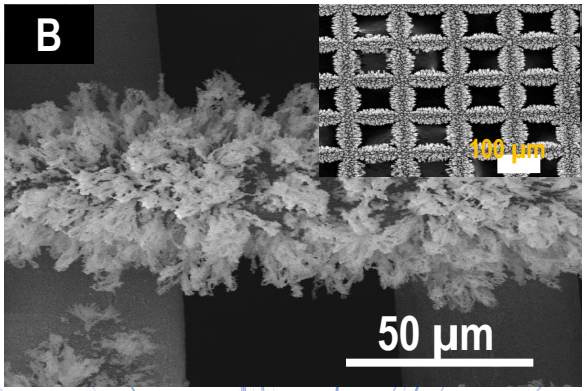
low-cost nanostructured electrodes which interact directly with enzyme (e.g. graphene or CNT).

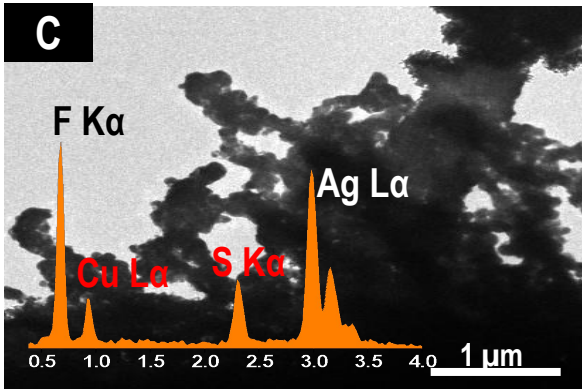
New harvesters



