TIFAC : Technology Vision 2035

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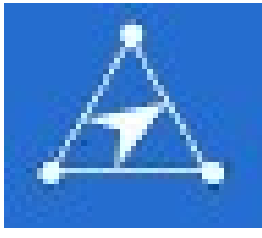
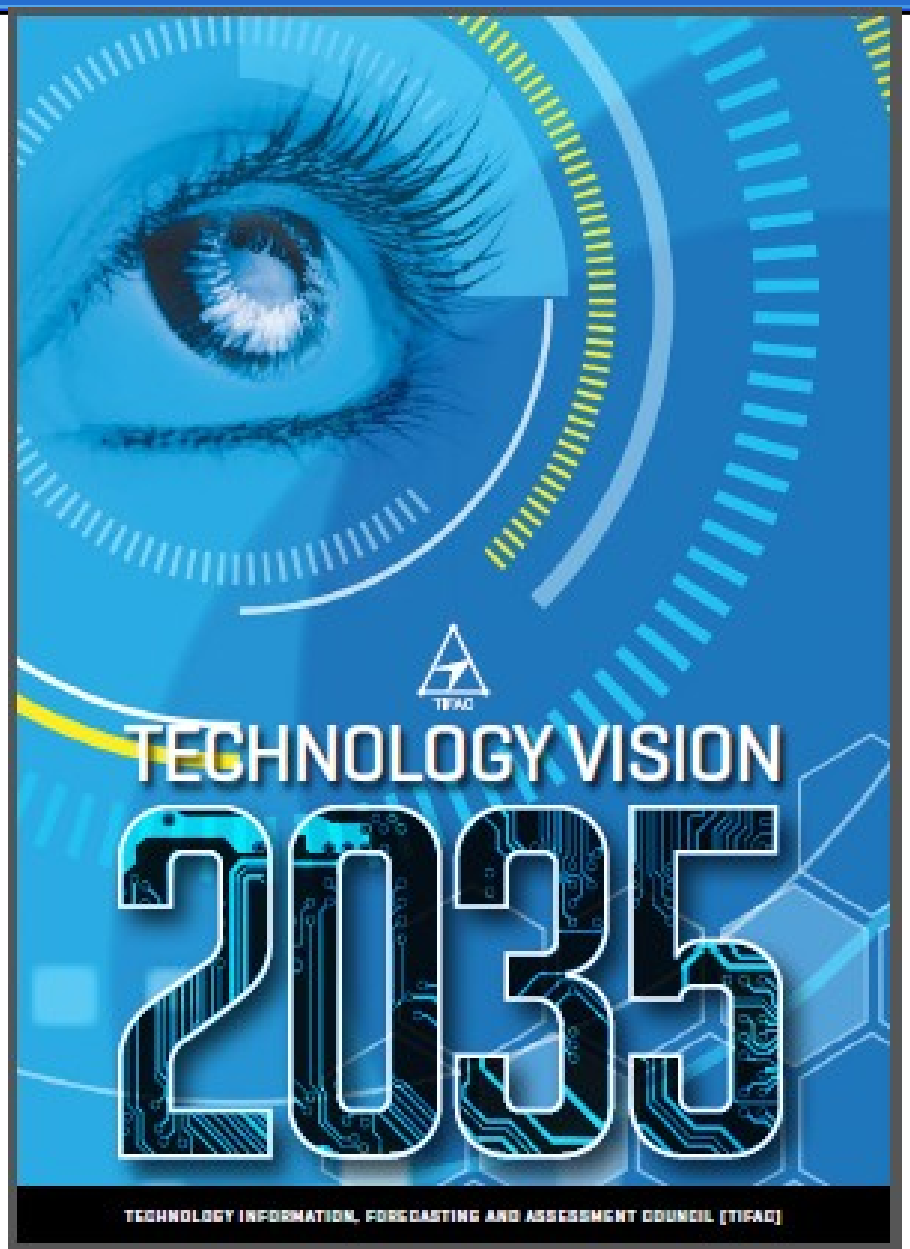
TIFAC

- TIFAC is setup as a Technology Think Tank for country and is an autonomous body of DST, GoI
- It has been in existence since 1988 and was responsible for Technology Vision 2020 under Chairmanship of Dr Kalam in 1996
- Currently TIFAC Governing Council is chaired by Dr Anil Kakodkar

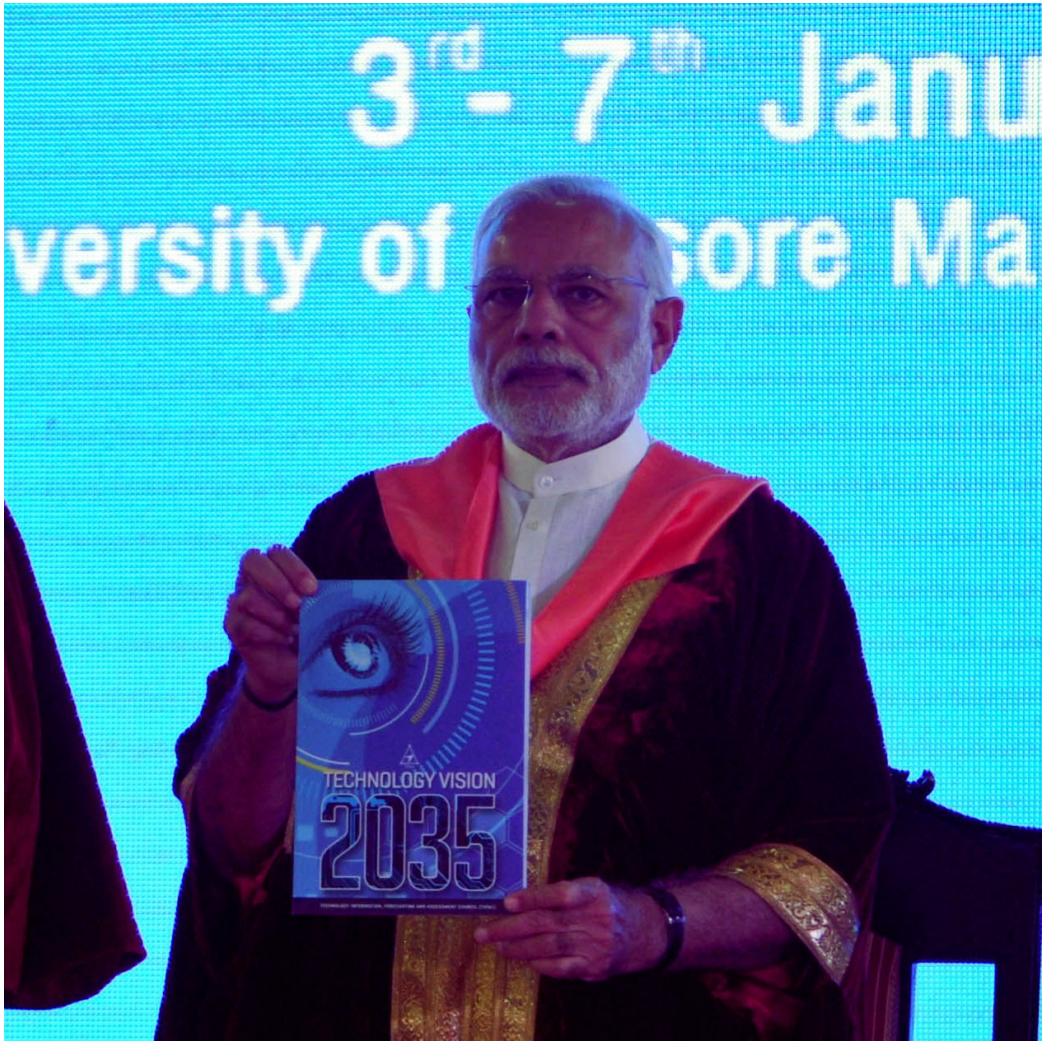


Technology Vision 2035



Technology Vision 2035: Status

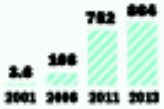
- Technology Vision 2035 Document released by Hon'ble PM on Jan 3, 2016 at Indian Science Congress



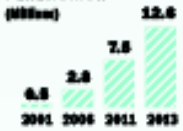
GALLOPING INDIA

TELECOMMUNICATION
India has the second highest telecom subscriber base (2010)

MOBILE USERS (Millions)



INTERNET PENETRATION (Millions)



SPACE TECHNOLOGIES
India has emerged as a significant player in building & launching satellite to both polar and geo-synchronous transfer space orbit

NUCLEAR TECHNOLOGIES
Leads with advanced nuclear technology like FBR.

MISSILE TECHNOLOGIES
Self reliance in missile technology with successful completion of Integrated Guided Missile Development Programme (IGMDP).

LIFE SCIENCES, BIOTECHNOLOGY
Spearheading low cost drug delivery to deprived sections in India and other parts of the world.

CANTERING INDIA

CIVIL AVIATION
Ninth largest civil aviation market in the world, still no indigenous aircraft manufacturing capability.

PASSENGER HANDLING CAPACITY (Million)

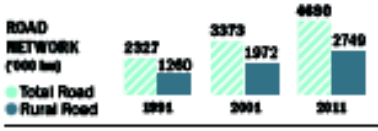
CARGO HANDLING CAPACITY (Million MT)

SERVICES
Contributes to 60% of the country's GDP, but skewed IT enabled services (ITeS) in rural India.

CHEMICAL PROCESS INDUSTRIES
12th largest producer in the world & 3rd largest in Asia in terms of volume, but a net importer of chemicals.

ROAD TRANSPORTATION
Notable progress in road infrastructure, but economic losses due to improper maintenance, poor handling of congestion and increasing accidents

ROAD NETWORK ('000 km)

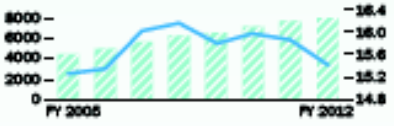


TROTTING INDIA

FOOD & AGRICULTURE
Wastage of one-third of the produce hinders growth, but still manages to contribute 12% of India's exports.

ENGINEERING
Contributes more than 40% of total export, while technology depth in manufacturing with value addition is yet to be accomplished.

Manufacturing- % contribution in GDP



ELECTRONIC & COMMUNICATION
Leader in software export; on the flip side, is also a large importer of critical hardware & general use electronic items.

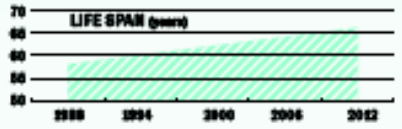
27.4%
Electronics export from India in FY 2007-12

<1%
India's electronic product export share

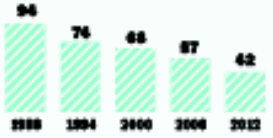
MATERIALS & PROCESSING
Industry rising in sectors like Steel though technology breakthroughs in metals like Titanium, Nickel, Magnesium etc still awaited; De-growth in mining sector prevails

WALKING INDIA

HEALTHCARE
Lack of affordable healthcare systems, inadequate infrastructure and expensive diagnostics



INFANT MORTALITY RATE (deaths per 1000 live births)

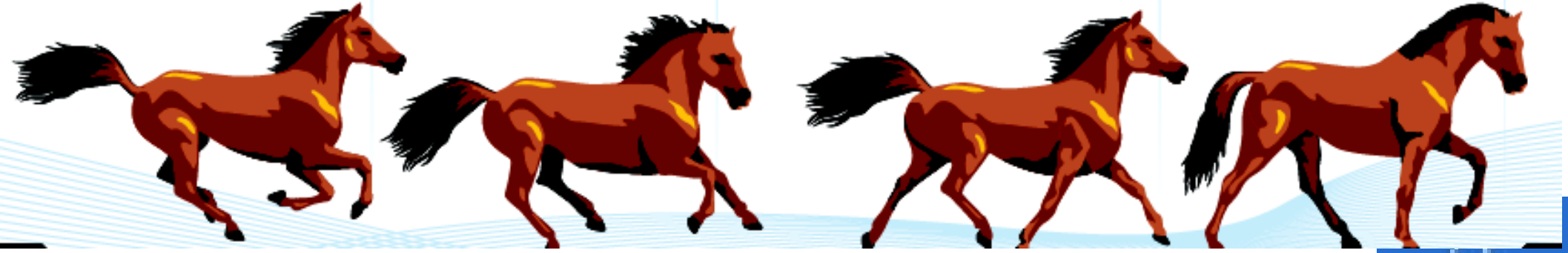


MATERNAL MORTALITY (deaths per 1000 live births)

ADVANCED SENSORS
Low indigenization, banking solely on import.

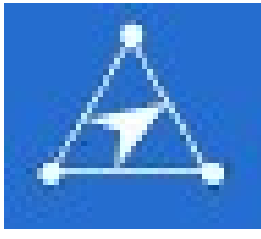
WATERWAYS
Less than 1% share of cargo; short of fairways, terminals, navigation aids and fleets

Figures are for corresponding financial years



TV2020 vs TV2035

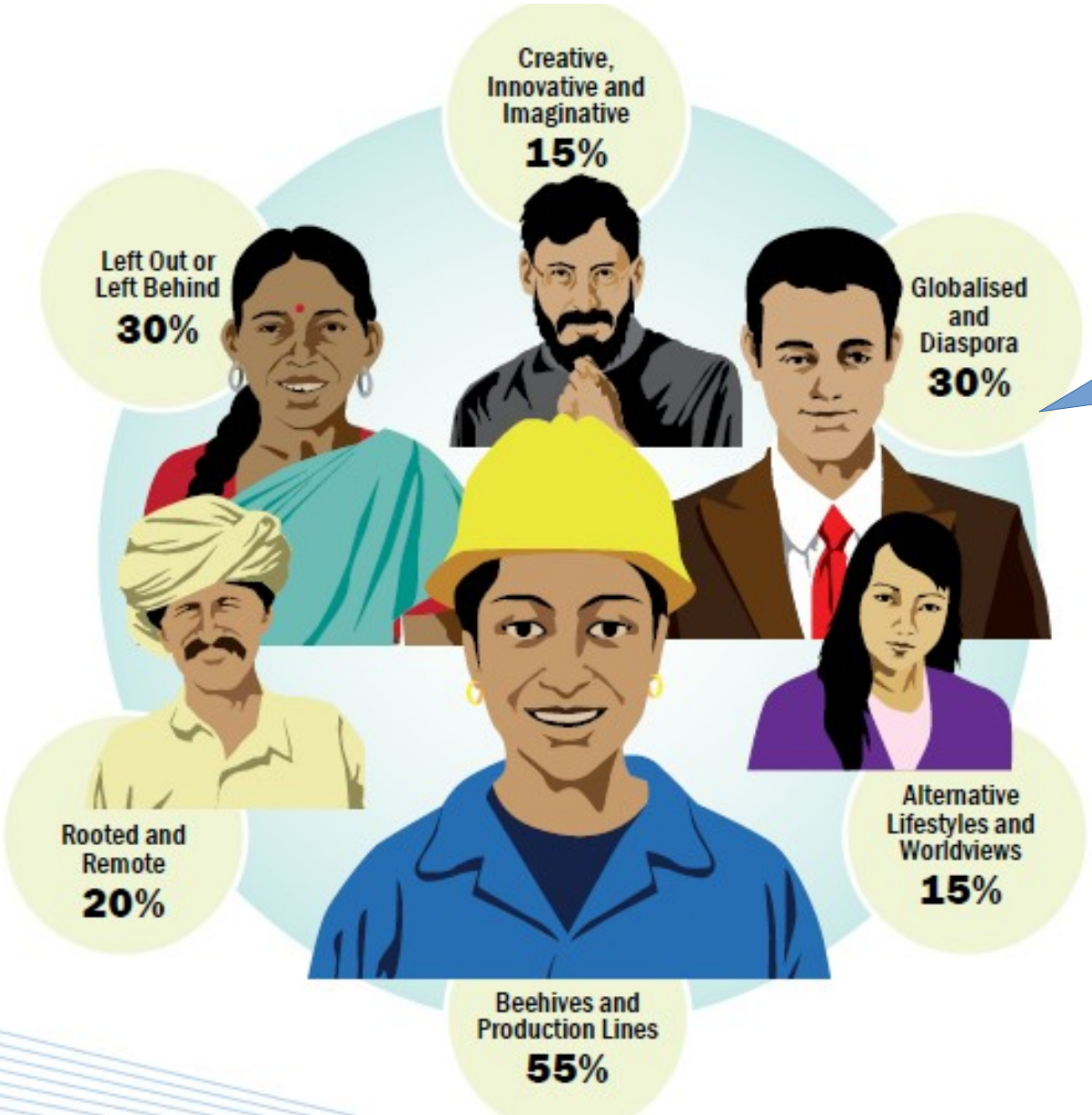
- Technology Vision 2020 focused on developing India as a country
- Technology Vision 2035 focuses on developing quality of life of each Indian!



INDIANS IN 2035: OUR NEEDS

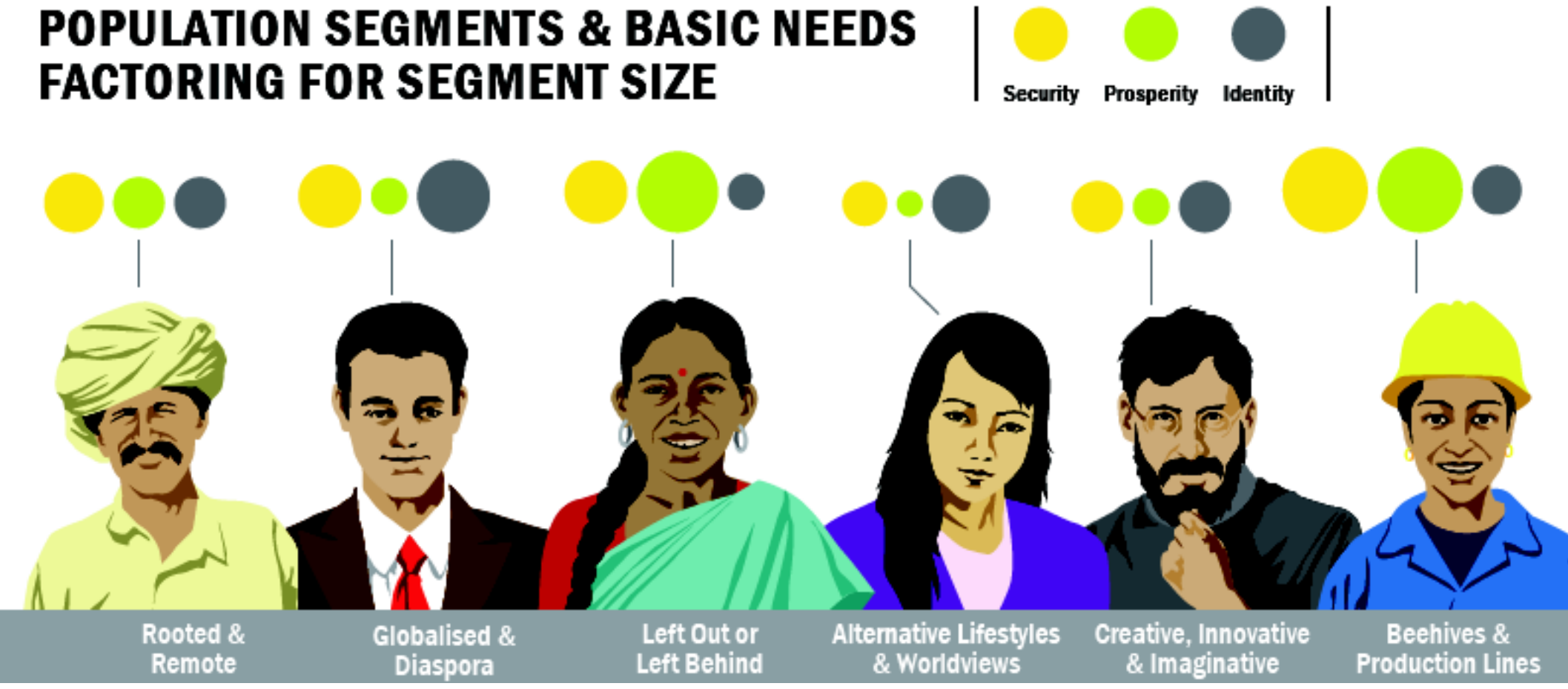
TECHNOLOGY VISION 2035

Indians in 2035: Our needs



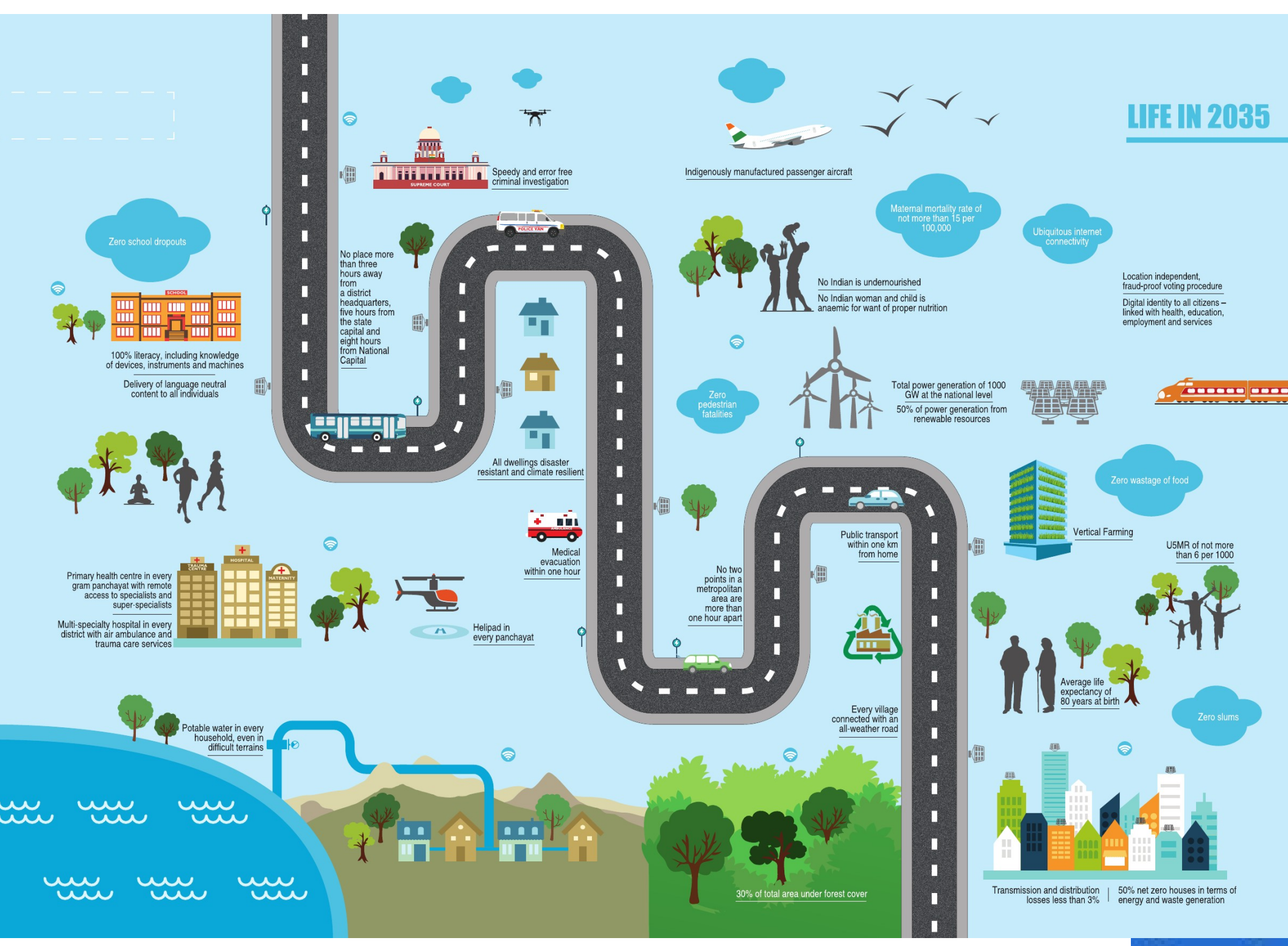
Non Exclusive Population Segment

Indians in 2035



“Technology in the service of India: ensuring the security, enhancing the prosperity and strengthening the identity of every Indian.”

