Demonstration of basic science experiments

KIDS ZONE
OPEN DAY

Indian Institute of Science

Venue: Old Aerospace Building, Opp. Choksi Hall
Date: 23rd March, 2019
Time: 9:30 AM to 4:30 PM

Contact details: kidszoneise@gmail.com
OPEN DAY

IISc
INDIAN INSTITUTE OF SCIENCE
The Indian Institute of Science (IISc) was conceived and founded by Shri Jamsetji Nusserwanji Tata, whose birthday on the 3rd of March, is celebrated in IISc as Founder’s Day. The 28th of February is celebrated all across India as the National Science Day to commemorate the anniversary of the discovery of the Raman Effect, whose discoverer, Sir C V Raman, was a former Director of IISc.

It is in conjunction with these days that, each year, IISc holds an Open Day during which its portals are open for the public to observe first-hand the activities of the Institute. This year again, the Institute welcomes you on Saturday, the 23rd of March 2019, to Explore, Experience, and Enjoy the wonders of scientific and technological research and innovation at IISc, Bengaluru.

DID YOU KNOW?

The idea of having an Open Day in IISc was suggested in 1948. This was one of the recommendations made by the Egerton Committee that was formed soon after independence to review the activities of the Institute. This was conceived of as a day on which industrialists could visit departments and seek technical advice and know-how.

The first ever Open Day, as we know it today, was held on 3rd March 1977.
• UAVs for different purposes
• UAV Control
• Flow Instabilities, Transition & Turbulence
• Rocket Launch Demo
• Hypersonic Flows
• Rocket Launch Pad Flows & Acoustics
• Vibrating Plate mode shape under PZT Actuation
• Structural Health Monitoring using Acoustic wave propagation
• Ultrasound in Inspection of Structures
• Computer Simulation of Material Fracture
• Materials with Memory
• Design of Composite Structures
• Damage Tolerance Analysis
• Computational Fluid Dynamics
• Fuel Injector droplet sizing
• Laser Visualization inside gas turbine combustors
• Poster display: “JN TATA” in the Reception Hall, Main Building, IISc

• Visit IIScPress stall for Books and Gifts, IIScPress Books, Centenary Medallion, Key Chain, Pen Drive, Mugs, Snippets and Post cards from Archives, Jute Bags, etc.,
• DNA: The code of nature
• Understanding genomic instability
• Guardians of genome
• Cure to the incurable: cancer-origin and therapy
• What are heat shock proteins and how do they protect our cells
• How does a cell fights foreigners?
• Know the parasites: Little monsters within us
• Enigmatic enzymes and vivacious viruses: lessons from baffling biological stories
• How to make vaccines?
• The road to next generation drugs: Microbes coming to help where synthetic drugs chemistry fails
• Extraction and bioassays of plant and fungal natural products
• Posters and videos on Atmosphere, Ocean and Climate
• Demonstrations: Clouds
• Demonstrations: Stratified fluids
• Demonstration: Vortices in Fluids
• Demonstrations: Dye patterns
• Take Someone’s free will with Human-Human Interface
• Everything goes with the flow, Why not cells?
• Eternal colors of nature
• Feel the cell and its inner world!
• Build your AFM
• Many more showcasing a blend of Biology and Engineering
to thrill the inner curiosity and tinkerer!
CENTRE FOR BRAIN RESEARCH (CBR)

DEMONSTRATIONS AND ACTIVITIES

- How we do cognitive test
- Visualizing genetic variations in DNA
- On field activities for population-based studies
- Get to know a neurological disease

POSTERS ON THE FOLLOWING TOPICS

- What is dementia and why study dementia
- Description of two longitudinal studies (one rural and another urban) on dementia
- Neuroimaging techniques
- GenomeINDIA: a large whole genome sequencing project to develop a reference genome for India
• Cryo bazooka
• Magnetic levitation
• Lenz’s law
• Resistance Vs Temperature
• Wavelength Vs Temperature
• Hoeffler’s Tube
• Boyle’s law
• Charle’s Law
• Gay-Lussac’s law
• Property changes at cryogenic temperatures
• Rocks and Minerals Pavilion: Showcasing of Gem Stones, Ophiolites sequence with Rock samples: Thin section observation with multi-headed microscope
• Fossil Pavilion: Cretaceous Fossils
• Fossil hunt
• Geophysics Pavilion
• GIS & Remote Sensing
• A cool display of the evolutionary history of life on Earth
• Demonstration of different geological features such as folds, faults etc. on a desktop
• Quiz Program
• General presentations describing research at CES
• Exhibits of live animals and preserved specimens
• Games to test your knowledge of nature
• Documentary screenings at 11 am, 1 pm, and 3 pm
• Two Nature walks (10 am and 4 pm - Please assemble at CES)
• Outdoor treasure hunts through the eyes of a field ecologist (10 am, 12 noon, 2 pm and 4 pm - All treasure hunts will begin from CES)
• Teaching of field ecology techniques like navigating with GPS and tracking animals with radio telemetry
POSTER DISPLAYS