D. Sarkar, et. al. Adv. Mater. 2016

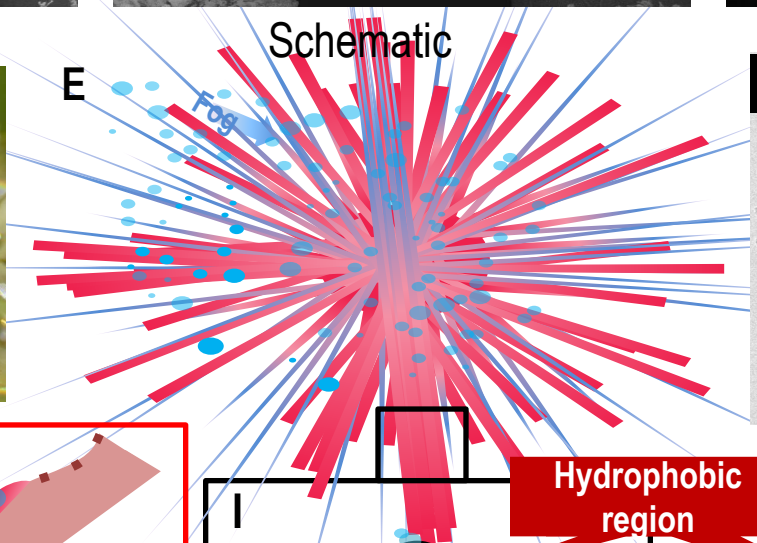




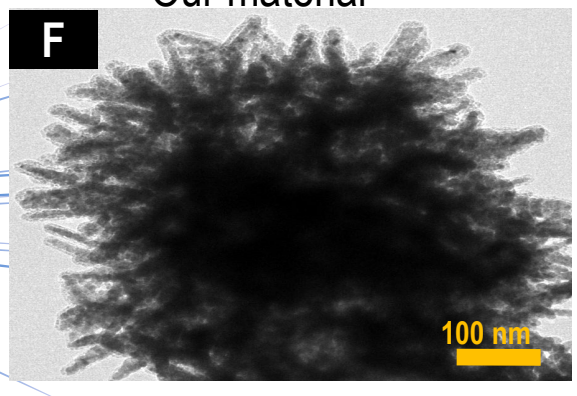


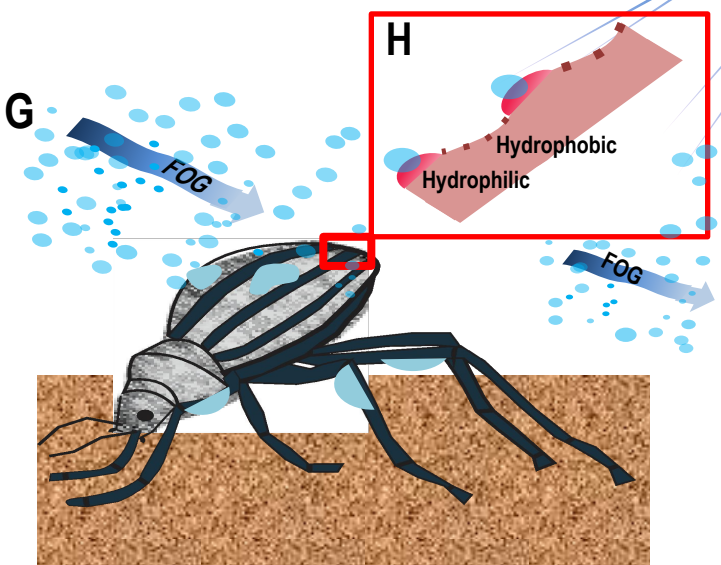
Nature

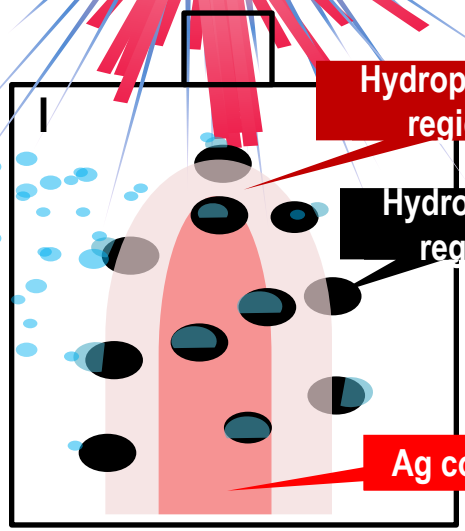