LIFE IN 2035


SUPREME COURT
Speedy and error free criminal investigation
Indigenously manufactured passenger aircraft
Maternal mortality rate of not more than 15 per 100,000
Ubiquitous internet connectivity
Zero school dropouts
SCHOOL
100% literacy, including knowledge of devices, instruments and machines
Delivery of language neutral content to all individuals
POLICE VAN
No place more than three hours away from a district headquarters, five hours from the state capital and eight hours from National Capital
No Indian is undernourished
No Indian woman and child is anaemic for want of proper nutrition
Location independent, fraud-proof voting procedure
Digital identity to all citizens – linked with health, education, employment and services
Zero pedestrian fatalities
Total power generation of 1000 GW at the national level
50% of power generation from renewable resources
All dwellings disaster resistant and climate resilient
Zero wastage of food
Vertical Farming
Public transport within one km from home
Medical evacuation within one hour
Primary health centre in every gram panchayat with remote access to specialists and super-specialists
Multi-specialty hospital in every district with air ambulance and trauma care services
TRAUMA CENTRE
HOSPITAL
MATERNITY
Helipad in every panchayat
No two points in a metropolitan area are more than one hour apart
U5MR of not more than 6 per 1000
Average life expectancy of 80 years at birth
Potable water in every household, even in difficult terrains
Every village connected with an all-weather road
Zero slums
30% of total area under forest cover
Transmission and distribution losses less than 3%
50% net zero houses in terms of energy and waste generation

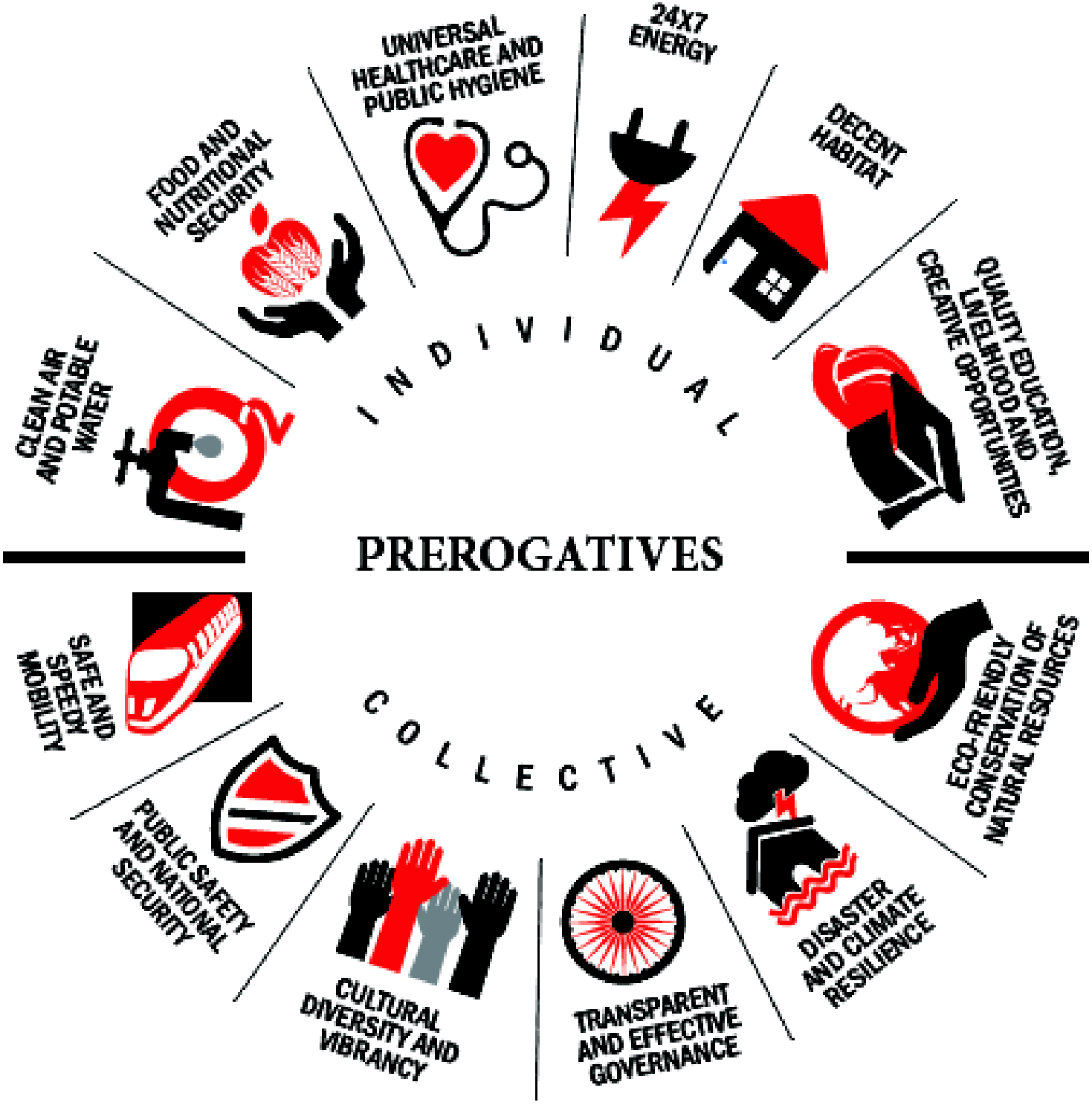
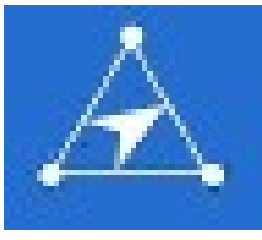

UNIVERSAL HEALTHCARE AND PUBLIC HYGIENE
24X7 ENERGY
DECENT HABITAT
QUALITY EDUCATION, LIVELIHOOD AND CREATIVE OPPORTUNITIES
ECO-FRIENDLY CONSERVATION OF NATURAL RESOURCES
DISASTER AND CLIMATE RESILIENCE
TRANSPARENT AND EFFECTIVE GOVERNANCE
CULTURAL DIVERSITY AND VIBRANCY
PUBLIC SAFETY AND NATIONAL SECURITY
SAFE AND SPEEDY MOBILITY
CLEAN AIR AND POTABLE WATER
FOOD AND NUTRITIONAL SECURITY
INDIVIDUAL
COLLECTIVE
PREROGATIVES

TABLE 1

ADVANCED CLEAN COAL TECHNOLOGIES		●	●	
ALTERNATE FUEL BASED TRANSPORTATION	●	●	●	
NOVEL PROPULSION TECHNOLOGIES		●	●	
GREEN MANUFACTURING	●			
INTELLIGENT TRANSPORTATION SYSTEM	●			
LOW DUST CONSTRUCTION TECHNOLOGIES	●	●		
REAL TIME DENSE SPATIAL AIR QUALITY MONITORING		●	●	
REAL TIME AQUIFER MONITORING INCLUDING SALINITY INGRESS		●	●	
INSTANT PORTABLE WATER QUALITY TESTING	●	●	●	
AFFORDABLE DESALINATION TECHNOLOGY		●	●	
MEMBRANE BASED WASTE WATER TREATMENT	●			
AFFORDABLE DE-SILTING OF WATER BODIES		●	●	
TECHNOLOGY FOR RUN-OFF CONTROL	●	●	●	
SCALABLE POINT-OF-USE WATER TREATMENT TECHNOLOGY		●	●	
DEW HARVESTING		●	●	
IN-SITU WATER PURIFICATION IN PIPELINE			●	
SELF HEALING PIPELINES			●	●

Readily deployable
From Lab to Field
Requiring targeted research
In the imagination

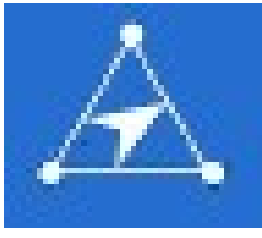


Essential Prerequisites

- Transversal Technologies
  - Materials
  - Manufacturing
  - ICT (Info and Comm Tech)
- Infrastructure
- Fundamental Research

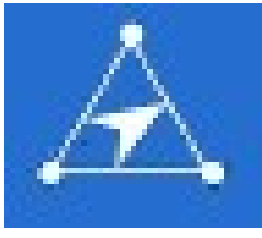
Capabilities and Constraints

- Technology leadership
- Technology independence
- Technology innovation
- Technology adoption
- Technology constraints



10 Grand Challenges

1) Guaranteeing nutritional security and eliminating female and child anaemia
2) Ensuring quantity and quality of water in all rivers and aquatic bodies
3) Securing critical resources commensurate with the size of our country
4) Providing learner centric, language neutral and holistic education to all
5) Understanding national climate patterns and adapting to them



Grand Challenges ...

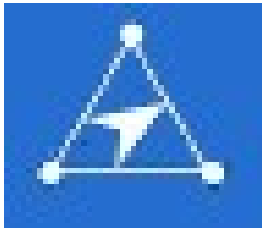
6) Making India non-fossil fuel based

7) Taking the railway to Leh and Tawang

8) Ensuring location and ability independent electoral and financial empowerment

9) Developing commercially viable decentralised and distributed energy for all

10) Ensuring universal eco-friendly waste management



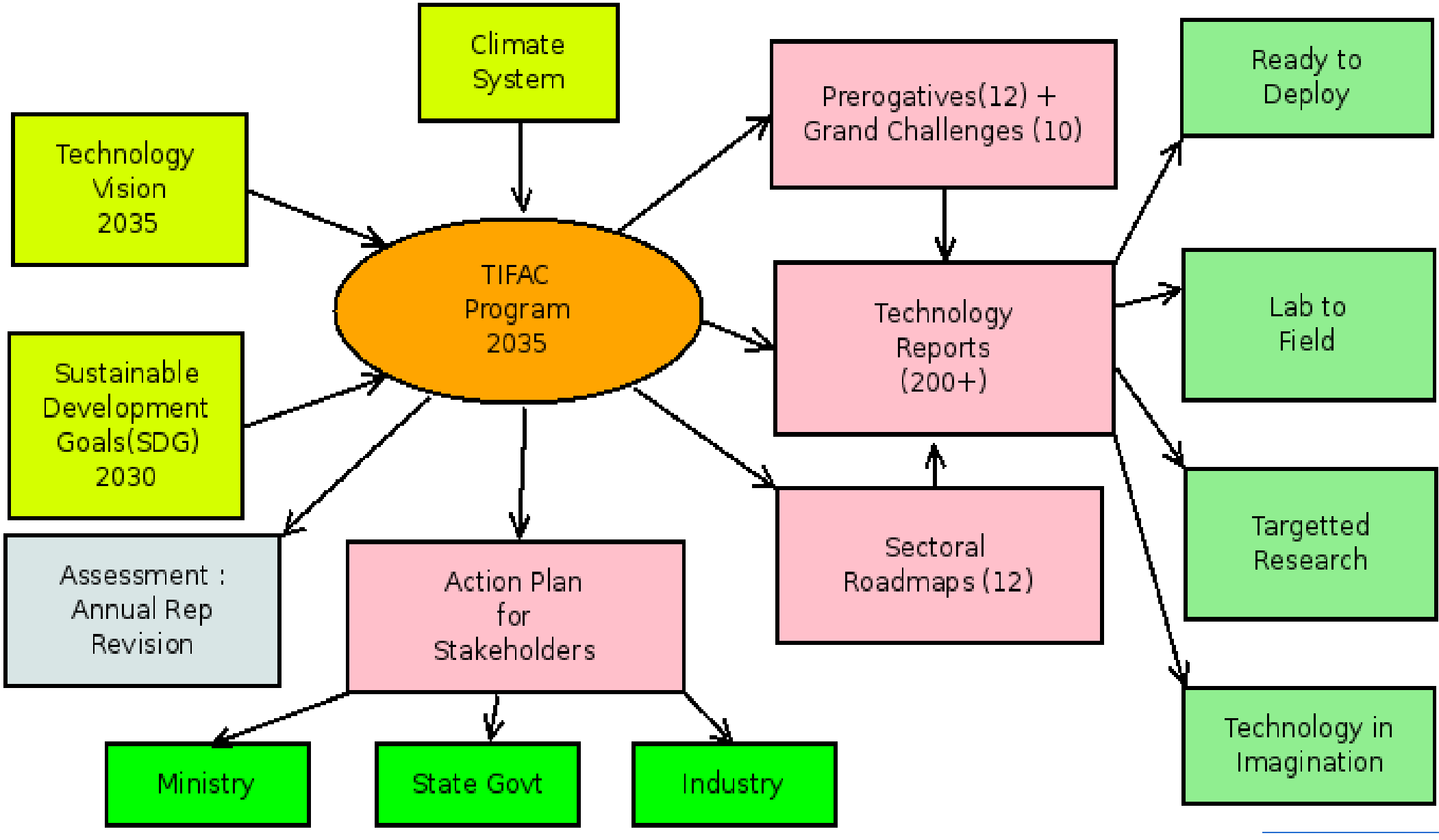
Technology Roadmaps

- Education
- Medical Sciences & Health Care
- Food and Agriculture
- Water
- Energy
- Environment
- Habitat
- Transportation
- Infrastructure
- Materials
- Manufacturing
- Information & Communication Technology

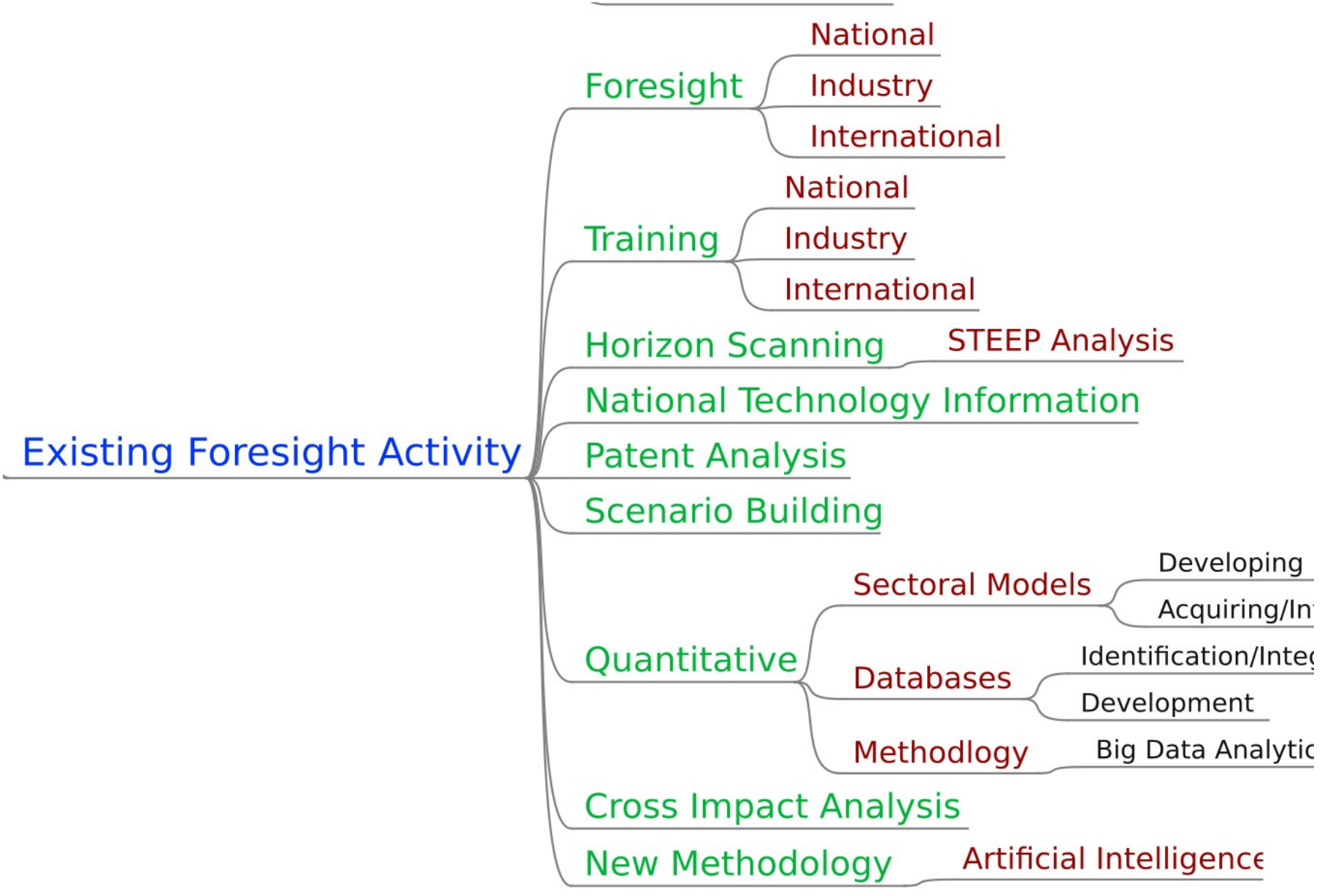
Road ahead ...

- Experience after Technology Vision 2020
- Build network with S&T organizations, Ministries/Depts, State Govts, Industry, Academia ..

TV2035 follow up

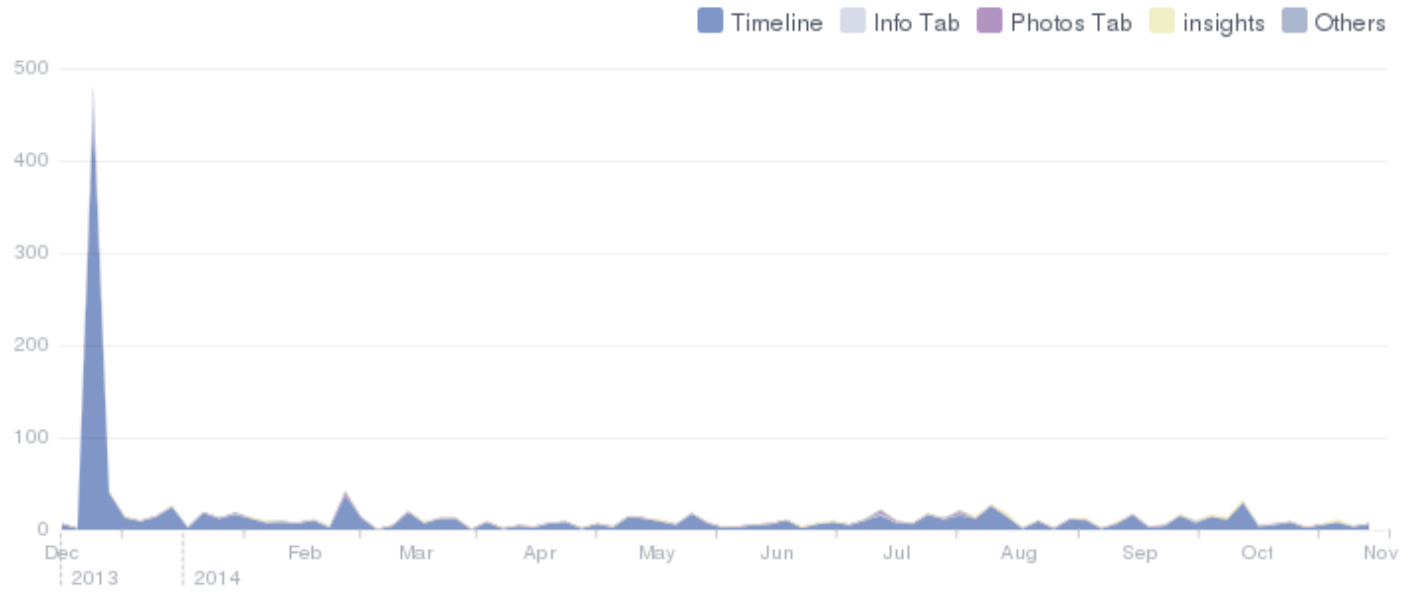


Enhancing Existing Activities



Connecting to young – Social Media

★★★★½
1,057 likes
25 visits



BENCHMARK
Compare your average performance over time.

Timeline
Info Tab
Photos Tab
insights
Others

Twitter Link

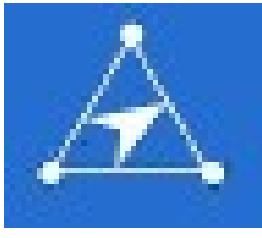
Prabhat Ranjan @Prof_P_Ranjan · 24h
An African solar plant could power UK homes by 2018 fb.me/3gxzql6ga

Prabhat Ranjan @Prof_P_Ranjan · 24h
AeroMobil 3.0 transforms from car to flying car fb.me/3kpn8e5iF

View summary

Prabhat Ranjan @Prof_P_Ranjan · 24h
Scientists have invented a brain decoder that could read your inner thoughts fb.me/1xGXGdsYd

Prabhat Ranjan @Prof_P_Ranjan · 24h
A quantum leap in nanoparticle efficiency fb.me/2TKSUbN06



Newsletter : TIFAC*i*Tech


TECHNOLOGY THINK TANK

TIFACiTE

TECHNOLOGY INFORMATION, FORECASTING AND ASS

FROM ED'S DESK

GUAR AT VANGUARD OF INDIA

GEARING UP

As this edition of TIFACiTECH goes to your hands, we cannot ignore the roaring success of India's first Mars Mission, which has brought science, back to focus among young minds. From my own experience, I know how hard it is on scientists involved in such projects, who give their lifetime and may not see any successes. So it is extremely gratifying to remind ourselves that India became the first country to be successful in the very first attempt, in a venture where failures outnumbered successes.