- Large Hadron Collider
- The Standard Model
- Monte Carlo simulations
- Quantum Computing
- String theory and gravity
- Dark matter

VIDEO PRESENTATIONS

- Gravitational Waves
- Neutrinos
- Large Hadron Collider
- Quantum Computing
- Dark matter direct detection
- Fermi- LAT
CENTRE FOR INFECTIOUS DISEASES RESEARCH (CIDR)

- Display of posters on various infectious diseases of relevance at present
- Display of posters on important work in CIDR
- Display of infected and normal small animals used in research on Infectious Diseases
- Relay of video on the working practices in a BSL3 lab
- Microscopy
CENTRE FOR INFRASTRUCTURE, SUSTAINABLE TRANSPORTATION AND URBAN PLANNING (CiSTUP)

- Traffic Game
- Quiz
- Traffic Models display
- Puzzles
- Videos relating to transportation
• Periscope
• Kaleidoscope
• Motor principal
• Electric motor
• Unconventional energy demo
• Thermal power
• Hydro power
• Temperature indicator
• Shocking coil
• Chemical tree
• Chemical garden
• Fountain
• Magic water
• Micro thruster - demo
• IOT- monitoring system
• Body phone
• Smoke detector/ alarm
• Virtual eye
• Ultrasonic liquid detector
• Punching Bag
• Lead & fros
• Solar car racing
• Total internal refraction
• Optical waveguides
• Thermal imaging
• Acoustic levitation
• Quiz on nano science
• Super-hydrophobic surface
• Gyro measurement
• Meter to nano meter posters
DEMONSTRATIONS

- Mind-gym
- Human Brain anatomy
- Ames windows Illusion
- Luminance Illusion
- Endless wormhole
- Laser cavity
- Demonstration of Optogenetics
- A learning related task
- A hologram presentation (3-D presentation of neuron, spines etc.)
- The Cockroach Dance
- You will do as I do
- Visualizing neural spikes in cockroaches:
- Stimulate your brain - TMS Demo
- Attention please - Covert attention task
• Cognitive workout - Brain-Machine Interface
• Genie in the bottle
• Citizens of the city of Brain

POSTERS

• Neurodegenerative disorders and Alzheimer’s disease
• How do we pay Attention
• How do we move
• How does the brain develop
• How do evolutionarily conserved molecular building blocks from fruit flies also make a system as complex as a mouse brain
• How do neurons communicate with each other and how is this machinery is built at a molecular level
• How do we remember and how do we forget
• How do we see objects
• Posters detailing the large-scale population studies being undertaken by CBR and CNS to study neurodegenerative diseases in India
• Annual design show - Ripples
• Life Box - For preservation of organs during transportation
• Connected Modular motorized systems controller for industry 4.0
• CleaneRAT - IOT powered sewer inspection and declogging system
• Robotic Arm with manual teaching controls for warehouse automation.
• Solar Water Purifier through heating followed by evaporative cooling and remineralization without any reliance on grid power
• Dhwani - Hearing therapy process on a digital platform
• Design mockups, scaled models
• Live demonstrations, interactive installations
• Design gallery and exclusive CPDM merchandise store
• Live demonstration of Biomass-Gasifier, leaf based biogas plants and building integrated photovoltaic
• Showcasing new technologies for Grey water treatment, plasma activated water based plant growth system and ozone producing reactor
• Workshop for kids: “Roshni” a DIY kit for lighting using ‘end of life’ materials and low cost simple solution to overcome harmful radiation from commercial LEDs
• Posters and models demonstrating on-going status of research in different sectors of sustainability at CST
• Photowalk to highlight glorious past and impact made by various technologies of CST on society
“Back of the Spoon” Outlook of Coanda Effect
Can Surface tension beat Gravity
Diy Microscope
Magnets
Pattern formation in Granular Media
Rod Climbing Effect
Drinking word
Leidenfrost Effect
Basic Laws of Thermodynamics
Measuring the Humidity
Atomic and Molecular level of any Macroscopic behaviour
Baking soda vinegar fire extinguishers
Electromagnets
Lemon Batteries
Impact of Hydrological Cycle on Rain Water Harvesting
• The Brachistochrone Curve
• Disappearing of Glass Beads
• Self Siphoning Beads of a Metal Chain
• Disappearing of Glass Beads
• Bhaskara’s Perpetual Wheel of Water and Sand
• Flow of Sands through a stand pipe
• Demonstration of multi-component earthquake simulation
• Demonstration of shake table
• Demonstration of various experiments in dynamics lab
• Demonstration of pseudo dynamic testing on reaction wall system
• Demonstration of fracture mechanics-based experiments on concrete
• Demonstration of use of acoustic emission to study fracture behaviour of concrete
• Demonstration of uniaxial and biaxial fatigue testing machines
GEOTECHNICAL ENGINEERING