Schematic



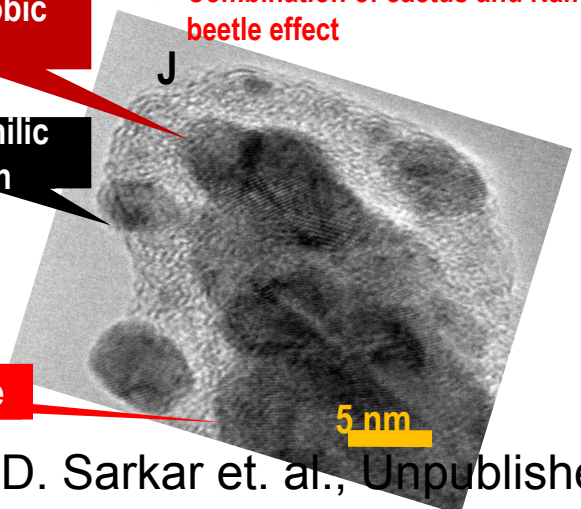
Our material



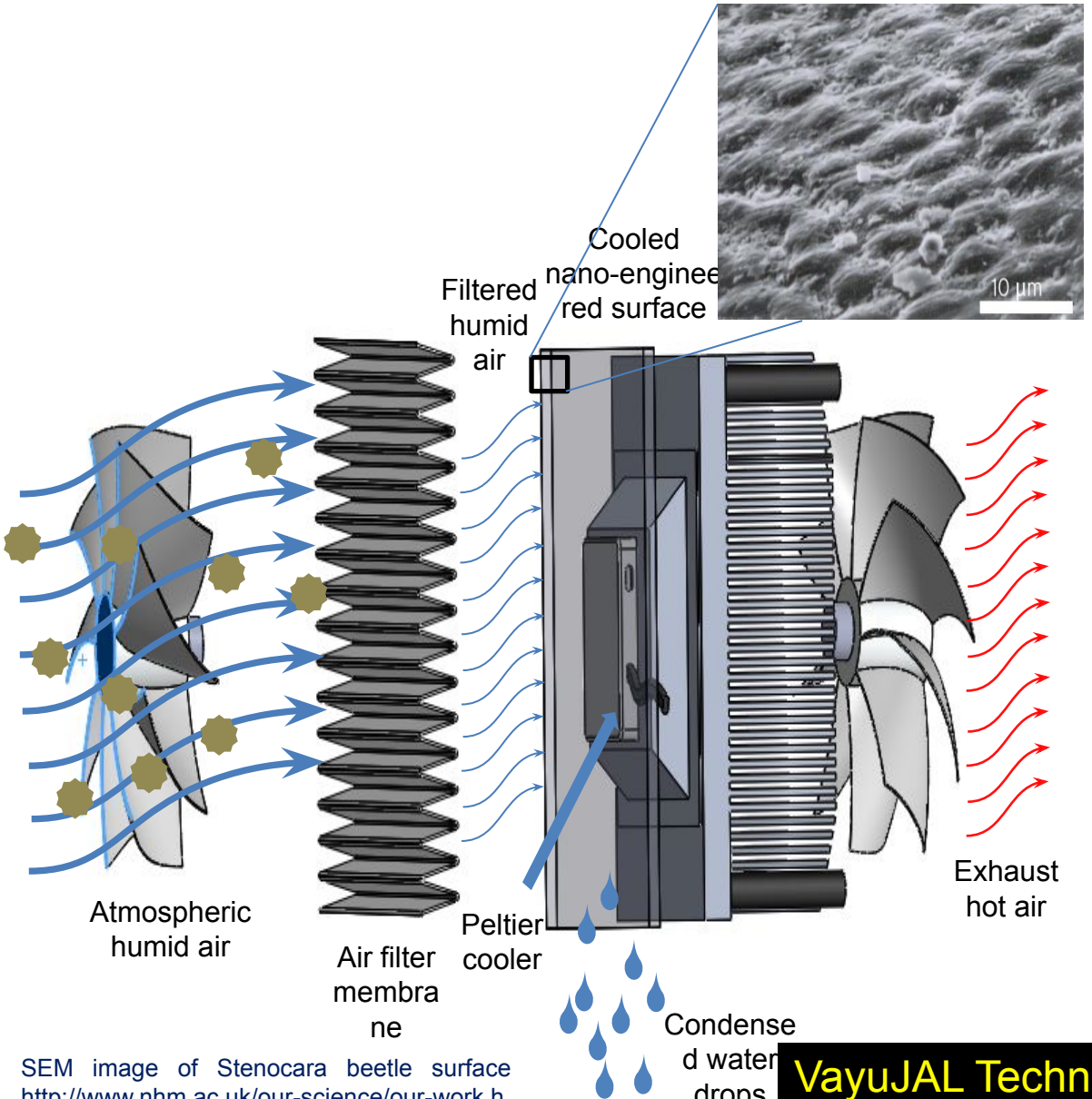




Combination of cactus and Namib desert beetle effect



D. Sarkar et. al., Unpublished