Moving on to TIFAC, green theme of this edition shows the cover story's link with agriculture. TIFAC got associated with the Guar Gum sector with not much experience. However it quickly geared itself up, noting the great significance of this sector not only to exports but millions of lives associated. We have been able to put together a report with the help of all stakeholders and expect that soon it would result in a string of actions to galvanize this sector.

At the end, I cannot stop to mention that TIFAC is all set to launch the first document of Technology Vision 2035 soon and we hope it would bring excitement among the minds of our citizens.

— Dr. Prabhat Ranjan

Micro, Small and Medium Enterprises (MSMEs) are the growth engines of Indian economy. A large chunk of MSMEs being based in rural areas, their sustenance is critical for the inclusive growth of our nation. However, the sector is so small in its resource base that it is hardly able to invest into R&D and updating of technologies and machineries used for manufacturing or even acquiring new technologies.

The plummeting performance of the export oriented MSME sectors prompted Government of India during 2012-13 to constitute an Inter

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TECHNOLOGY THINK TANK

TIFACiTEC

TECHNOLOGY INFORMATION, FORECASTING AND ASSESSM

FROM ED'S DESK

MIND AND MACHINE

EMBRA

OR BA

As technology advances, it has not left unreached the most important part of the human existence— brain. Brain and mind have dominated the deliberations on human thought process for thousands of years, especially in India. However, the computers have now started to match the capability of the brain, making discussion on "man between mind and machine" topical. Obviously, no other topic would have been befitting than this for the 26th Foundation Day of TIFAC. Some views of eminent experts on this issue are being shared in this edition.

TIFAC will be organizing an international conference on disaster risk reduction, later this year. It is aimed to develop a comprehensive roadmap for mitigating impact of earthquake, flood and other natural hazards.

— Dr Prabhat Ranjan

Brain has always intrigued us since time immemorial. Any world seems to be a defining phase for the h understanding of the brain is concerned. This is the building of the brain, which was hitherto confined t has come out in the hands of enthusiastic amateur in electronic, sensor and communication systems, economic now available, sparking up opportunities among other things with severe disability. This breakthrough has spawned ra involving brainwaves, to the extent that Hackathons are being p probe the mind but also influence it! The curiosity in brain ha worldwide in recent times and it is no surprise that many co mega projects to solve the mystery of the brain, though a to the recent level escalating the European Human Brain Pr billionaires of the US being the most prominent.

In addition to the ability to probe the brain, there has been discovery of being able to modify the brain/mind. Foremost a standing of Neuro-plasticity which has replaced the formerly brain is a physiologically static organ. In Indian tradition, this thousands of years. The Buddhist tradition has been especially focusing on the proper development of the mind. Brainwave children with learning disability as well as adults with various now a reality and success stories are being reported from all ac

Can anyone think about the rationale behind the Indian sy

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TECHNOLOGY THINK TANK

VOL 2 n ISSUE 2 n MAY 2015

TIFACiTECH

TECHNOLOGY INFORMATION, FORECASTING AND ASSESSMENT COUNCIL

FROM ED'S DESK

My involvement with assistive technology to help persons with severe disability started through a student project to help a girl with cerebral palsy 7-8 years back. It got intensified as our developments started to bring smiles to many faces. We quickly realized that information gap needs to be bridged to let the benefit of technology reach larger number of users. As I moved to TIFAC, we started to address this aspect and in collaboration with Department of Empowerment of Persons with Disabilities, a web portal "swavlamban.info" was launched by Hon'ble President of India on December 3, 2014.

We carry forward this task and focus in this newsletter on how technology today and tomorrow is likely to overcome disabilities.

—Dr. Prabhat Ranjan

Speaking about the persons with disabilities (PwDs), one can tinker with a famous Shakespearean quote and say, "Some are born with disability, some acquire disability and some have disability thrust upon them". This has been a tenable reality for the human beings all through, alongside the fact that even the able-bodied too need assistance or support at one point of time or the other. The disabled have always been among us, but not always with us, at times marginalized and even bereft of human rights. Yet, there has always been an unabated quest to develop assistive technologies to alleviate the hardships faced and help them lead a normal life; thanks to spirited individuals and organizations championing the cause for PwDs.

As assistive devices evolve from glasses to tunable lenses, from walkers to exoskeleton and from crutches to cybernetic limbs, technology is fast surmounting the biological impairments. The world-view too seems to be changing as put aptly by Hugh Herr, the bionics designer at the MIT Media Lab and pioneering a new class of biohybrid smart prostheses and exoskeletons, "A person can never be broken. Our built environment, our technologies are broken and disabled. We the people need not accept our limitations, but can transcend disability through technological innovation".

Technology by itself is assistive, aiding humans and empowering societies not just disabled but the abled too. With advancements in manufacturing, novel materials, communication, sensors *etc.* the need for customization of devices for the needy is being addressed quickly and reliably. The convergence of or interplay between nano, bio, info

DISABLING DISABILITY

TIFAC NEWSLETTER MAY 2015

Thanks!

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Facebook :
facebook.com/
tifac.dst.india

My Journey to Brain

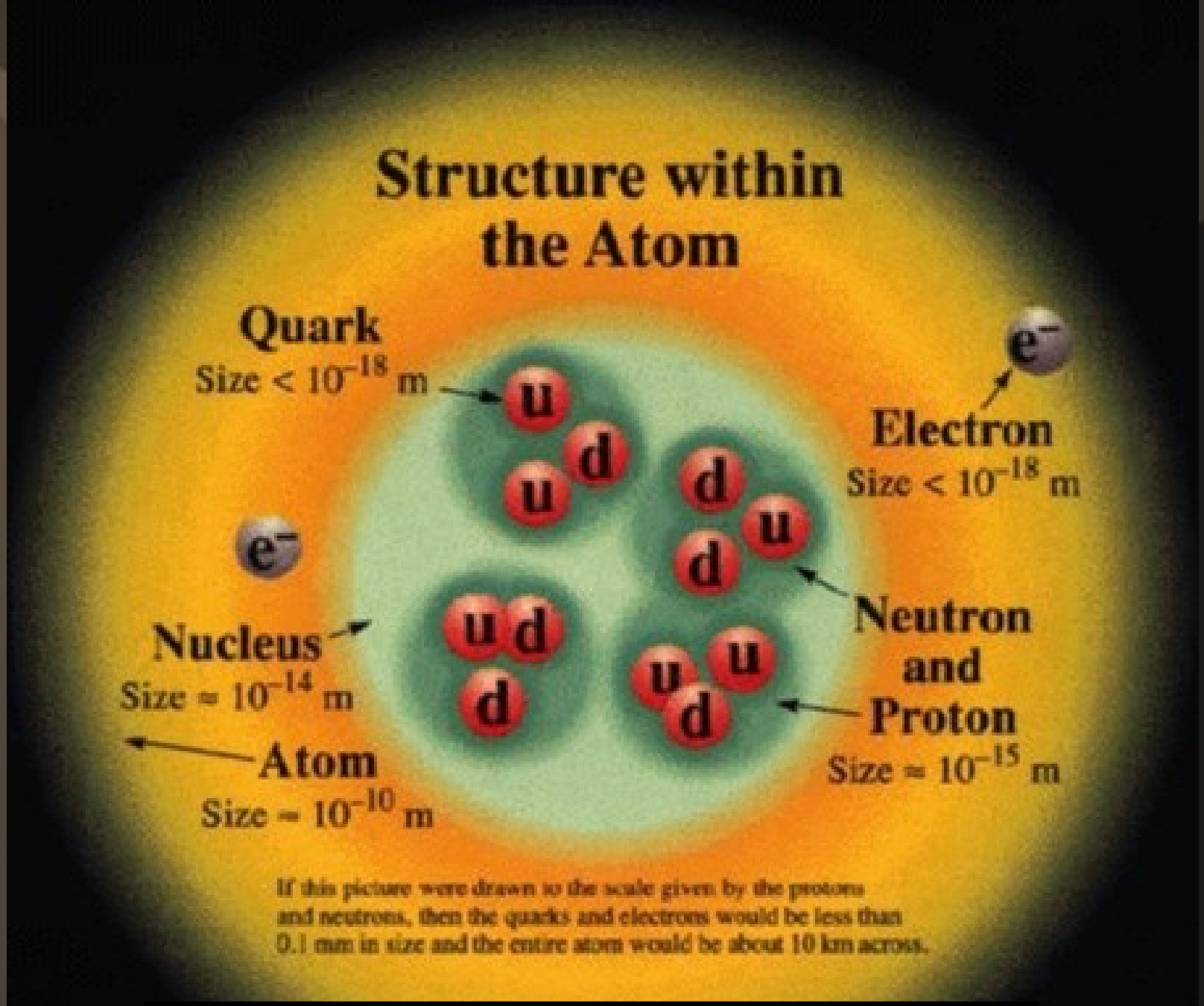
Prof Prabhat Ranjan

(prof.prabhat.ranjan@gmail.com)

Technology Information Forecasting and Assessment Council(TIFAC), Delhi

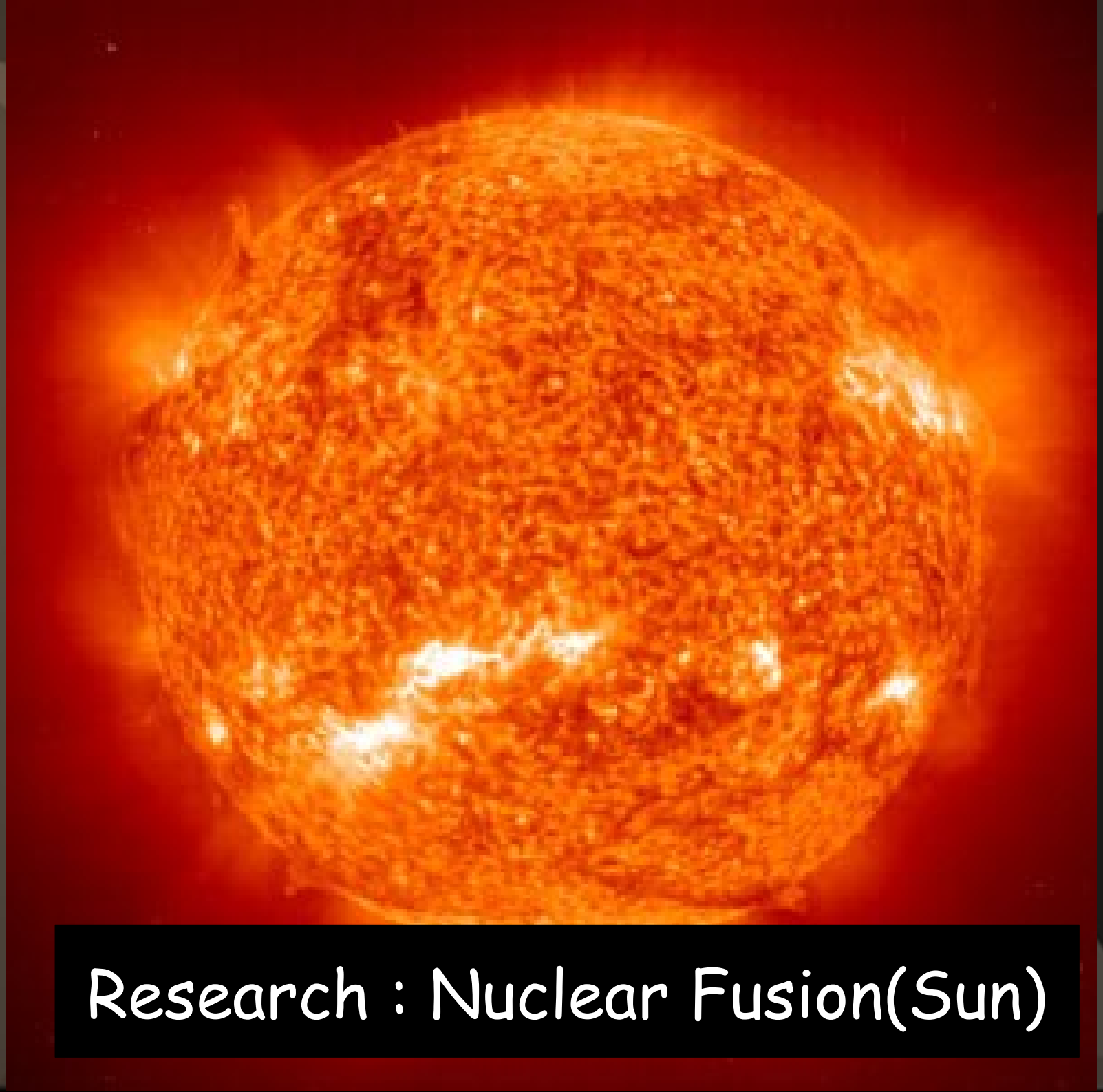
An Autonomous body of

Dept of Science and Technology, Govt of India

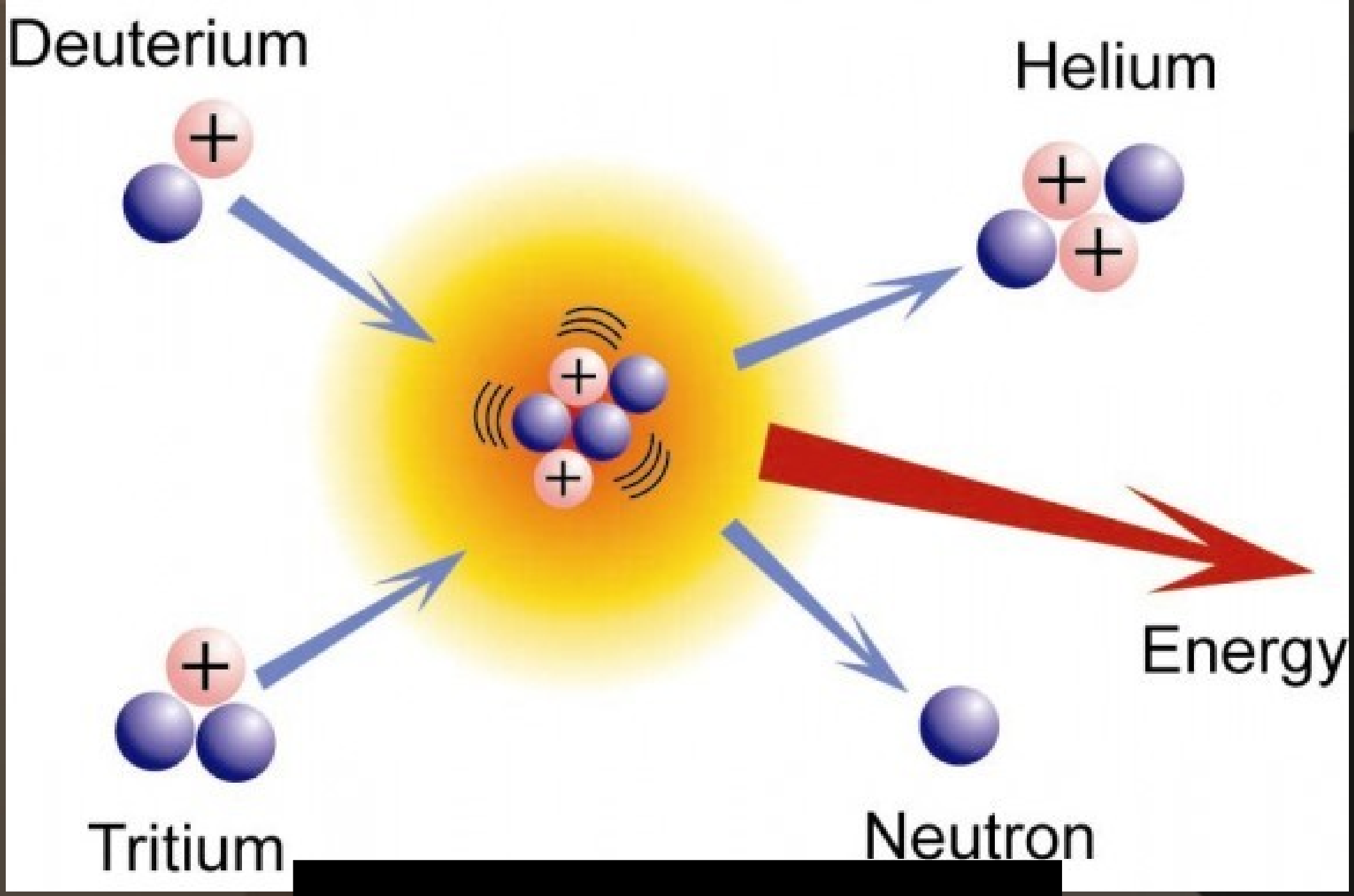


School : Particle Physics

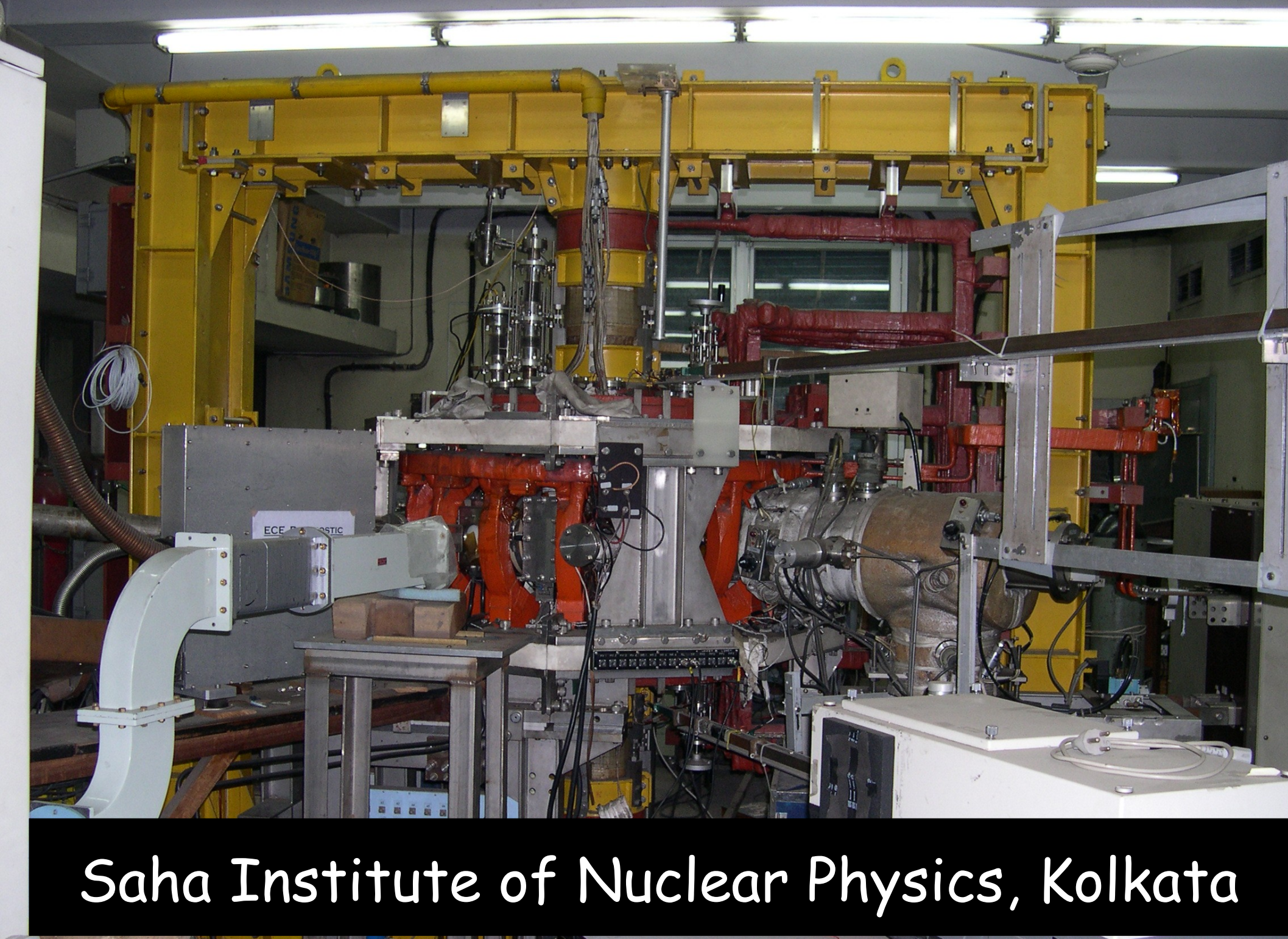

College : Universe



Research : Nuclear Fusion(Sun)