• Poster Presentation on seismic zone and earthquake
• Demonstration of shaking table
• Plate Tectonics model
• Shock waves assisted pile driving
• Simulations of dam and foundation failure using Plaxis
• Demonstration of large cyclic triaxial testing system
• Effect of different shape and sizes of foundations
• Site amplification and liquefaction demonstration
• Resonant column cum cyclic triaxial instrument

TRANSPORTATION ENGINEERING

• Need for Steel Flyover/ Elevated Corridor - A discussion
• Demonstration of Dynamic Traffic Assignment models
• Game theoretic applications in Transportation engineering
• Study on health impact assessment from transportation perspective
• Modelling crowd dynamics in mass religious gatherings - Challenges
• Application of agent-based modelling techniques to
simulate traffic movement

- A comparative analysis of the Smart City policy reforms and their impact on sustainable urban mobility

WATER RESOURCES & ENVIRONMENTAL ENGINEERING

- Animation of transient flow into porous media using numerical methods
- Multiscale persistence in Rainfall and Streamflow
- Spectral-spatial classification of hyper-spectral data
- Demonstration of Smart Water Lab
- Presentation: Earth from Space
- Inter-comparison of GRACE date over India
- Sensor Network Based cyclic physical infrastructure for continuous monitoring of water distribution network
- Parameter estimation of coastal phreatic aquifer near Mukka (Karnataka, India)
- Suggested parameterization choices in the weather research and Forecasting (WRF) model for extreme rainfall event simulation in India
- Four decades of microwave satellite soil moisture sensors

GENERAL QUIZ
COMPUTATIONAL AND DATA SCIENCES (CDS)

- Lab Demos
- Poster display
- Talk by experts
- Quizzes
- Puzzles
- Fun Games
COMPUTER SCIENCE AND AUTOMATION (CSA)

- Interactive Demos
- Technical Quiz
- Coding:
  - Game of Codes
  - Bet to code
- Lab Demonstrations
- Keynotes
- Posters about the current work
DIVECHA CENTRE FOR CLIMATE CHANGE (DCCC)

EXPERIMENTS

- IR absorption by CO2: greenhouse effect demonstration
- Laser beam propagation through the atmosphere: effects of scattering and turbulence
- Real time measurement of black carbon particles
- Real time, size segregated measurement of aerosols
- Particle counter
- Simple experiment to show the influence of surface heating on vertical wind
- Simple experiment to show the inefficiency of incandescent lamps
- Water Quality testing
- Interactive demo of 3D forest scan
- Dual axis solar tracker
- Climate Change Quiz
- Microbes through a microscope
POSTERS

- Application of Drones for effective pesticide spraying
- AC02 and global warming
- AAerosol instrumentation
- AClouds
- AFlouride and Arsenic contamination in water
- ASulphate and radionuclide contamination in water
- A20 kW PV System at Library
- AElectric Mobility in India: Progress and Challenges
- AGlacier Mass Balance
- AHimalayan Glaciers
TALKS & QUIZ

VENUE: G J HALL

- Optics and Photonics Applications Lecture OPAL by Prof. T. Srinivas

OPTICS AND PHOTONICS APPLICATIONS QUIZ

4 SESSIONS:

- OPAQ1 - School level 15 mins forenoon
- OPAQ2 - College level 15 mins forenoon
- OPAQ3 - School level 15 mins afternoon
- OPAQ4 - College level 15 mins afternoon
DEMOS & DISPLAYS

- Basic Optics and Applications (School level) by T Srinivas and team
- Optical Sensors (College level) by T Srinivas and team
- Quantum Communications (Advanced level) by T Srinivas and team