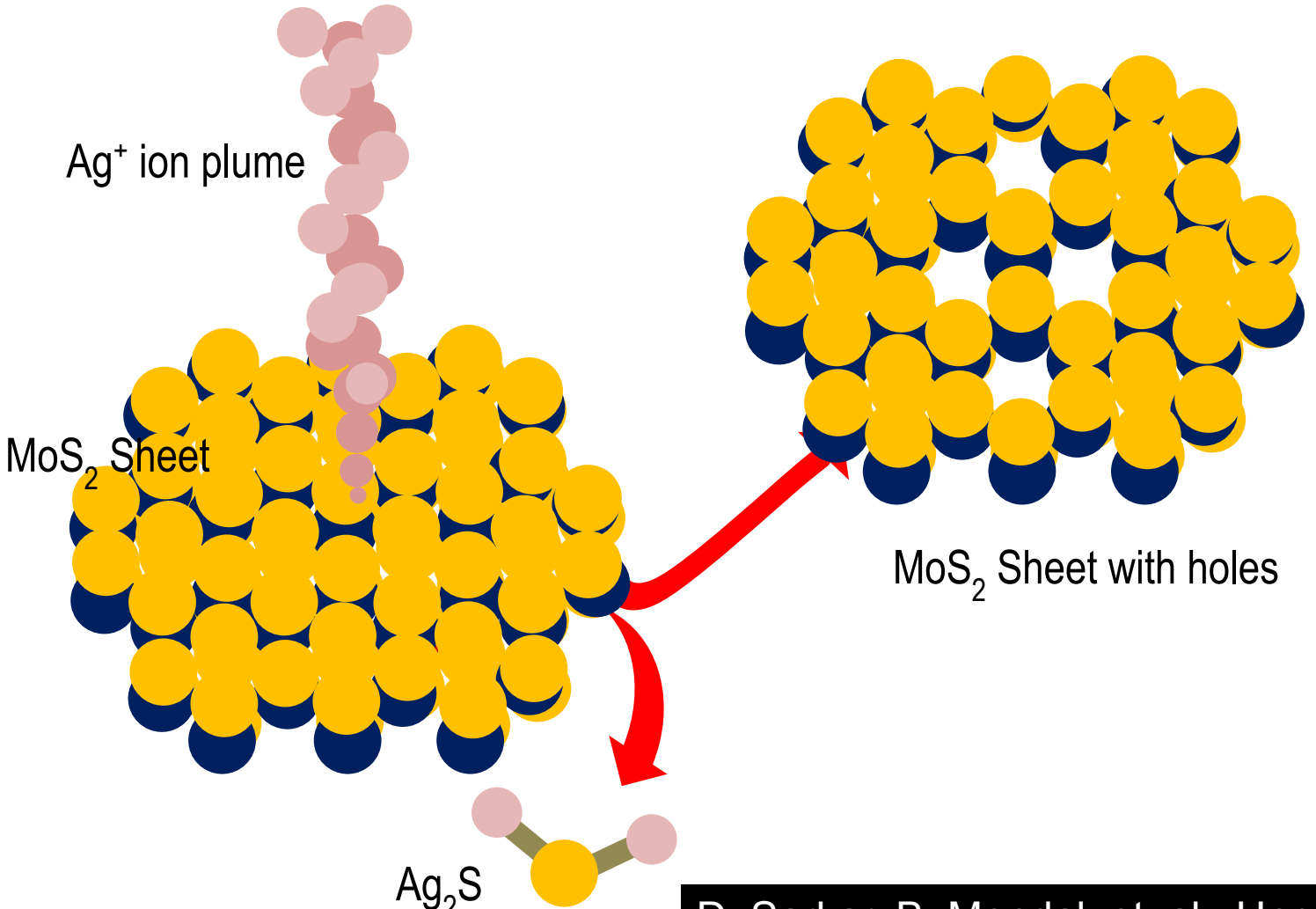


SEM image of Stenocara beetle surface
http://www.nhm.ac.uk/our-science/our-work.html

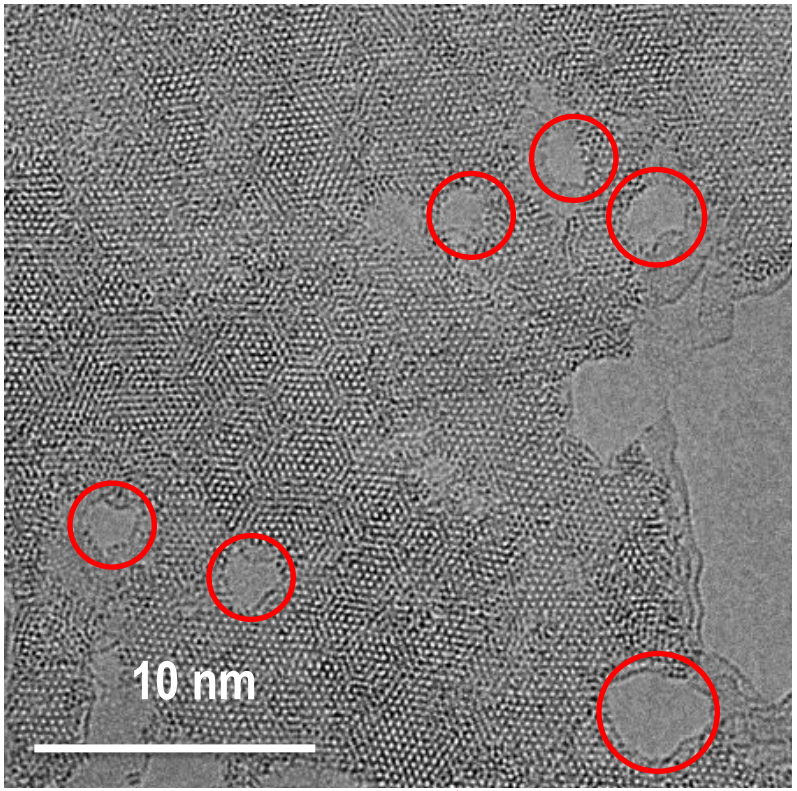
VayuJAL Technologies Pvt. Ltd.