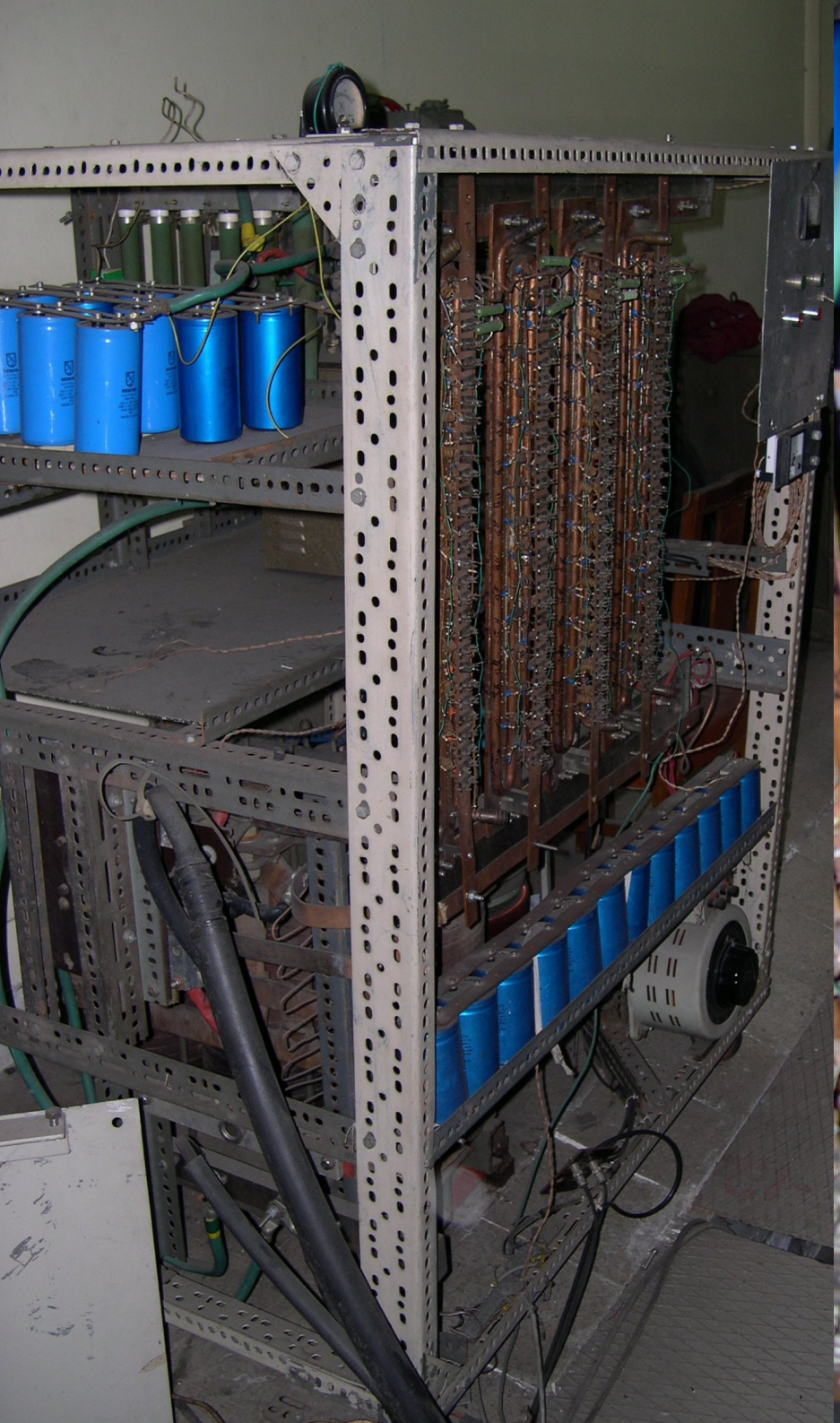
Nuclear Fusion

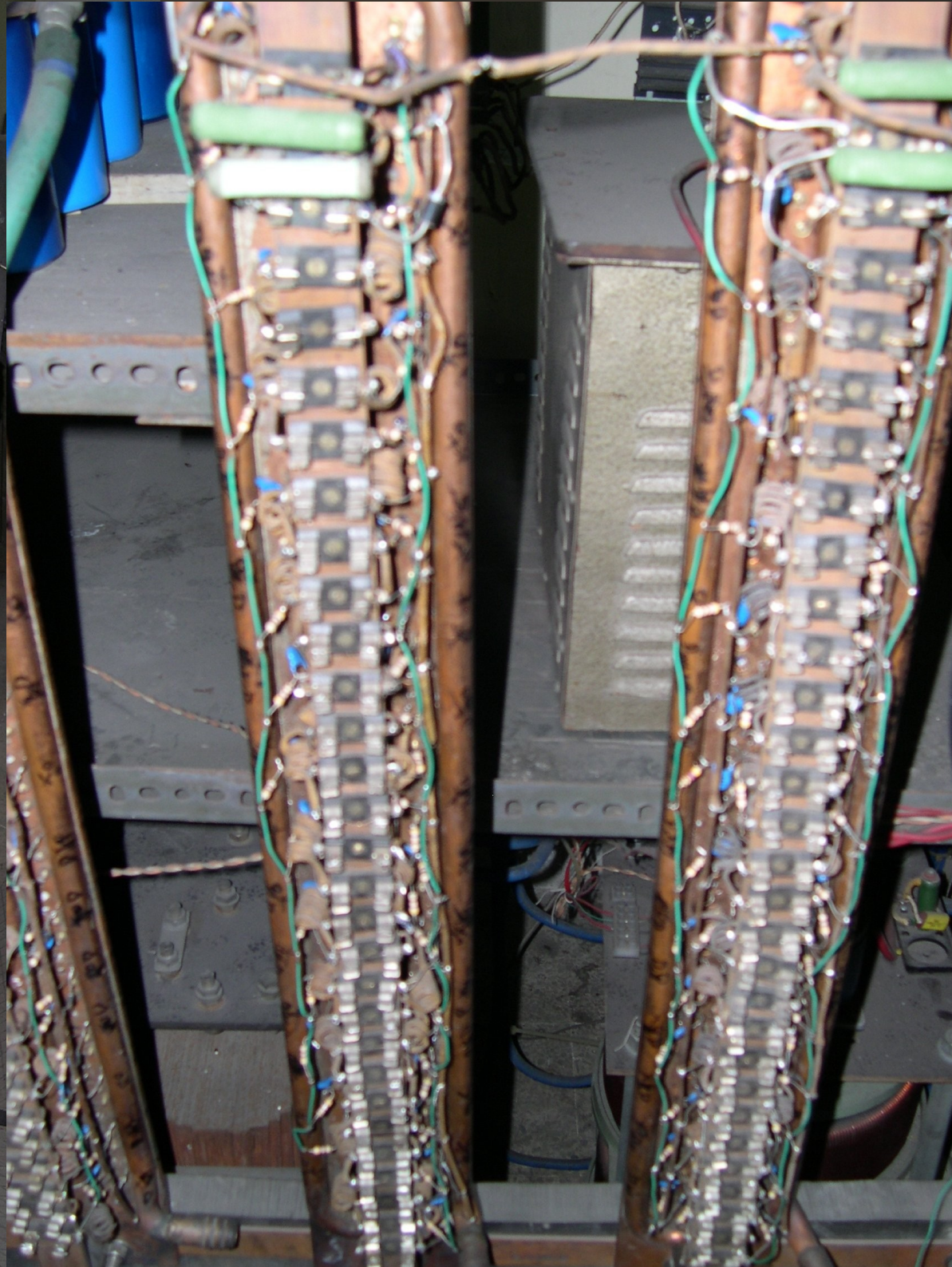


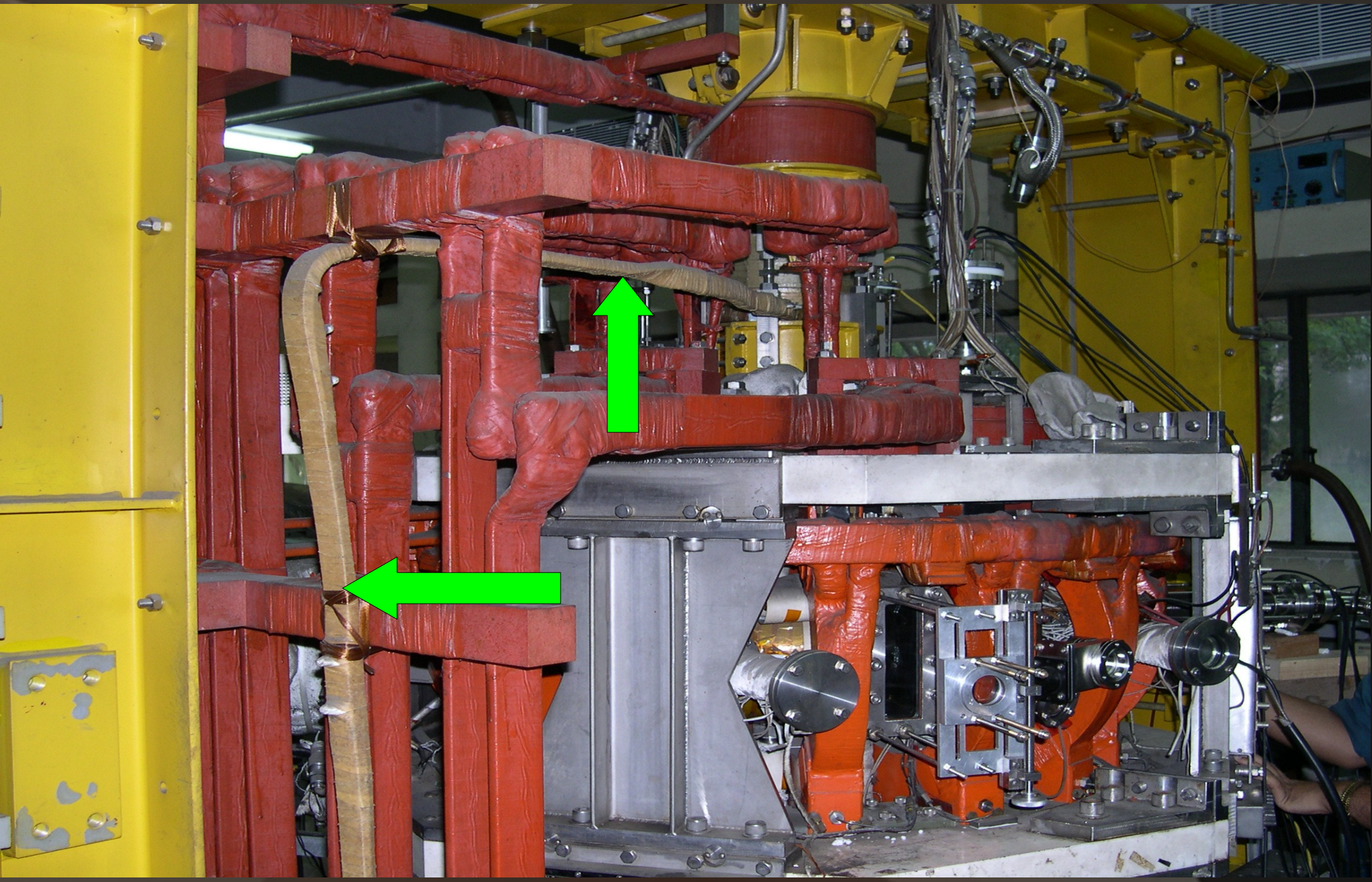
Saha Institute of Nuclear Physics, Kolkata

Audio frequency discharge cleaning system

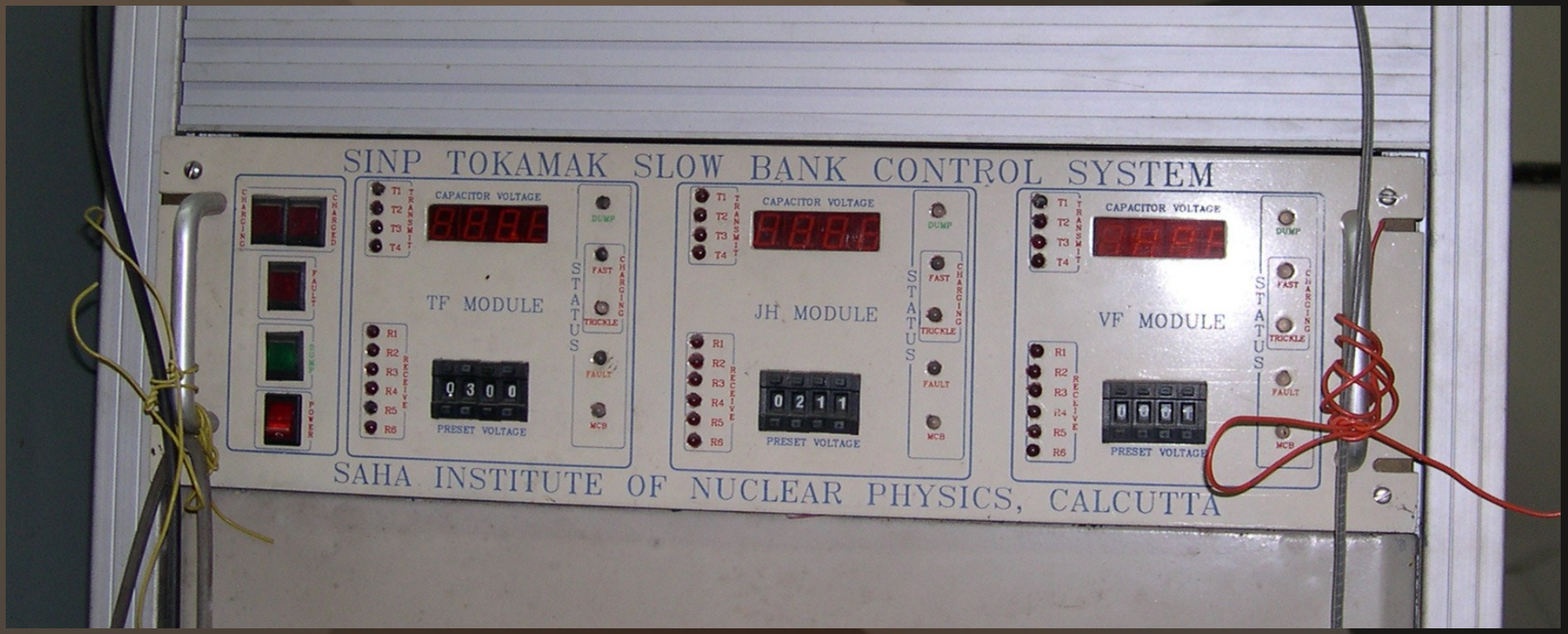
- Modeling
  - Sophisticated Tokamak Code BALDUR
  - Zero-dim code
- High impurity in plasma
- To avoid delay in developing cleaning system
  - System based on local components
  - Single turn primary, Transistor based
- Review of Sci Instr







Slow bank system – long duration plasma



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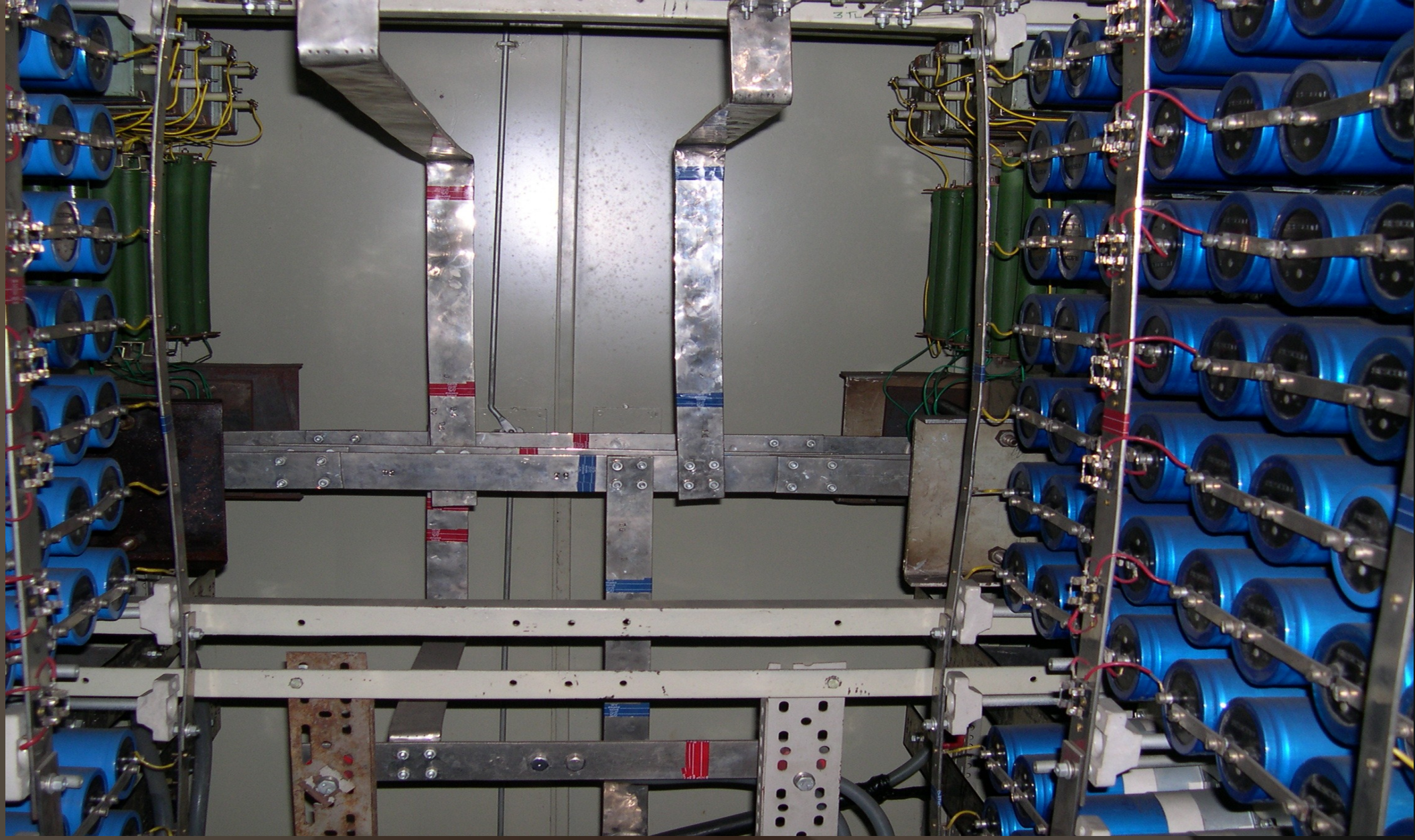

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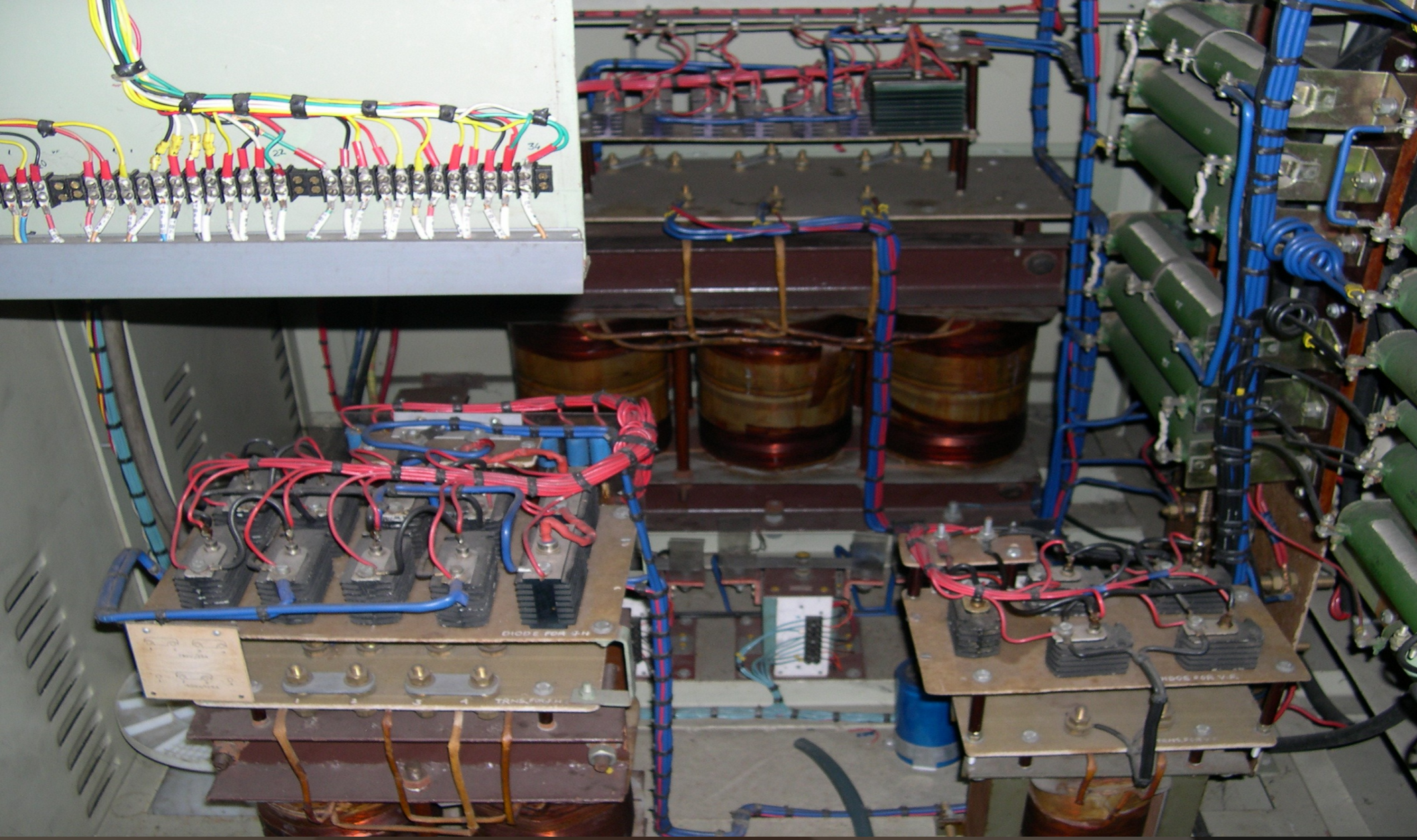