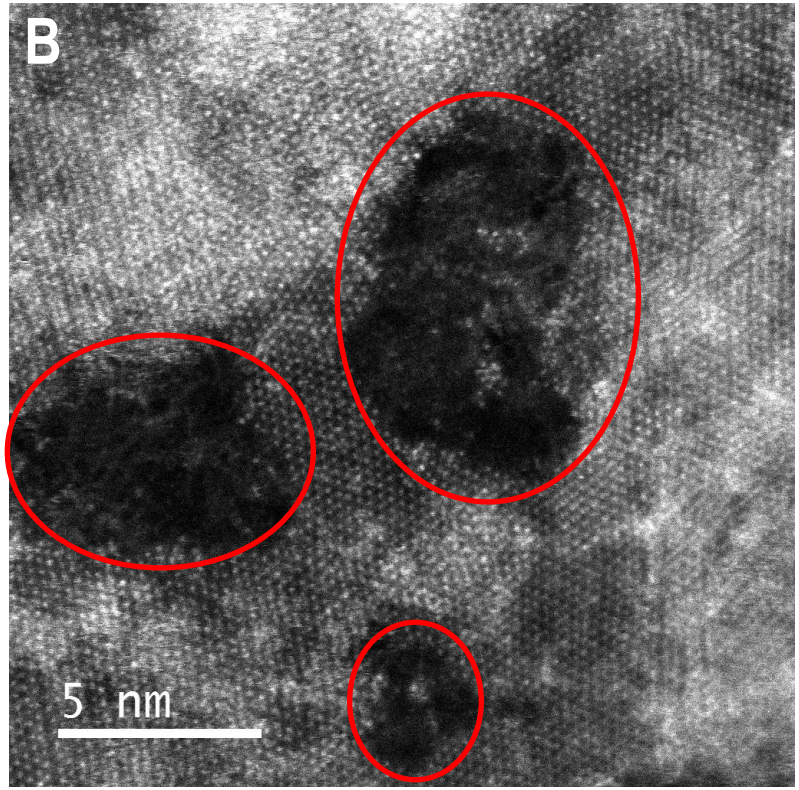
Ankit Nagar and Ramesh Kumar Soni

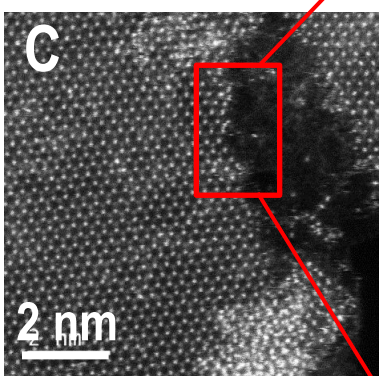
Atomically precise holes

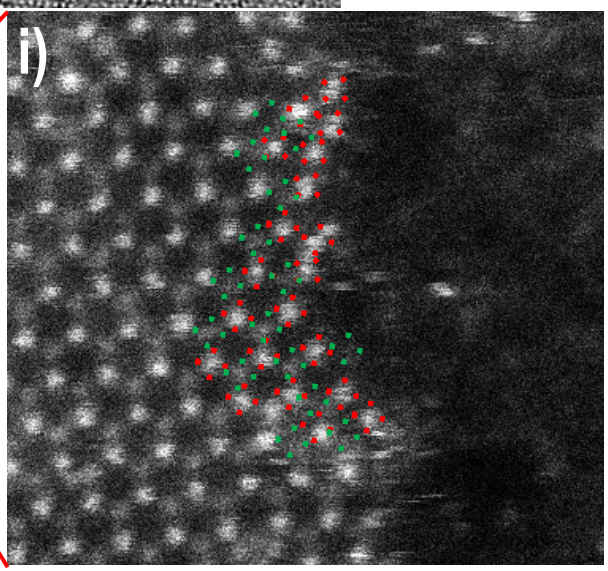


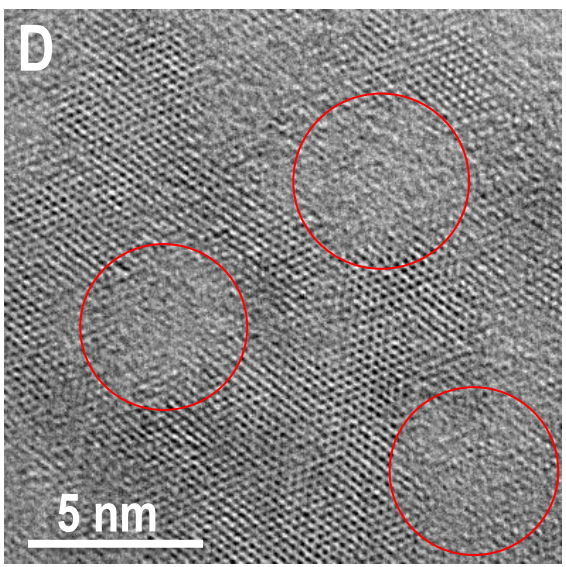
D. Sarkar, B. Mondal, et. al., Unpublished
Patented

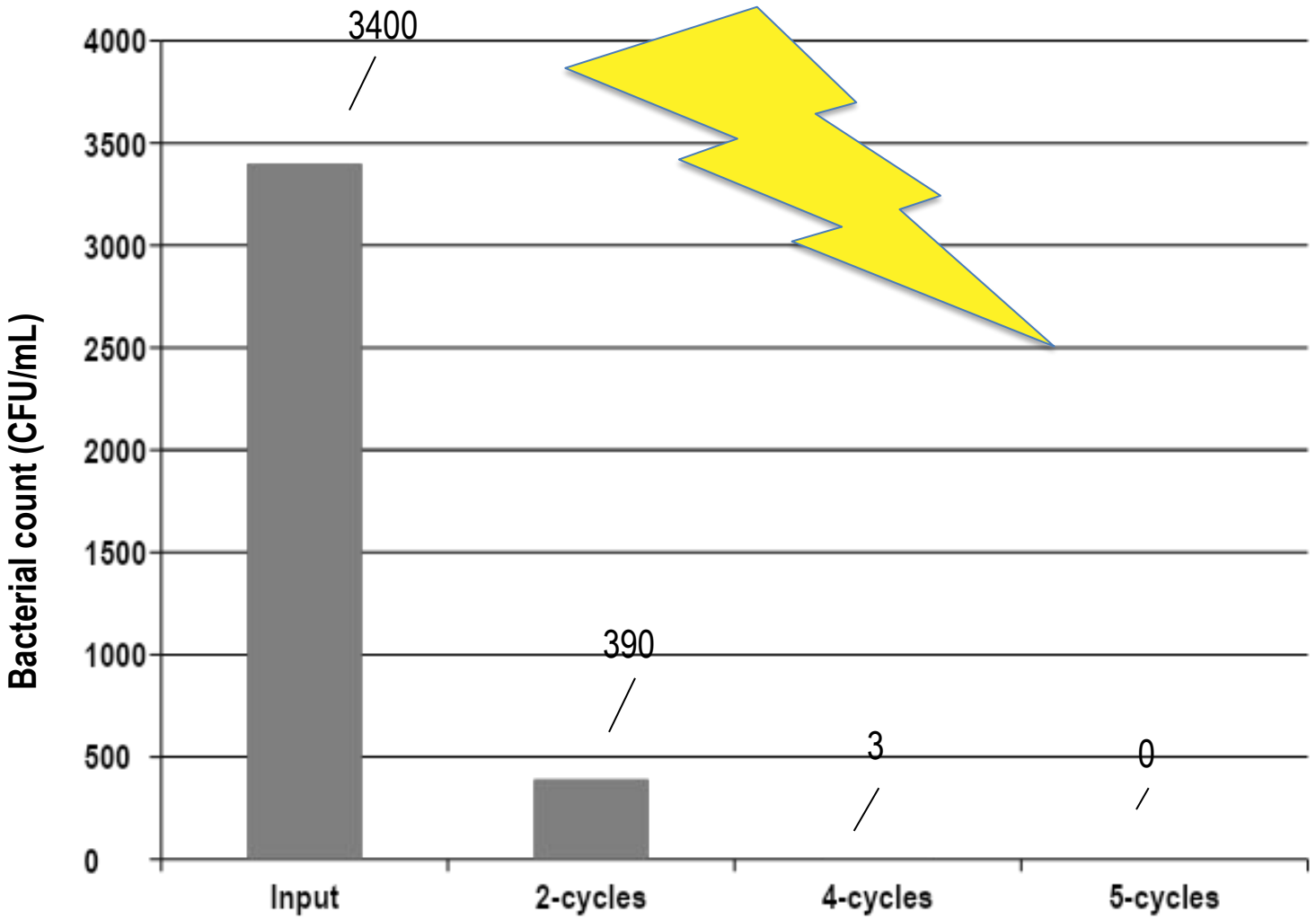

10 nm


B
5 nm


C
2 nm

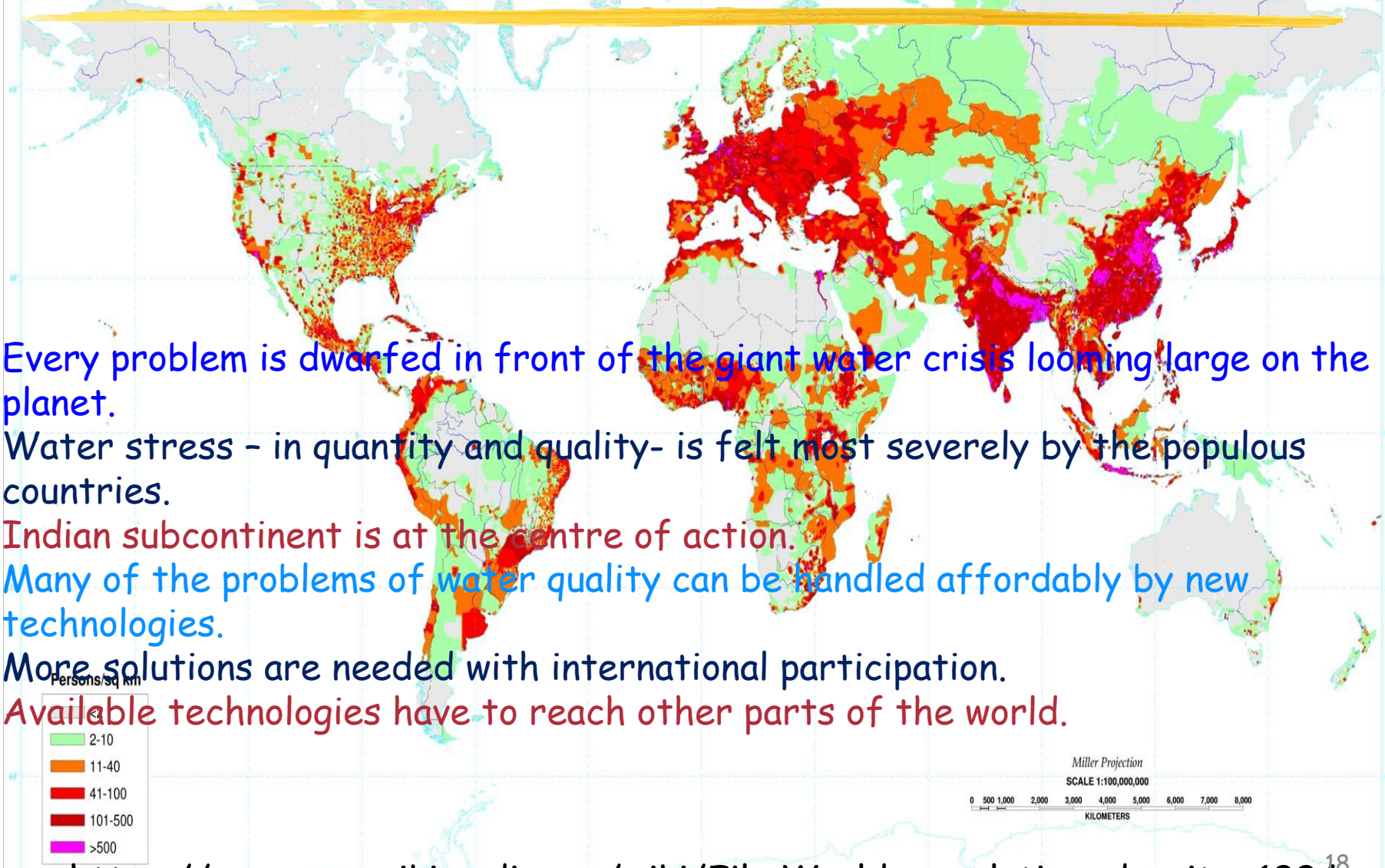

i)


D
5 nm


Bacterial count (CFU/mL)
4000
3500
3000
2500
2000
1500
1000
500
0
3400
390
3
0
Input
2-cycles
4-cycles
5-cycles

International centre for clean water

World population density 1994



Every problem is dwarfed in front of the giant water crisis looming large on the planet.

Water stress – in quantity and quality- is felt most severely by the populous countries.

Indian subcontinent is at the centre of action.

Many of the problems of water quality can be handled affordably by new technologies.

More solutions are needed with international participation.

Available technologies have to reach other parts of the world.

https://commons.wikimedia.org/wiki/File:World_population_density_1994.png


INDIAN INSTITUTE OF TECHNOLOGY MADRAS


iitmadras.

January 2016

My motivations

There is a grand challenge