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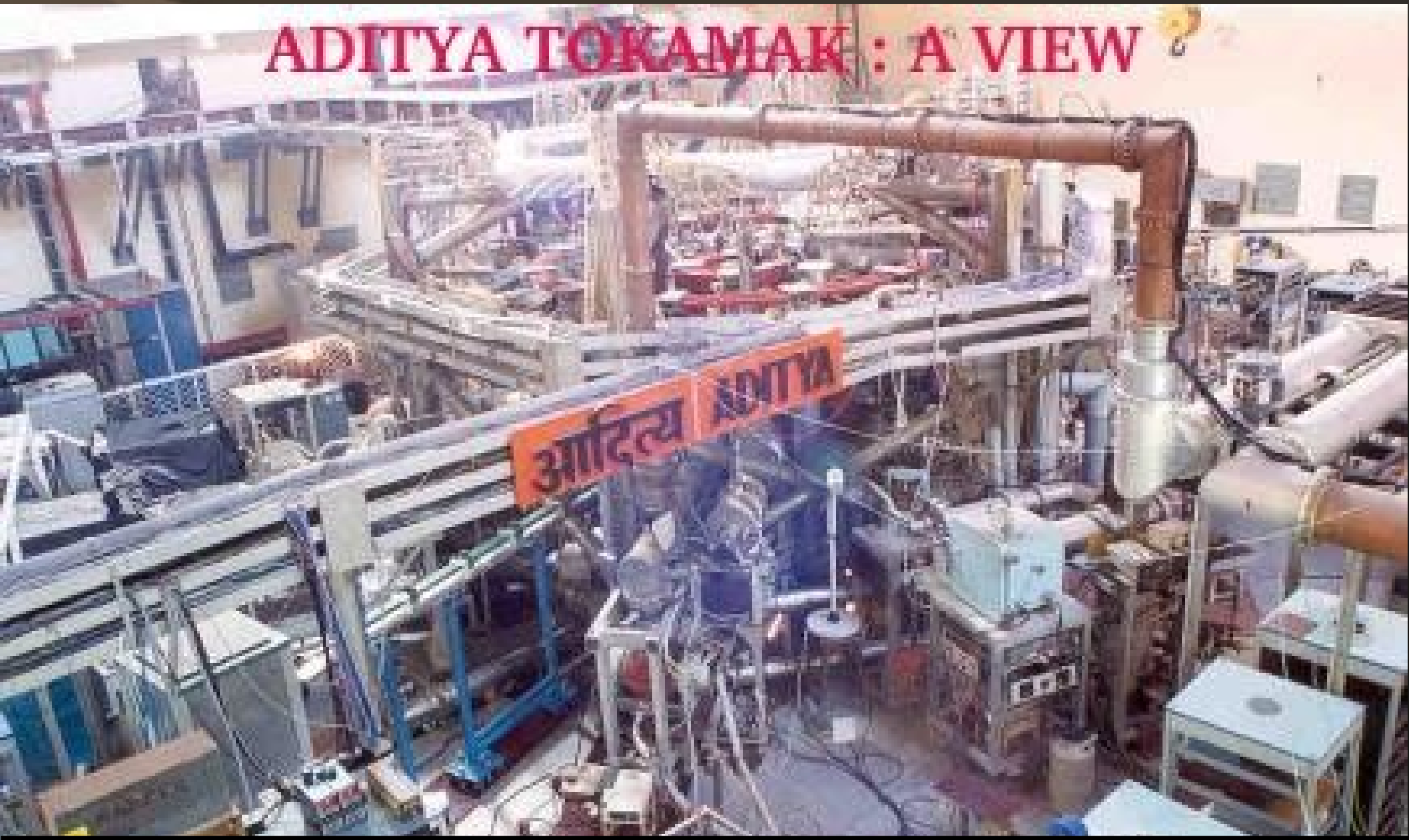
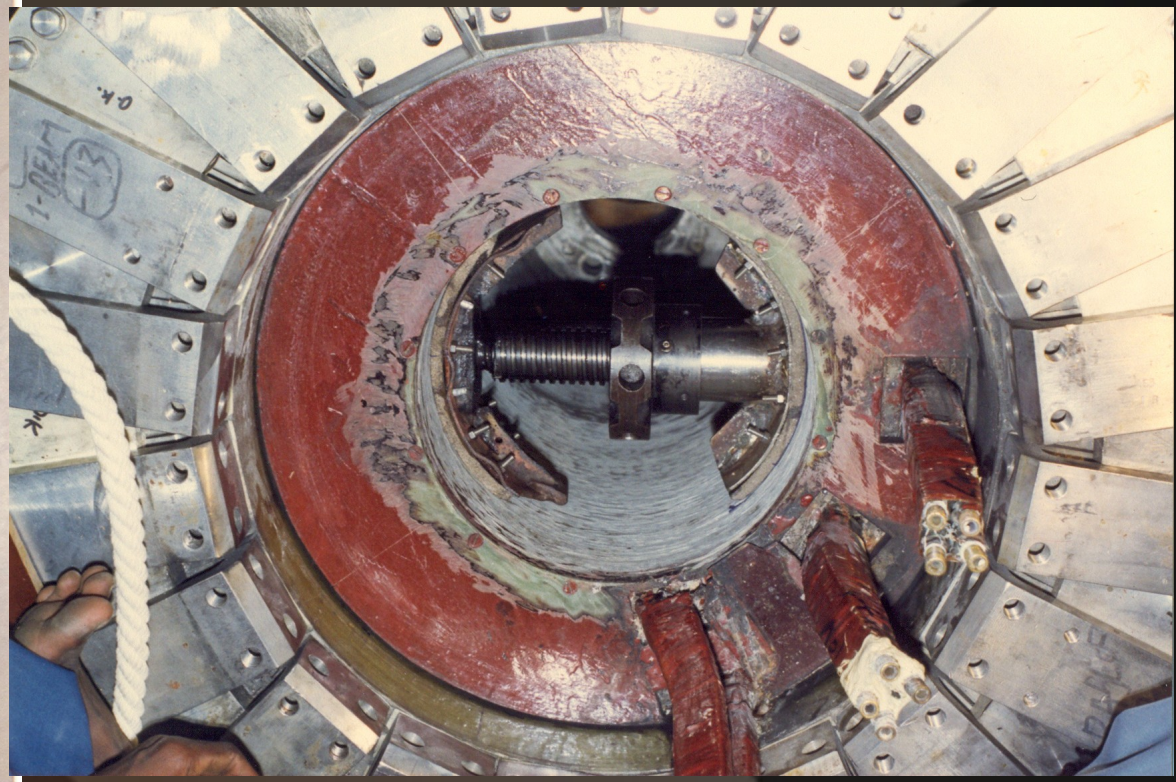


Institute for Plasma Research, Gandhinagar

Insulation Failure of TR-1 Ohmic Coil

- 1.5 ton solenoid magnet coil
- Centrally placed inside tokamak
- Prospects of repair bleak



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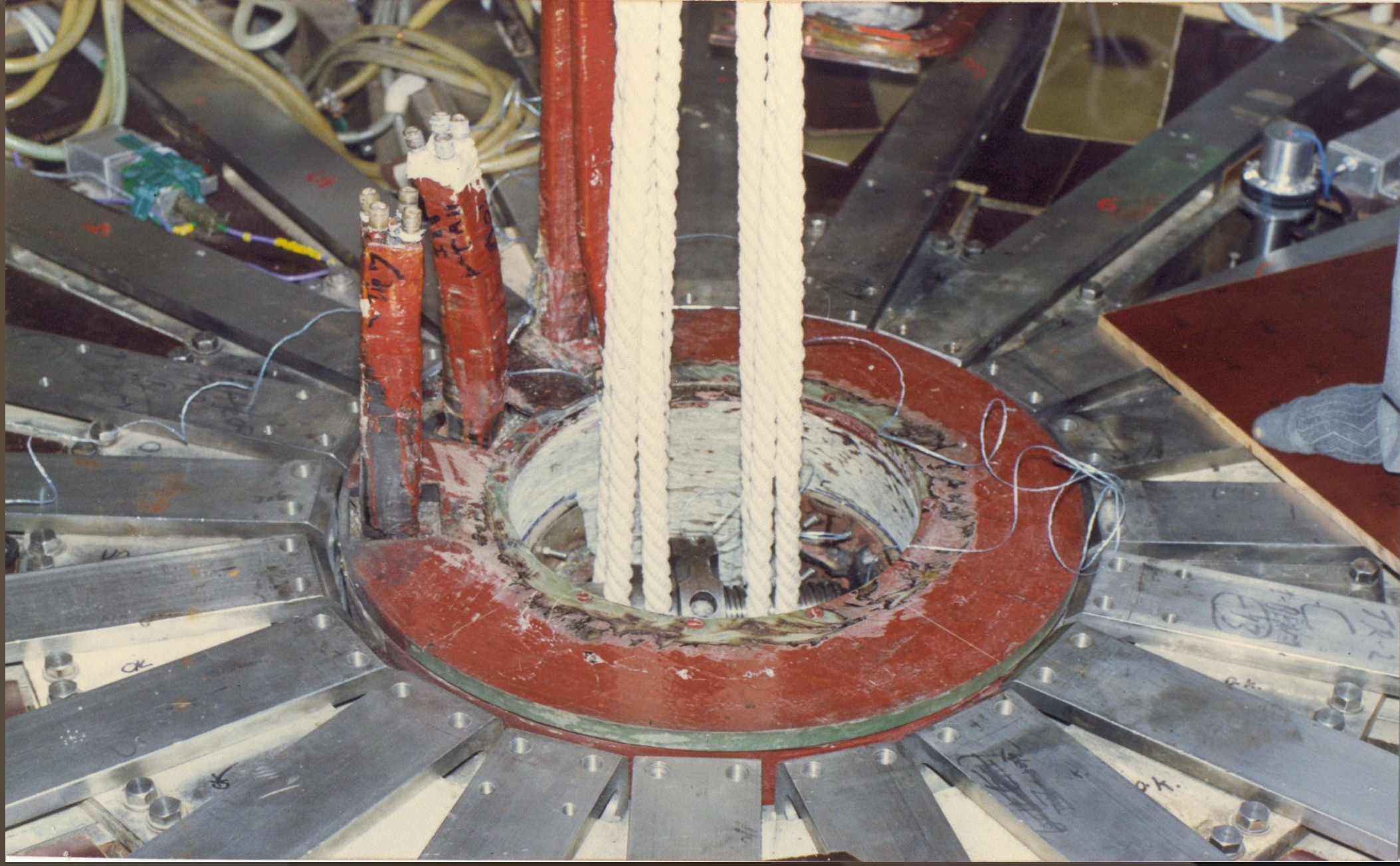

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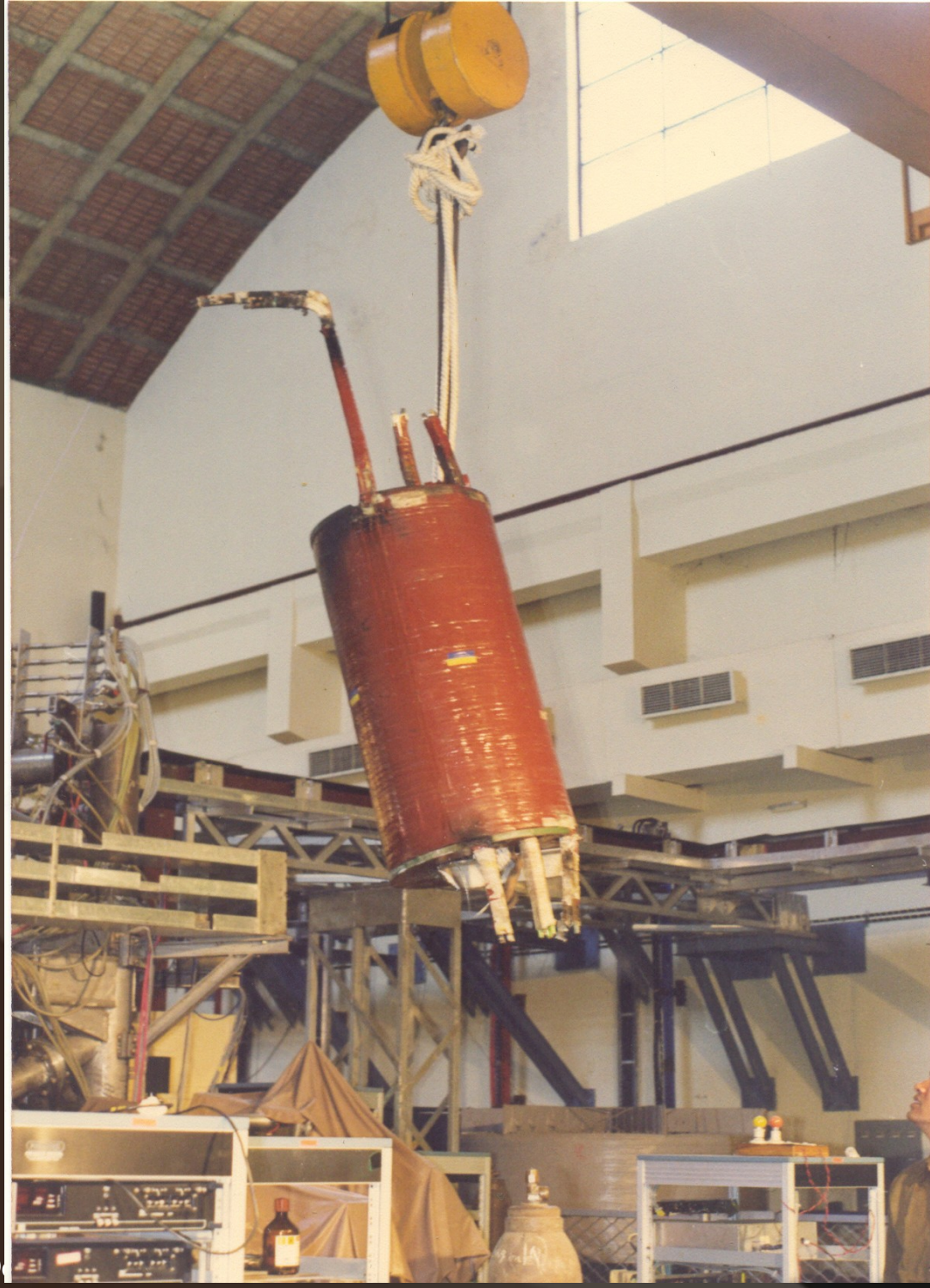

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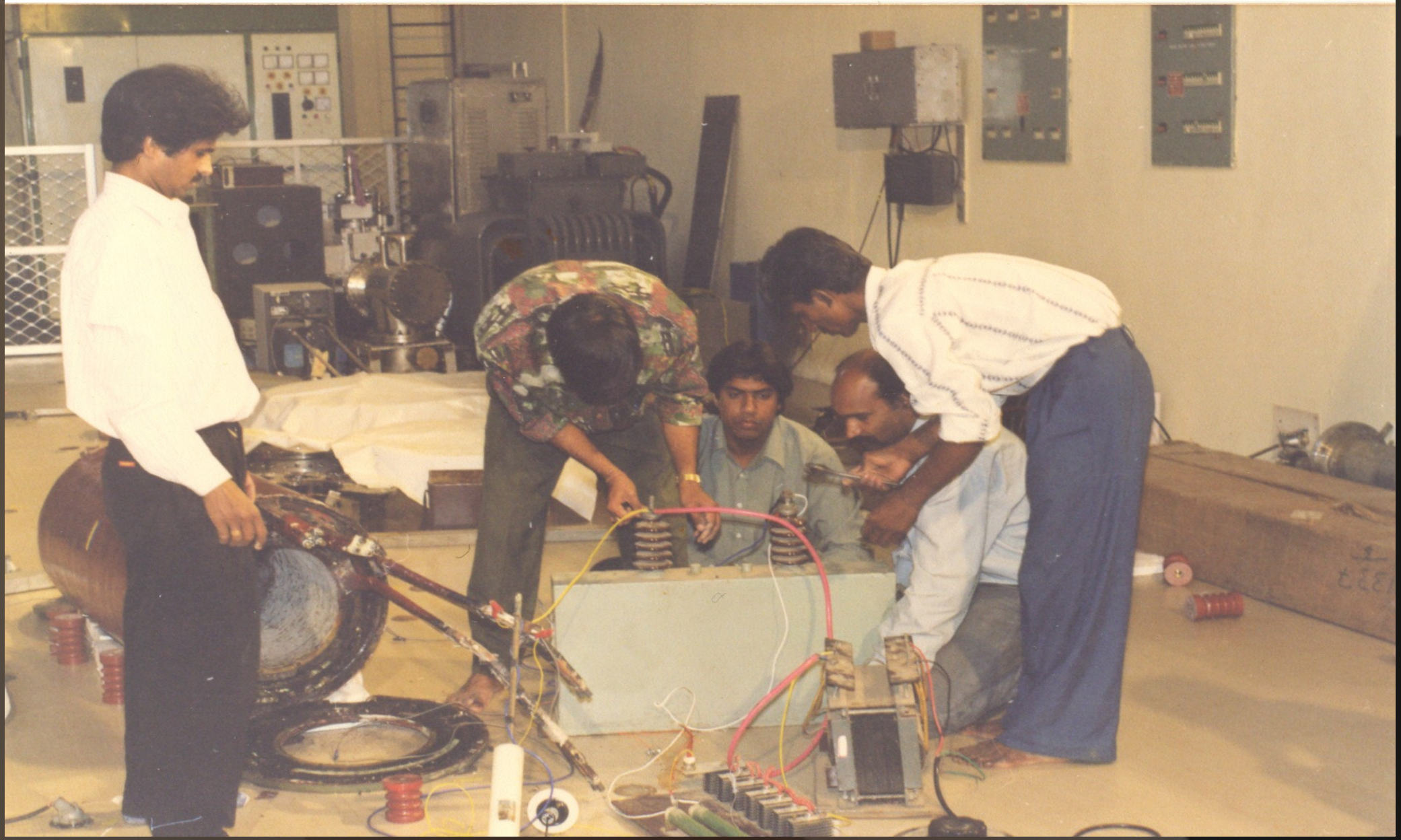

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Research : India's Moon Mission

Planetary Exploration – Chandrayaan-2 Mission

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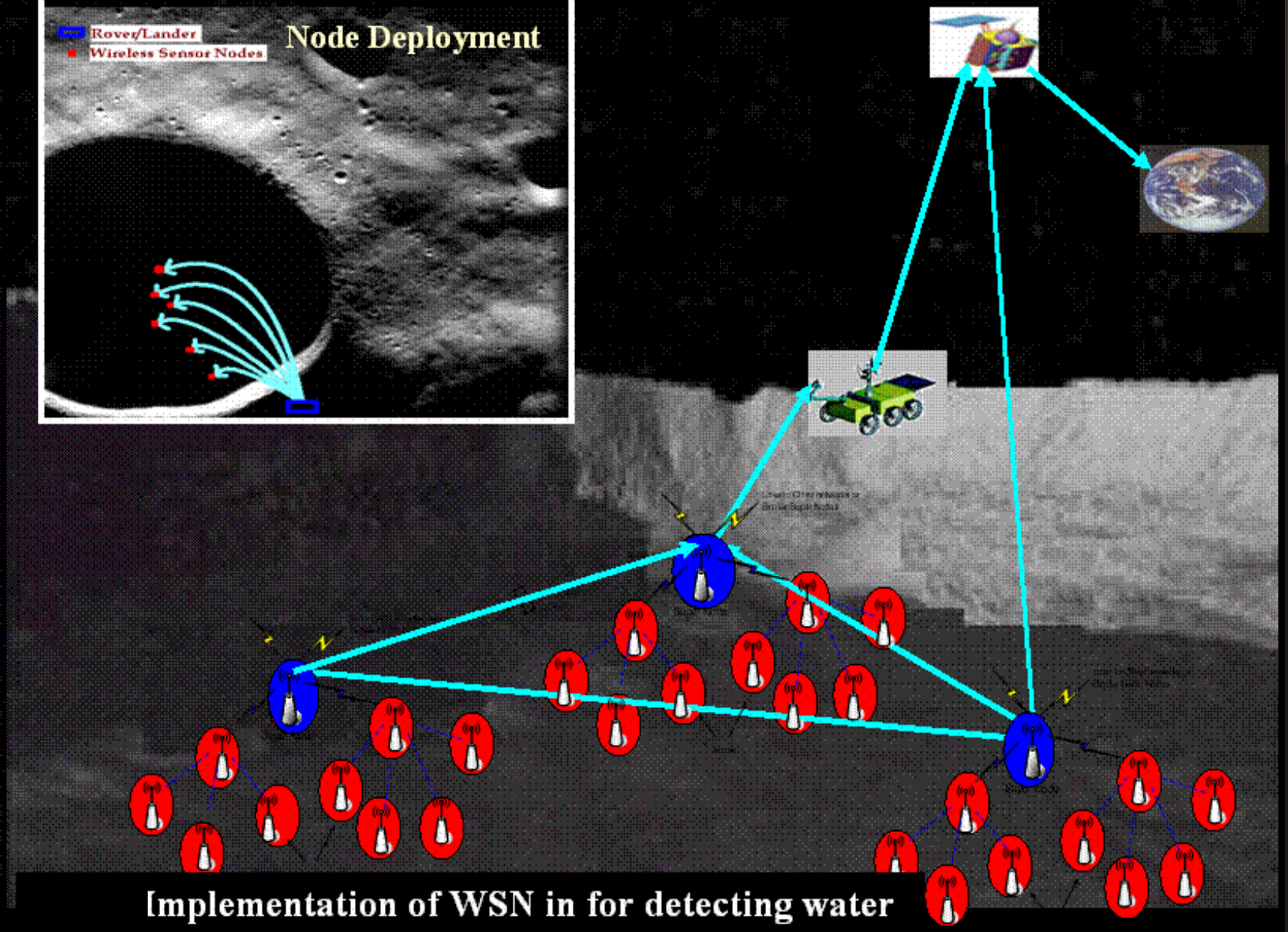
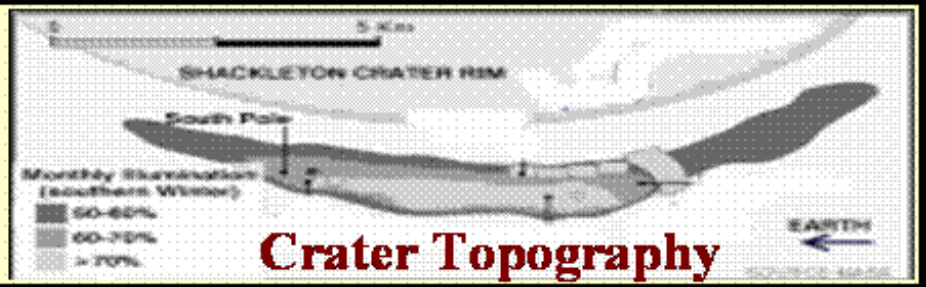
Multi-tier Architecture for Shackleton Crater



Implementation of WSN in for detecting water

Crater Characteristics:

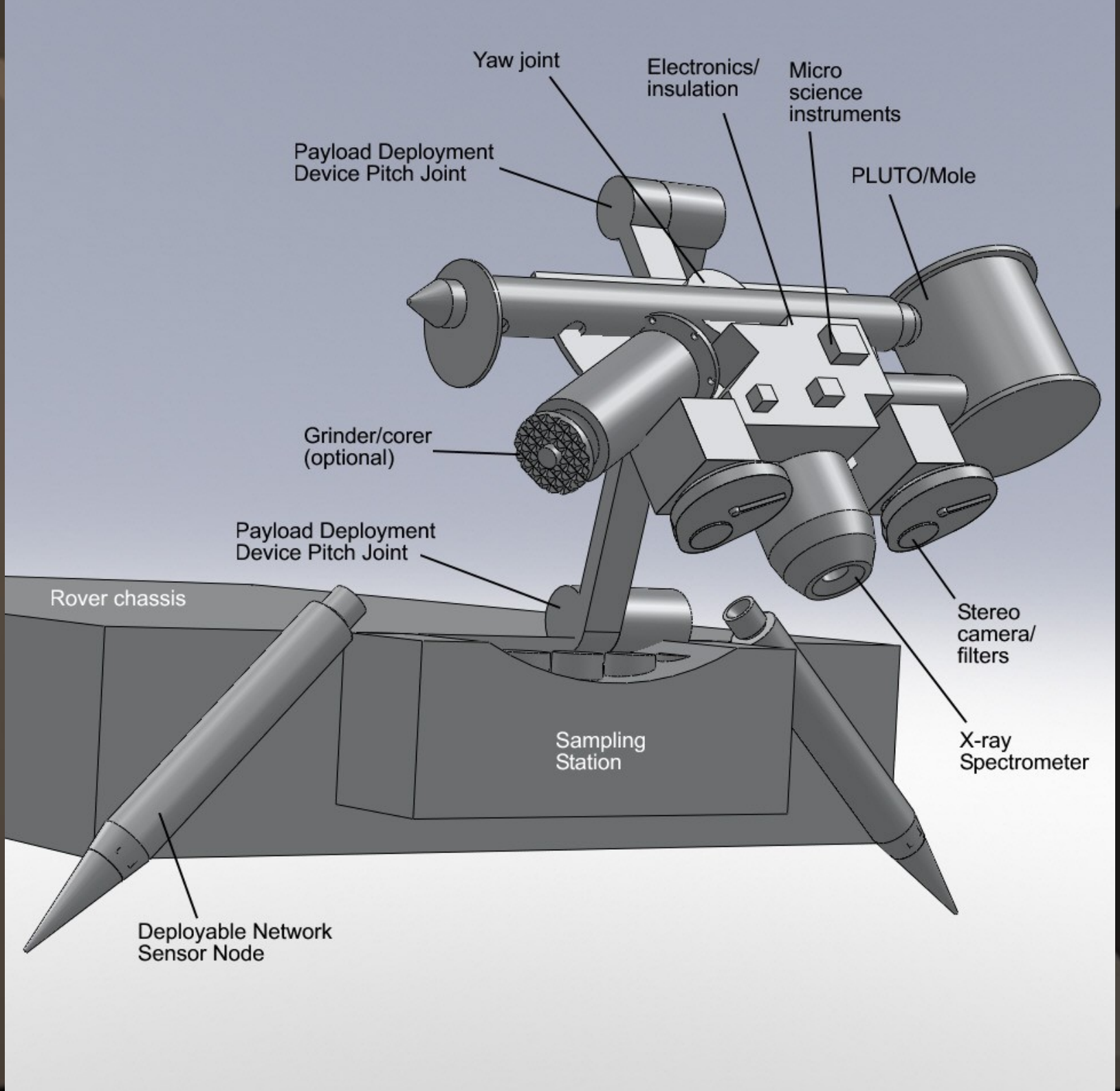
Coordinates	89.9° S, 0.0° E
Diameter	19 km
Depth	2 km



Crater Topography

LusseX : Lunar Surface and Subsurface explorer

- Chandrayaan-II project team requested me to come up with an integrated science package to carry out Lunar Surface and Subsurface exploration
- 20 W power, 5 Kg Payload


Yaw joint
Electronics/
insulation
Micro
science
instruments
Payload Deployment
Device Pitch Joint
PLUTO/Mole
Grinder/corer
(optional)
Payload Deployment
Device Pitch Joint
Rover chassis
Stereo
camera/
filters
X-ray
Spectrometer
Sampling
Station
Deployable Network
Sensor Node

Research : Earth

Agriculture : Reliance Agro-Initiative

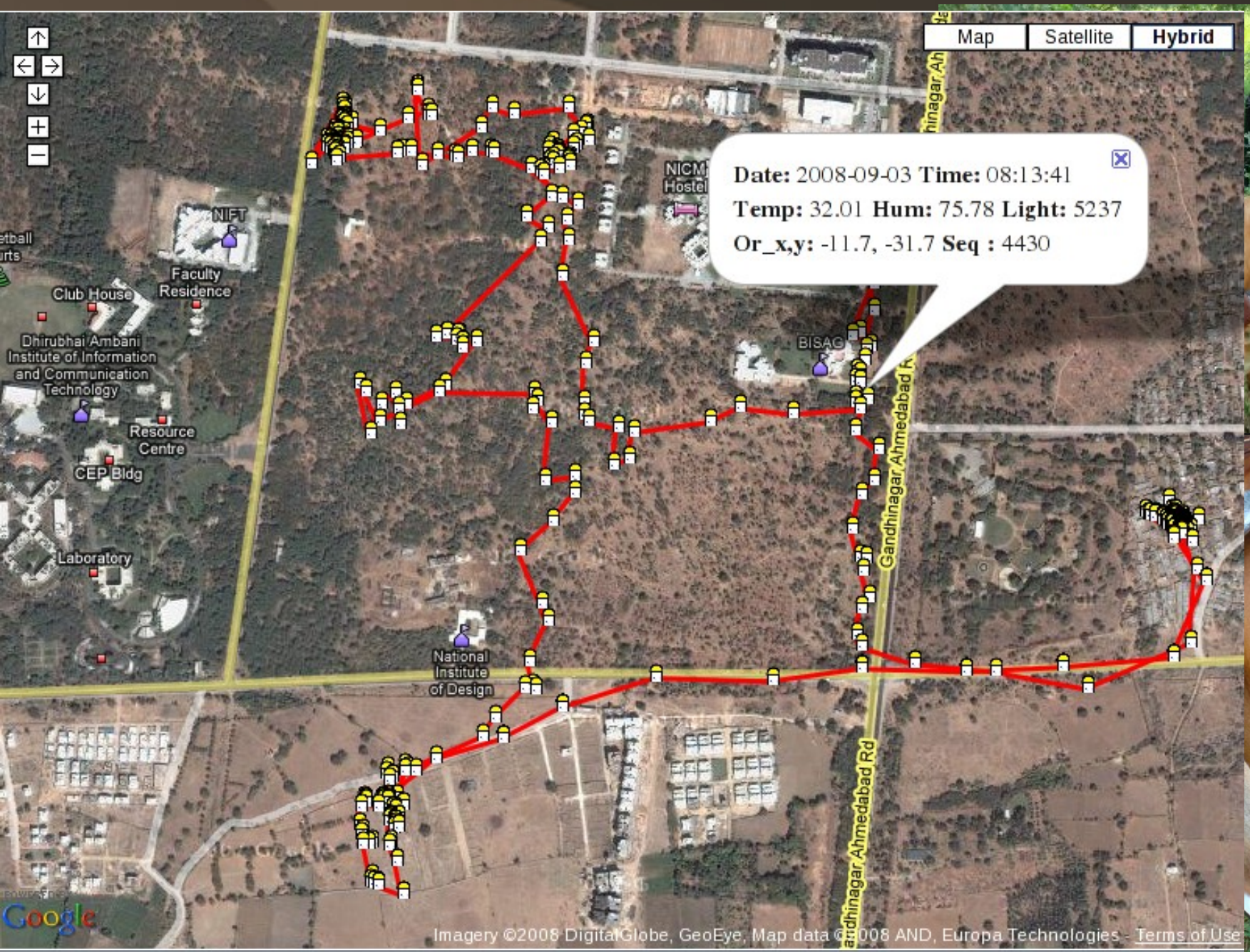
Wildlife : Wildlife Inst of India, Deharadoon

Swamp Deer (Barahsingha)

GPS based tracking

- Each animal has a GPS on a collar on its neck along with other sensors
- Animal collars communicate to each other and route the data to a receiving station
- We have tested on domestic animal
- Plan to test it on Spotted Deer (Cheetal) in Sariska
- Deploy on Swamp Deer (Barasingha) in Uttaranchal

Trial in Sept 2008 on Cow



Tricarinate Hill-Turtle in WII

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GPS Less tracking

- Designed for very small animals such as hill turtles
- A small radio device on the body of animal is tracked by a grid of receiving station
- Information about habitat, food preferences, hibernation etc available
- To be deployed in WII campus


15/06/2009

TigerCense – IR Image Sensor Network

- Designed to monitor movement of Tiger
- Can be used on other animals with well known trails having patterns on body
- No sound or visible flash disturbance

Prototype : Top view

Tiger Image in Zoo (June 2009)

FrogCense : Purple Frog Monitoring

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Acoustic Sensor Network based system

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CLIMATE CHANGE : CORAL REEF MONITORING

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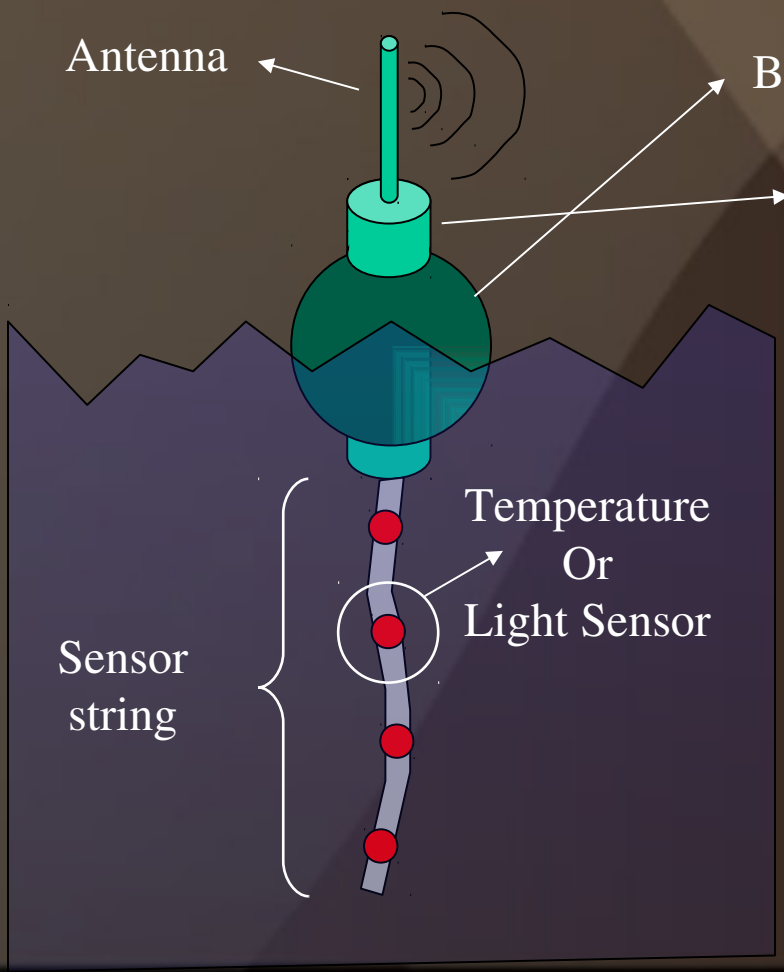
Effect of Climate Change on Barrier Reefs - Coral Bleaching

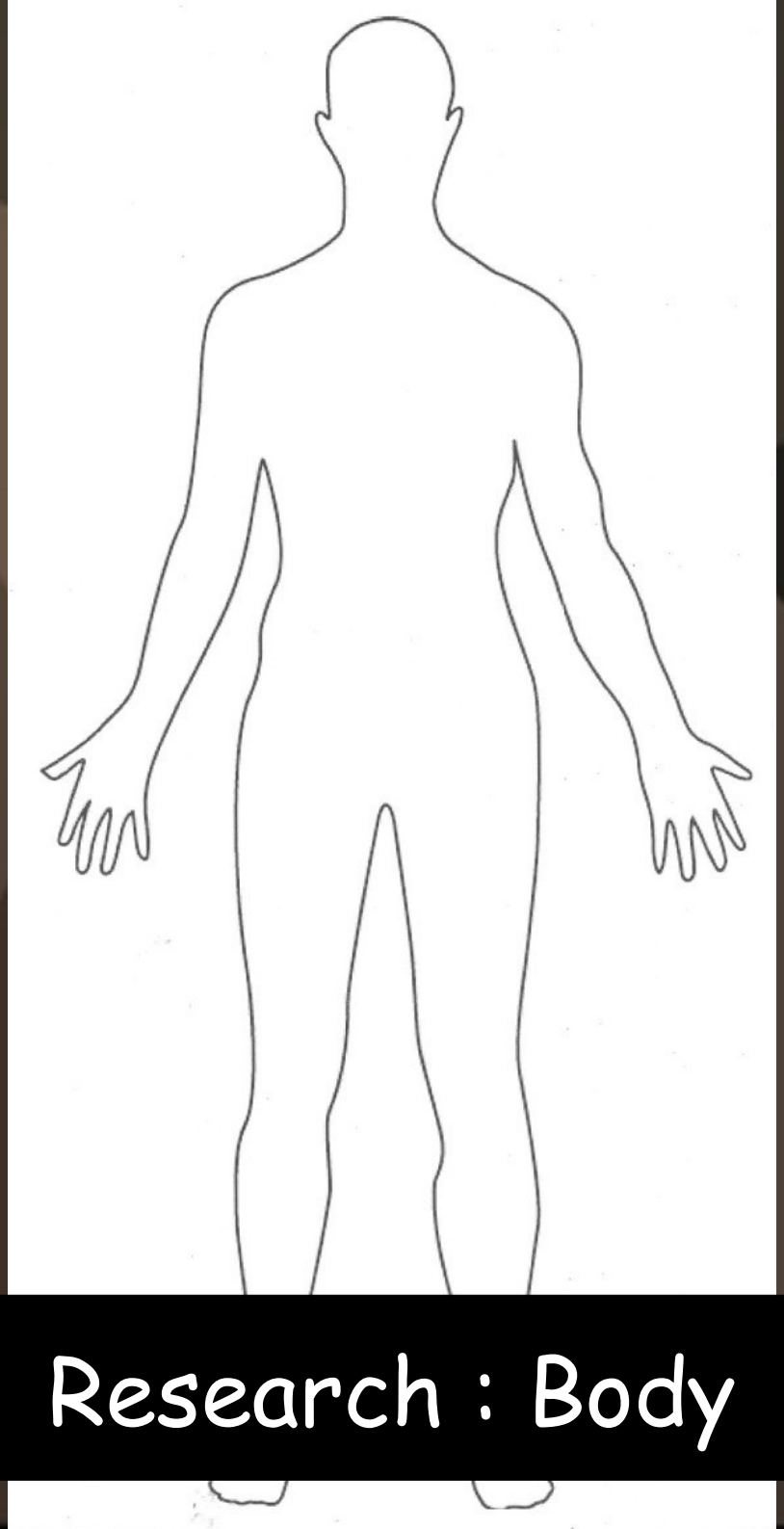
Increase in Temperature

2001 coral bleaching

WSN Deployment at the Great Barrier Reef, Australia



Great Barrier Reef pronounced dead by scientists



Research : Body

Disclaimer

- I am not an expert of NeuroScience
- I am not a medical doctor or healthcare professional

Assistive Technology for Persons with Severe Disability

TIFR, Oct 14, 2016

Introduction

- As per 2001 census, 2.1% of population in India (about 25 million) suffer from some form of disability
- Degree of disability varies from persons to person and so does the nature of ability
- Our work focuses on the ability of the person and utilizes it to improve their quality of life
- Many users suffer from cerebral palsy and our initial work was focused on them

Our Initial Work

- Developed a hand gesture based universal remote control to help persons with restricted finger movements by using accelerometer
- Due to many other users coming forward with different needs, we worked out a plan to use any ability that person has and improve their quality of life

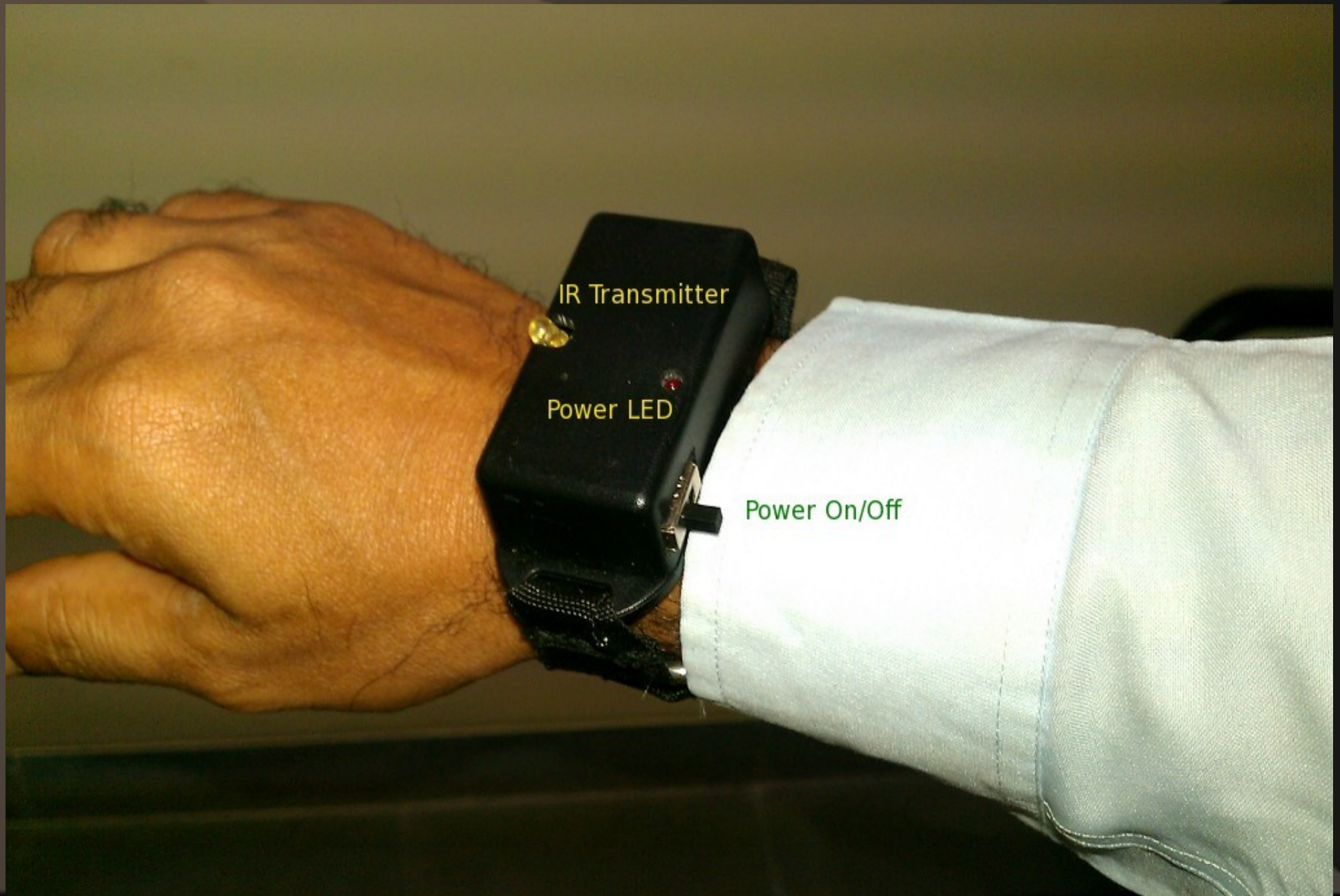

02/08/2010


02/08/2010


02/08/2010

- Awarded HP Innovate 2009 award
- Funded by
  - National Trust, Govt of India
  - IBM
- NCPEDP- Mphasis Universal Design Award given on Aug 14th 2012

Mini-CePal Final Version



RF-CePal : Split System

Experience in last five years

- Ahmedabad
- Baroda
- Bangalore
- Mumbai
- Kolkata
- Patna
- Allahabad
- Delhi
- Hyderabad
- Darbhanga
- Social Networking
- Kokilaben Hospital, Mumbai
- IICP , Kolkata
- AIIMS, Delhi

- Difficult to reach those with severe disability like quadriplegic, ALS, MND, Stroke Patients
- Easier to get in touch with
  - CP affected children
  - Paraplegic
  - Amputee
- Each has unique needs

- I am diagnosed with spinal muscular atrophy , completely bedridden but painting keep my hopes alive. Can you help me? I have difficulty in holding brush and speaking now.
- I am an albino with weak eyesight. I would like to know if there is anyway in which you can help me

- Can you help a child who is blind, deaf and dumb?
- Can you help a person who is blind and quadriplegic?
- Can you make a person communicate, who is in vegetative state?

- Can you help me go up/down stairs as I do not have lift in my house?
- Can you help me reach higher parts of my house since I am paraplegic?
- Can you make me use phone? I am quadriplegic.
- Can you make a simple massage machine for my arms?
- …

Count the ability
Not the disability!

Sarita Dwivedi

TIFR, Oc

Ability	Technology
Hand/Leg movement	Accelerometer
Head movement	Gyro-sensor
Voice	Voice-recognition chip
Eye movement/Blink	Image, BCI
Facial Expression	BCI
Conscious Thought	BCI
Muscle Movement	EMG

TABLE 1 : VARIOUS POSSIBLE ABILITY AND RELEVANT TECHNOLOGY TO INTERFACE IT

Possible Outputs

Light	Door
Fan	Gate
TV	Geyser
Computer	Water Tap
Speech Output	Simple Electrical Machinery
Wheelchair	

TABLE 2 : EXAMPLES OF VARIOUS EQUIPMENTS THAT CAN BE CONTROLLED OR NATURE OF OUTPUT POSSIBILITIES

www.employmentnews.gov.in
www.rojgarsamachar.gov.in

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Employment News

WEEKLY

VOL. XXXVIII NO. 7 PAGES 56 NEW DELHI 18-24 MAY 2013 ₹ 8.00

Ability Brings Employment

IMPROVING SELF RELIANCE AND EMPLOYABILITY

–Prof Prabhat Ranjan

A worth of an individual in society is measured by the value they bring to family/society etc. For persons with severe disability, this can be severely affected due to lack of physical ability. However with the help of newer technological developments within India, we can make them much more self-reliant as well as improve their employability. This makes a big impact on their quality of life as well as the way society treats them.

Normally one of the first issue that is faced in the case of persons with severe disabilities is to decide how to take information from a person about what he/she intends to do. If they have nearly full functional hands, they can easily do this since most of our systems depend on the use of hands to give input. In certain cases, legs could also be used if hands are not functional. However in many cases lower limbs do not function if upper limbs are

The author of this article has received many awards for his work in disability sector. He is also the recipient of NCPEDP-Mphasis Universal Design Award.

through speech synthesis (5) Operate simple mechanical systems etc. These can be immediately extended to cover those possibilities, which lead to employment of the persons e.g. Being able to operate a simple machine such as drilling machine or security gate etc. We describe each of these possibilities in more detail later.

We first start by discussing about the possibilities of taking input from a user, with severe disability.