There is a giant need
The idea communicates to people
I find purpose in life

My capacity

Endurance
Focus
Capacity to build people
Institutional backing

My conclusions

Industry does not need papers, patents and traditional outcomes of research, but products.

Making products makes one humble. Products can be made only by standing on the past and on the giants.

You cannot invent everything in ANY product.

If a private citizen invests one rupee on you, you technology is good.

Have everything in unlimited measure, except money.

My recommendations

Identify the right problem

Iterate the solution in mind, repeatedly

Never miss a chance to visit an industry in the area of your work

Ask critical questions and learn from all

Give a form to the product, place it on the table

Give credits to all

Innovations in academic institutions

Interactive website – A window for problems and solutions
Innovation in entrepreneur education
Sustainability education - principles in products and practices
Technology-social science interface
Common centres for prototyping
National nanofabrication facility for small-scale manufacture
Technical commercialisation funds for social innovation
Biotechnology Industry Research Assistance Council (BIRAC)-Type models in all sectors of innovation
Enabling ESCROW accounts in all social sectors
Showcasing products and entrepreneurs

Innovations in academic institutions

Academic rewards for entrepreneurs
Grand challenge initiative – W-H-A-M-E-EN-ED
National mission on instrumentation
Technology business incubators (TBIs) in all institutions
Legal system
Statutory framework for sharing of ownership, technology, royalties
Valuation of pre-revenue companies
Technology appreciation
Procurement / tender policy to accommodate incubated companies


Where there is clean water, there is hope.