- Hand gesture : Here a small device is strapped to hand/wrist, which monitors

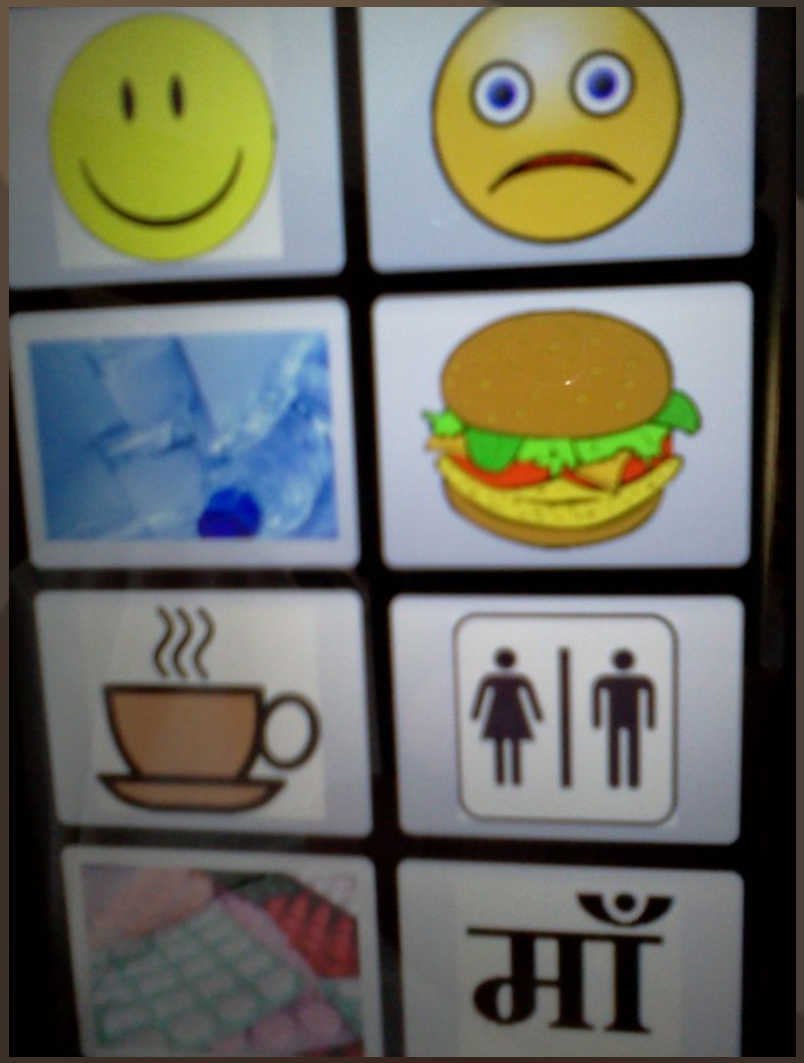
Touch Screen Technology

TIFR, Oct 14, 2016

Touch Screen based Tablet/Mobile

- Touch screen based tablets/mobile now available at very low cost
  - Aakash Rs 1200 through Govt
  - Ubislate+ Rs 3000 commercial
- AAC (Augmentative and Alternative Communication) can be now made very cheap
  - Indian language support needs work

Low Cost AAC Device



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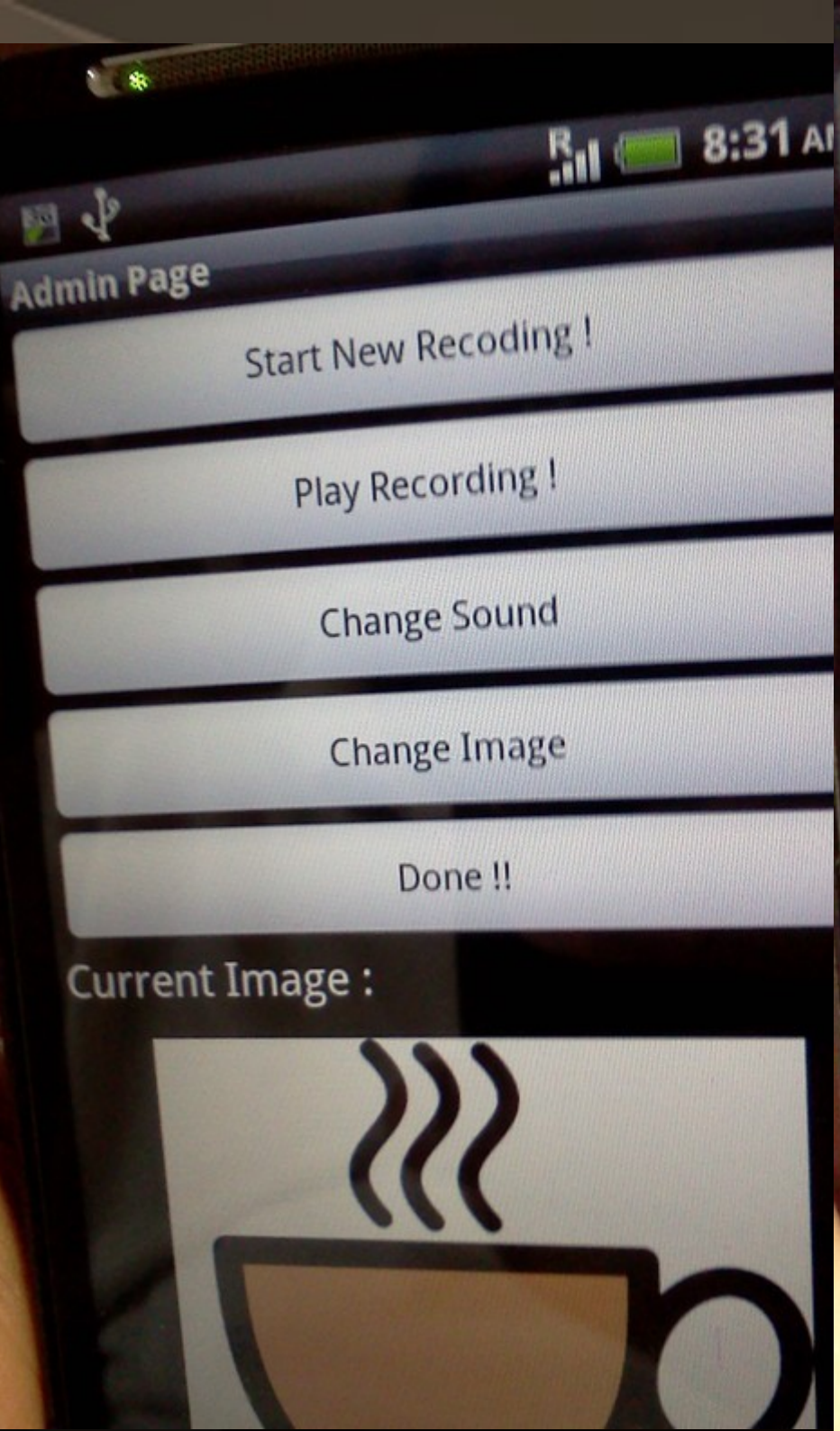
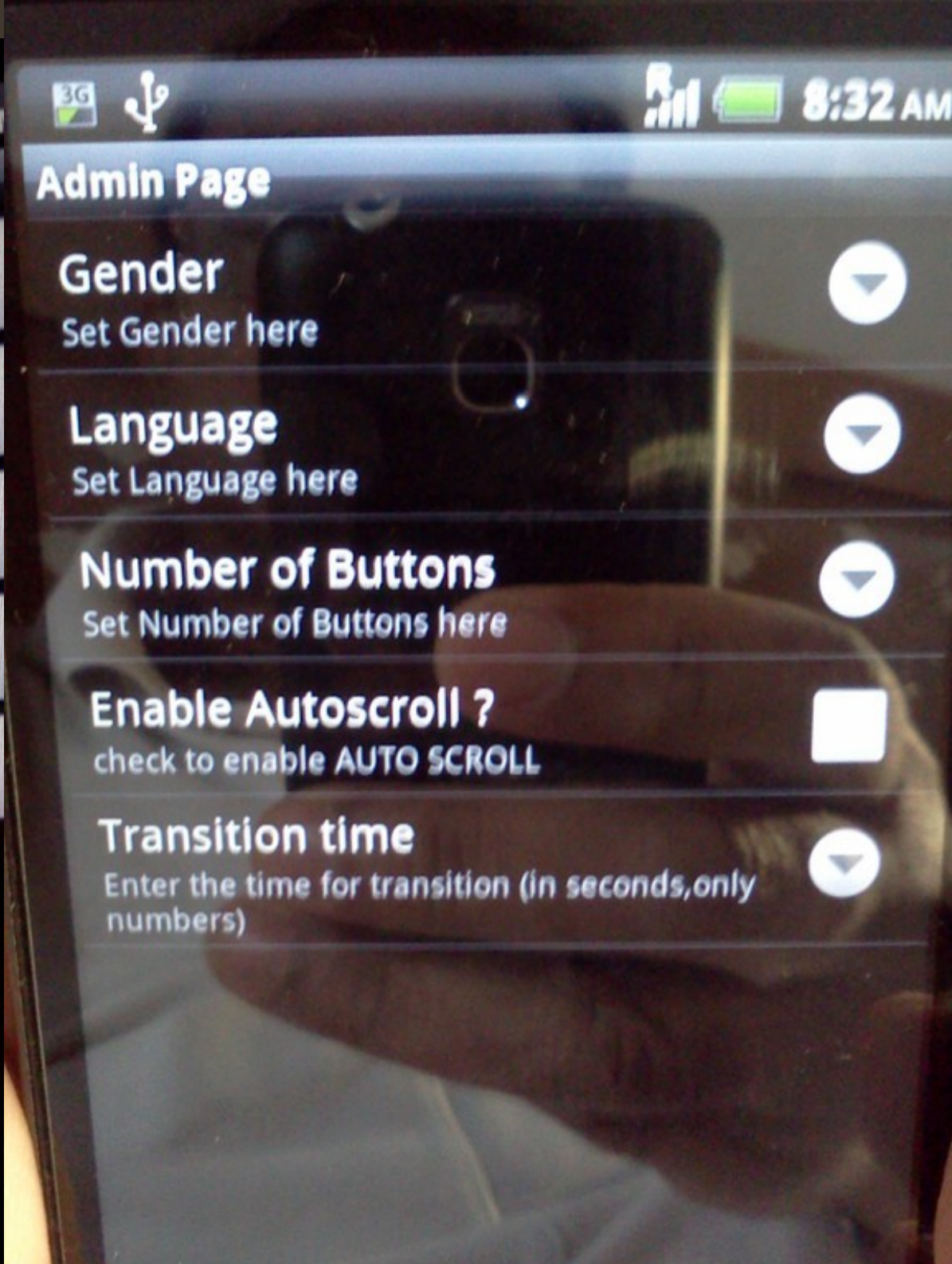

8:31 A
Admin Page
Start New Recoding !
Play Recording !
Change Sound
Change Image
Done !!
Current Image :

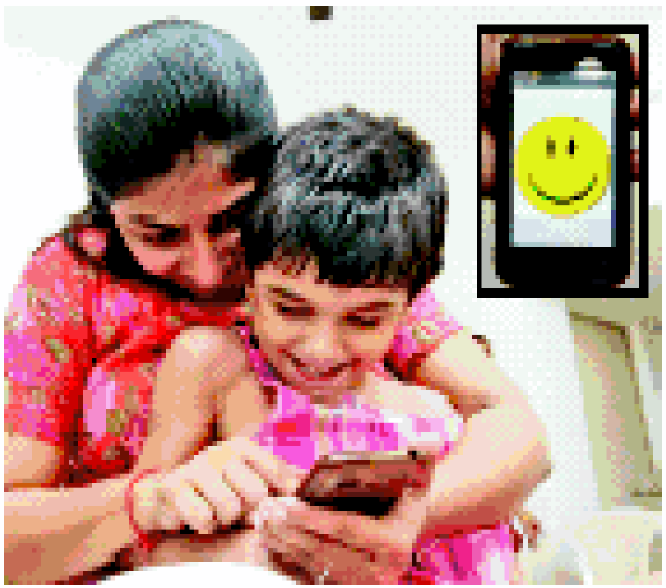

8:32 AM
Admin Page
Gender
Set Gender here
Language
Set Language here
Number of Buttons
Set Number of Buttons here
Enable Autoscroll ?
check to enable AUTO SCROLL
Transition time
Enter the time for transition (in seconds,only numbers)

Devanshi :Dystonic Cerebral Palsy

- 9 years old
- Non Verbal
- Communicate : Touch screen
- Type : Neuro-headset

DAIICT prof gives 9-year-old a voice

Supporting the Upadhyays whose daughter suffers from dystonic cerebral palsy, Mirror tested the efficacy of Prof Ranjan's award-winning communication system



[illegible]

[illegible]

Devanshi Upadhyay was just eight months old when she had an epileptic fit. Scared, Vinay and Rashmi rushed their daughter to the doctors only to find that she would struggle with spastic-dystonic quadriplegic cerebral palsy all her life. Their child was trapped in her body without the ability to communicate her needs. They learnt to read her eyes for clues but her lack of interaction with the outside world had them worried.

Till, they read an article in Mirror about the communication system developed by Prabhat Ranjan, professor at Dhirubhai Ambani Institute of Information and Communication Technology, Gandhinagar. Ranjan had recently bagged a national award for his communication system for quadriplegics and paraplegics.

Devanshi had turned nine and it was important for her to connect with people other than the family. Egged on by this thought, Vinay — who works as a senior manager in a pharmaceutical company — spoke to their

PAGE 6 [illegible]

Madhuri , IICP, Kolkata

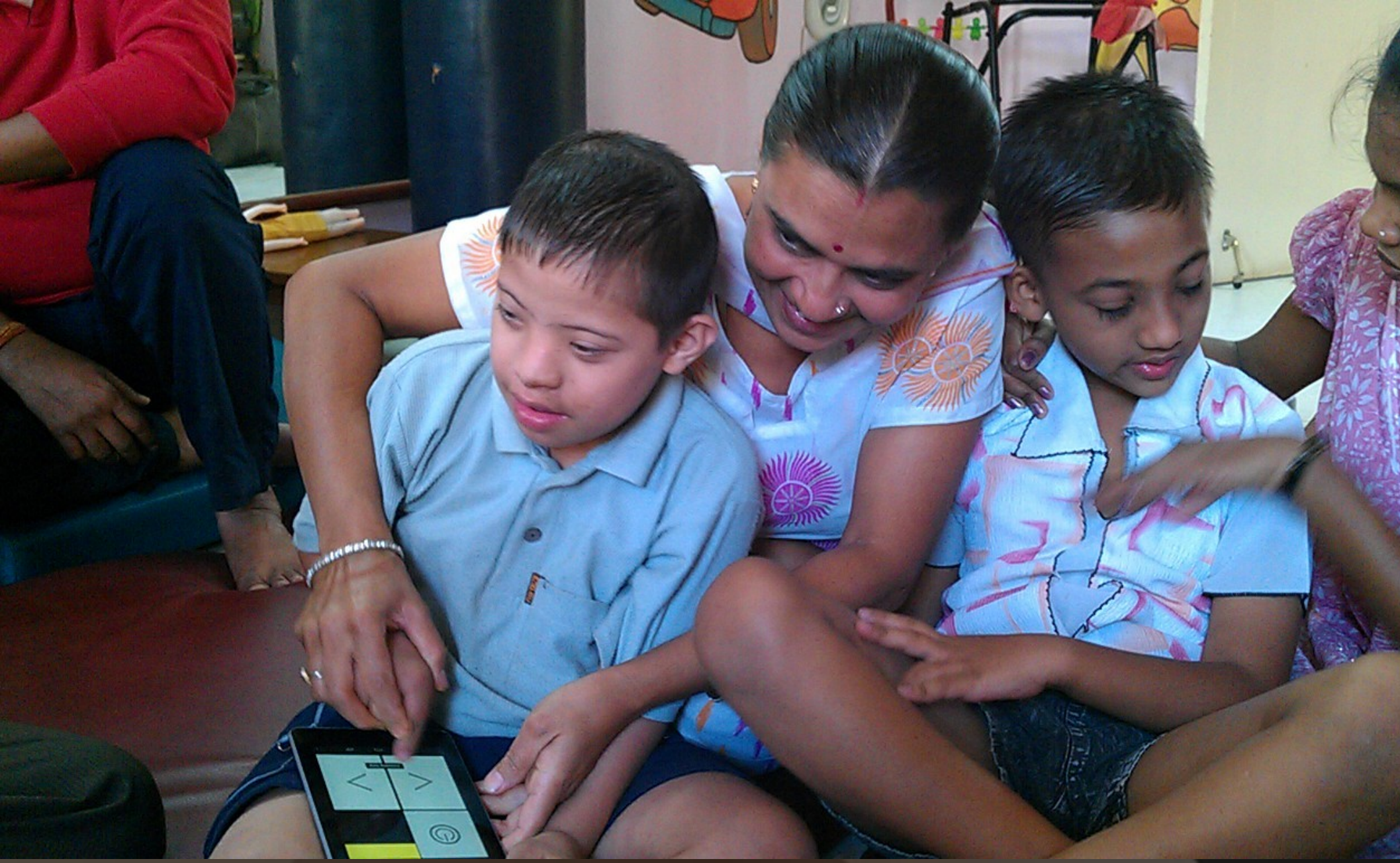
TIFR, Oct 14, 2016

Ganga : 10 years old , Shishur Sevaye, Kolkata

TIFR, Oct 14, 2016

- HI5 CDC, Mumbai
- Hitansh : Dystonic
- Non Verbal
- Could use neuro-headset to try typing

- Cheshire Home, Mumbai
- Learning alphabets



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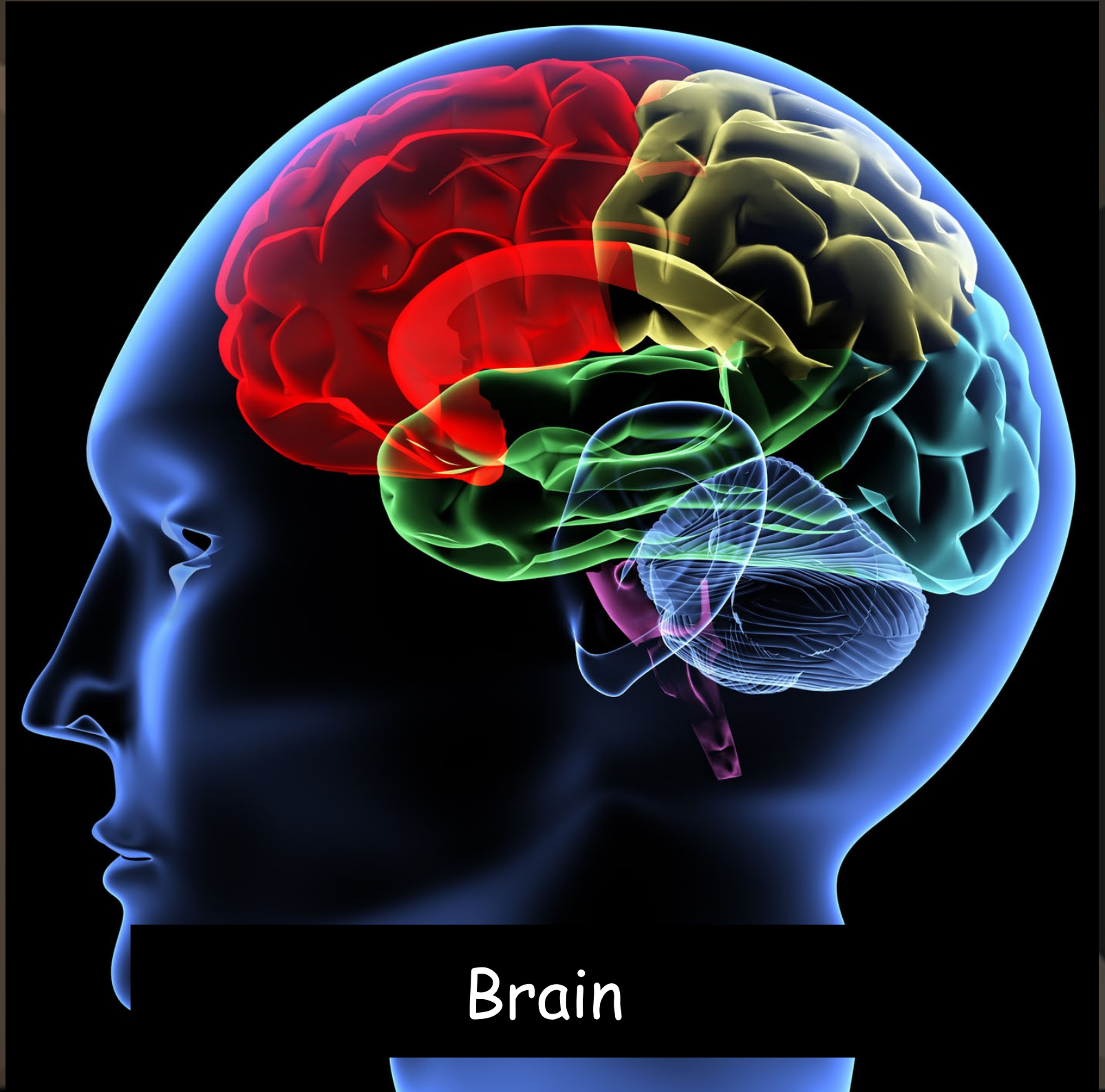

Brain

Brain-CePal

TIFR, Oct 14, 2016

Brain Computer Interface

- BCI has been going on for nearly 40 years with focus on Neuroprosthetics to help persons by replacing functions of impaired nervous system and allowing them to restore body functionality such as hearing, vision etc
- Cochlear Implant

EEG History

- BCI depends on collecting Electroencephalography (EEG) waves from brain through single or multiple electrodes and analyzing it to gain insight in understanding brain conditions
- EEG waves were discovered nearly 90 years back and used since then in medical research and diagnostics.

Current Development

- Interpretation of EEG waves is a complex task and most of the work was done offline by recording waves and doing analysis later
- With development of embedded systems and more powerful processors, it became possible to carry out real time analysis of EEG signals
- This combined with wireless communication has led to the development of neuro-headsets

- These measure EEG waves and partially process the signal before transmitting it wirelessly to computer for more sophisticated analysis.
- With games market being very large, some of these headsets are being targeted to games community - Cheaper
- This is making it possible to take advantage of this development to help persons with disability at a much lower cost and for wider

Emotiv Epoc

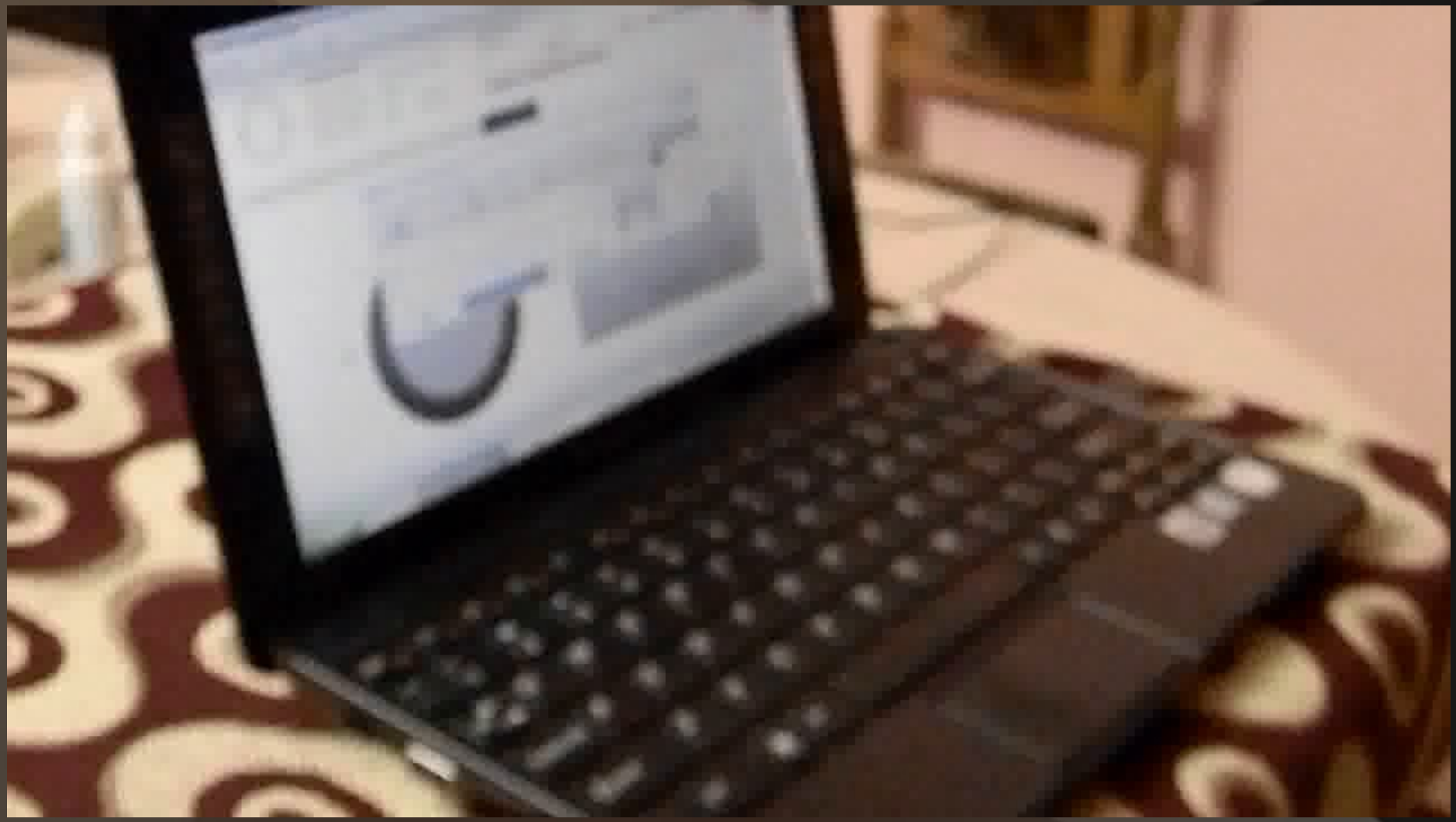
- Epoc has 14 electrodes along with 2-axis gyrosensors to measure head movement
- Electrodes have a felt pad, which is wet with saline solution to improve contact with skull
- Electrodes are positioned to certain locations on skull as per direction
- This has a processing unit along with wireless communication unit


HOLLISTER

Changing life of Mr Suresh

- IIM Ahmedabad MBA
- Brainstem Stroke in 1999
- No hands/legs movement
- No voice but can hear and see
- Only communicated through blink of his eyes
- On March 13-14, 2012 we provided Brain-CePal to change his life

Suresh operating PC after 13 yrs



TIFR, Oct 14, 2016

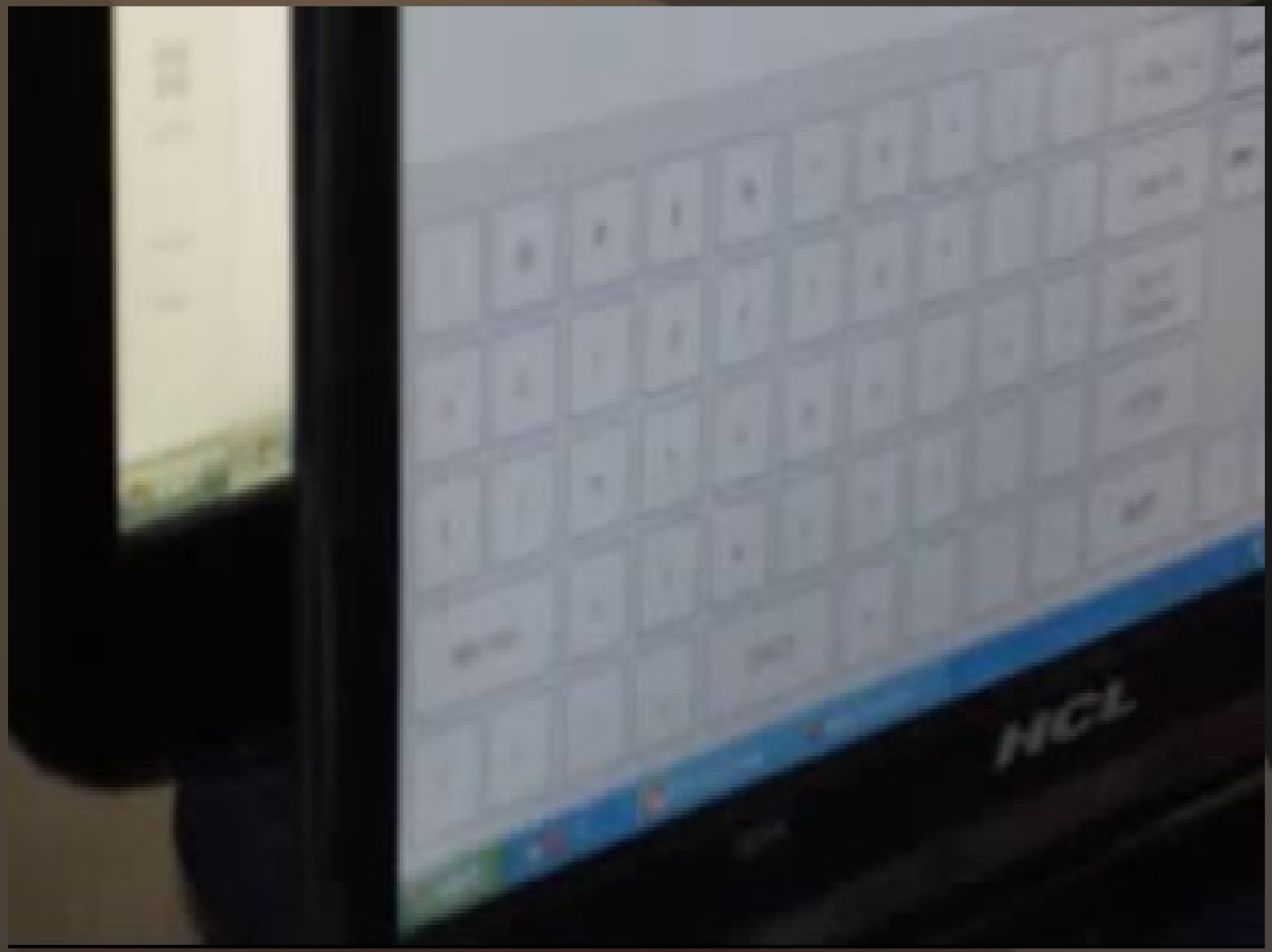
Suresh controlling a light

TIFR, Oct 14, 2016

After one month

- Suresh has improved much more and is able to focus better, when he is alone
- We are in the process of providing him
  - Speech Synthesis Capability
  - Being able to send/receive Text message through phone
  - Being able to make calls through phone
  - Hopefully find him a gainful employment

Suresh after one month



TIFR, Oct 14, 2016

Publication: The Times Of India Ahmedabad; Date: Apr 7, 2012; Section: Front Page; Page: 1;

DAIICT prof 'enables' quadriplegic IIM-A grad

Dayananda Yumlembam | TNN

Ahmedabad: Imagine spending 13 long years unable to move a finger, dependent on your family for all your daily needs. That was the life of 1993 batch alumnus of Indian Institute of Management - Ahmedabad (IIM-A) Suresh Karat.

But, not anymore. Suresh is now enjoying a new sense of liberation. Today, he can surf the internet and also interact with his teenage son. Thanks to an innovation from Dhirubhai Ambani Institute of Information and Communication Technology (DAIICT), Karat is now able to use a computer to type and express his feelings just by moving his head and blinking his eyes.

Karat can now use a computer, thanks to the new interface

puter in such a way that that the user can use it to control the computer," said Ranjan, who is also a scientist working with Isro in the project for finding water on moon.

The device enables Karat to move the

Youth Curry - Insight on Indian Youth

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SUNDAY, APRIL 08, 2012

Do you believe in miracles?

This story begins in September 2010, when Professor Prabhat Ranjan and I found ourselves in a Qualis vehicle. Lurching towards a sleepy student town, from Mangalore airport.

We were to speak at TEDx Manipal.

Partly out of curiosity and partly for timepass, I asked Prof Ranjan about his work. He told me about many interesting things, including a device he was developing for use by disabled people.

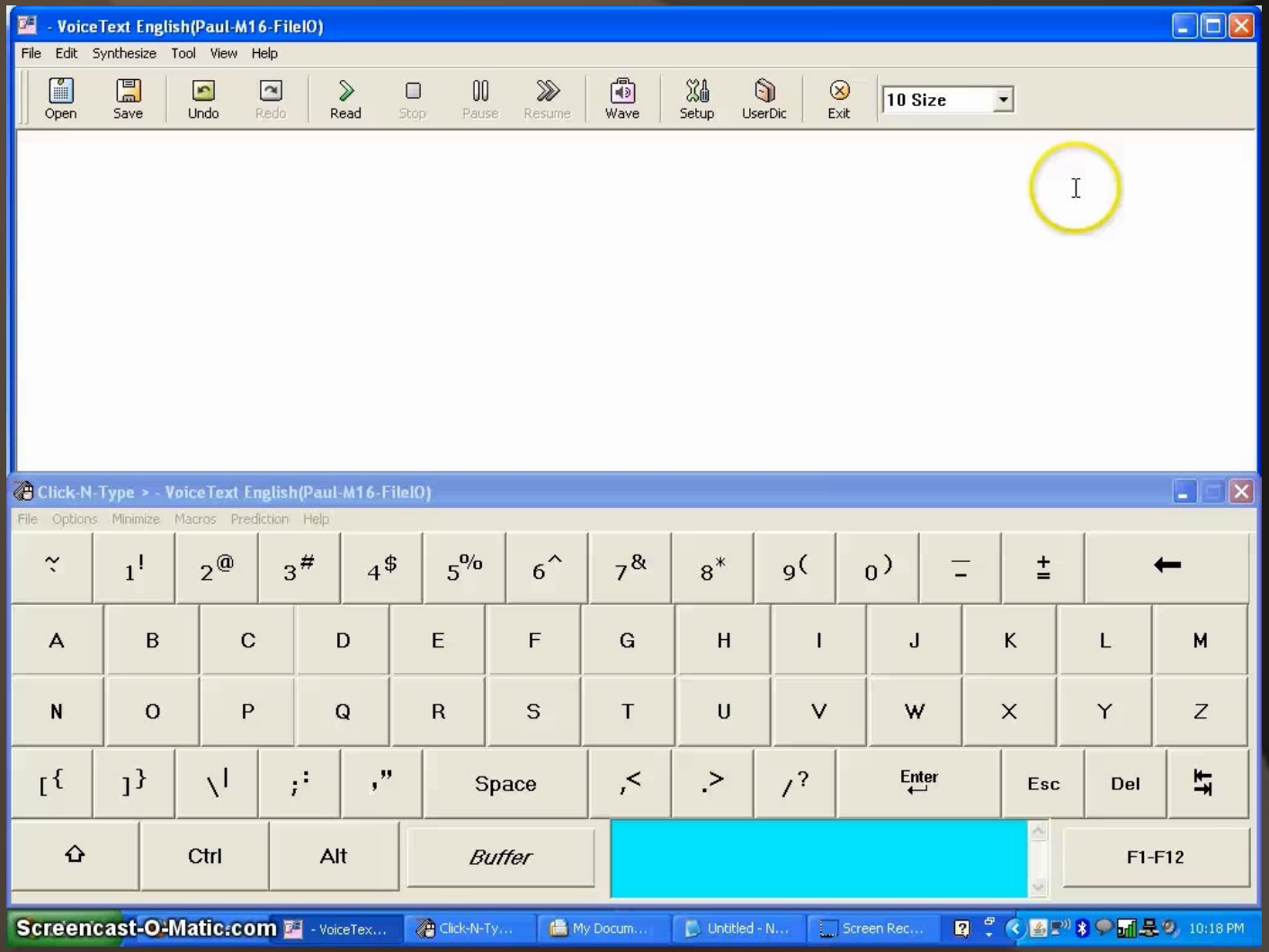
I thought it was a good idea, a noble idea, and said to myself - " I must write about this someday". Prof Ranjan invited me to visit his lab

MONDAY, APRIL 30, 2012

I can type!

Some months back, a classmate of mine at IIMA, Rashmi Bansal had visited us. She asked Jaya to contact Prof. Prabhat Ranjan from Dhirubhai Ambani Institute of Information and Communication Technology (DAIICT) who she said may be able to help me. (Rashmi has the whole story here.) Accordingly, Jaya contacted Prof.Ranjan, told him about my difficulties and also gave him the address of my blog so that he got more pointers about my needs. He thought that I would benefit by using a brain-computer-interface. (There was a story in ToI regarding this. And yes, the Karat guy is me.)

Speech Synthesis for Suresh



TIFR, Oct 14, 2016

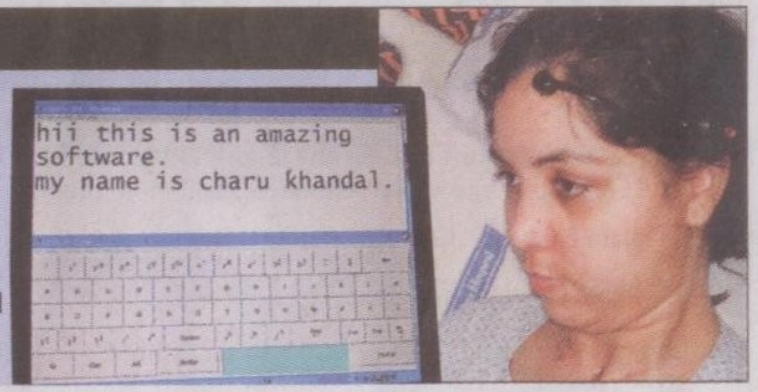
Charu Khandal – Ra.One Animator

Device helps paralysed Ra.One animator type

Prachi Pinglay
prachi.pinglay@hindustantimes.com

HELPING HAND

The device comprises a neuro-headset, used in computer games, which is attached to a person's head. The sensors in the headset translate head or eyelid movements into computer commands. So, while blinking translates into a right or left click, head movements can be used to move the cursor on the screen.



MUMBAI: "Hii this is an amazing software. My name is Charu Khandal," wrote the award-winning animator for the first time since a spinal injury in a drink-driving accident in March left her paralysed below the neck.

Khandal, 28, who was part of the Ra.One animation team, typed these words with the help of a device that allows people to type using eye and head movements. The device had a successful trial on June 8 at the Ambani hospital in Andheri.

"Doctors and a technical team placed a headset on Charu and connected it to a laptop. They will try it again and we will see if she can use it more often," said Sagar Thacker, her fiancée.

The device comprises a neuro-headset, used in computer games. The sensors in the headset translate head or eyelid movements into computer commands. While blinking translates into a right or left click, head movements can be used to move the cursor.

The device was developed by international firm Emotiv and adapted by Prabhat Ranjan, a professor at Dhirubhai Ambani Institute of Information and Communication Technology, Gujarat. It aims to help patients who have normal brain functions but suffer from quadriplegia.

"Charu took very little time to understand how to use it," said Ranjan. Ranjan said the device could be used to capture facial expressions. "Patients will be able to use appliances such as lights, fans and TVs. It will help them get back to work," said Ranjan, adding that Khandal is the fourth Indian patient to use the device.

Dr Ram Narain, executive director of the hospital, said: "We are excited about the trial, but it is at a preliminary stage."

Mr Prasad, School Principal, Hyderbad

Ajay Raj, Garhwa(in Patna)

Software suite with Epoc

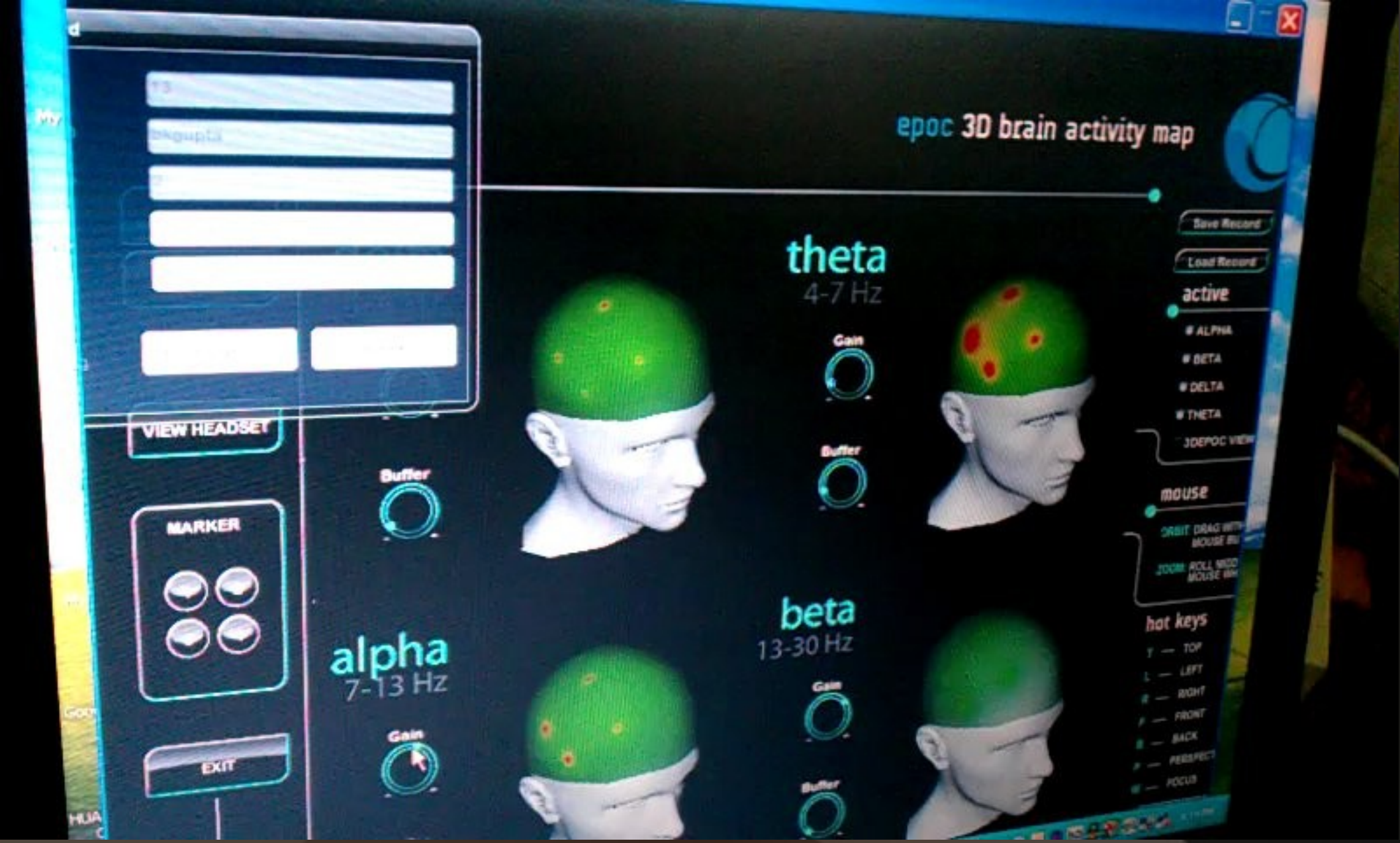
- Expressive – Facial Expression -
  - Individual eye lid and eye brow movements, eye position in horizontal plane, smiling, laughing, smirking
- Effective – Emotions
  - “Excitement”, "Engagement/Boredom", "Meditation", and "Frustration"
- Cognitiv
  - Recognize conscious thoughts – Push, Pull, Lift, Drop, Left Turn, Right Turn ...

"Vegetative" State : 3-D brain mapping

- A large number of persons have no means to communicate after their brain gets damaged due various reasons
- They remain alive but family members and caregivers have no idea about what is going on inside their brain

Probing mind using Neuro-Headset

TIFR, Oct 14, 2016



TIFR, Oct 14, 2016

Learning Disability

- Beta1/Theta lower –> learning disability (School of Creative Learning, Patna)
- How to improve this?
  - Ancient Techniques : Yoga, Pranayam, Kundalini
  - Brain Entrainment
  - Neuro-feedback
- Down Syndrome, ADD, ADHD .....
- Insomnia, Depression, ...

Maths Genius : Dr Vashistha Narayan Singh

Blog : ranjan.in

- I am about 36 years old female from Delhi. Since last 15 years I have suffered with sleep disorder, anxiety, memory loss, gas problem, hair fall problem. I did allopathy, homeopathy, accupressure and various medical counselling. I took medicines continuously for last 10 years. But there was no solution to my problems from any of these.

And now ...

- 7thApril onwards I could start to learn everything. Whatever I studied I would be able to retain in my mind. Today (April 14, 2013) for the first time in 15 years I could solve 60 numerical problems in 4-5 hours. I am preparing to give exam. Next month I have exams. I would be able to complete one subject in one week, which I have not been able to do in last 15 years!

THE AMAZING
LIVER CLEANSE

A Powerful Approach
To Improve Your Health And Vitality

Andreas Moritz

Holistic Approach to Learning

- Food, Body and Mind need to be taken care along with learning
- Gurukul system???
- June 29-30, 2013 – Workshop at Patna (school of creative learning – creativelearning.in)

Conclusion

- Combining India's traditional knowledge with modern science is a winning combination
- Focus on real problems
- Tremendous potential for innovation
  - Specially in area of disability and old age

Thanks

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