DEMOS

- Spatial Modulation by K V S Hari and team
- Poster Presentation - Applications of Nonlinear Optics by Varun Raghunathan
- Distributed computation with Finite Bit Exchanges by Chandra R Murthy and team
Real time hand Gesture recognition system
Wavelet based Image denoising using shrinkage algorithms
Real time image/video processing on PYNQ- Z2 board

Local air breakdown along surface (Lichtenberg figures)
Ion thrusters and arc inception-quenching
Lightning simulation
Simulation of damages due to lightning currents

3D Reconstruction using RGB and Depth images

Demo of the Tesla coil
MILE LAB
- Human-Human Interface
- Auditory Illusion
- Large vocabulary speech recognition for Tamil

SPECTRUM LAB
- Glaucoma prescreening with the help of a mobile phone
- Motion magnification
- Image Processing on the mobile phone
- Real-world speech denoising
- Text-to-speech synthesis for Indian languages
- Neuromorphic cameras and 3-D scanning

LEAP LAB
- How quickly can you learn a new language
- Identify the number of talkers in an audio snippet.
- Speak to me – we will profile you!
- Learning without an expert?
SPIRE LAB

• How fast can you sketch a vowel?
• Detect ALS by speaking to your phone
• How good is your pronunciation?
• Speak to me in the right tone
• Can you fool the computer by mimicking the celebrity voice?
• Binaural audio
PROJECT DISPLAY

• Sky Dragon (Birds Eye view of IISC)
• Padmapada (National award winning project on robotics)
• Neuromorphic camera Display
• Exoskeleton (Medical emergency handling Robot)
• Invisibility Cloak
• Foot Count without Battery
• Live B.P measurement without Battery
• Air monitoring Watch
• Documentary on Science Fiction (Se-Fi) Zone
INORGANIC AND PHYSICAL CHEMISTRY (IPC)

- Dry ice forming fumes
- Chemical Garden, Elephant Toothpaste
- Magnet & Tonner experiment
- Ink in Milk
- Thunderstorm in a test tube
- Dark room exp.
- Fireworks ignited by ice
- Glass blowing experiments
- Fluorescence
- Tricks with match sticks
- Ping pong ball with liquid Nitrogen
- Traffic Light
- Water Candles
- Polymer OLED
- Fiber formation from Polymer
- Lightning of Lava Lamp
• Interfacial Polymerisation
• Laser Experiment
• Bleeding Heart
• Ignition, extinguishment
• Chemical Garden
• Changing Color
• Chemical Cut Demonstration
• Lava Lamp (for decoration, live demonstration)
• A few posters explaining the science behind these results like: metal complex formation in (1), Crystallisation in (3), etc
Total internal reflection-based experiments and diffraction-based experiments

- Total internal reflection
- Diffraction
INTERDISCIPLINARY CENTRE FOR WATER RESEARCH (ICWαR)

POSTERS & ANIMATIONS

• Monsoon Low pressure Systems
• Climate change impact on water
• Wastewater Treatment
• Isotopes in Hydrology

MODELS

• Water to your home and beyond
• Urban Floods

PICTURES

• Wastewater Treatment
• Water Treatment
• Urban Flood Model

GAMES

• Water Hacks: A gaming zone of water
• Mathematical Puzzles
• Library tour
• An exhibit displaying library services and holdings
• An exhibit displaying major online resources subscribed by IISc
• An exhibit displaying ORCID service
• An exhibit displaying most prolific authors of IISc during 2018
• Handout giving general information about the library
• PPT based demonstration about the library, ePrints@IISc, and etd@IISc
• Quiz competition for the visitors
MANAGEMENT STUDIES (MS)

- MAD Adds - A unique Business Game on products and their prices
- QUIZ MANIA - Quiz on business and Indian economy related topics
- Isolation of DNA from Strawberry
- 3D printing for biomedical devices and tissue engineering
- Zinc-based rechargeable battery systems
- Making Battery from daily products
- Chemoluminescence
- Detection of Adulterated milk
- Microbial Organisms in the air, food and water
- Computer vision based Image processing
- Clapping circuit
- Seebeck and Peltier effect
- Making of artificial silk from Cotton wool
- Electromagnetic Train
- Free energy generator
• Quiz Session (Time: 9 a.m to 12:30 p.m)
• Panel Discussion (Time: 2:30 p.m to 3:30 p.m)
• Talk to Professor (Time: 4:00 p.m to 5:00 p.m)
• Documentary/Screen-cast
  - Session 1: 11:00 a.m to 12:30 p.m
  - Session 2: 3:00 p.m to 4:00 p.m
• Treasure Hunt
  - Session 1: 9:30 a.m to 12:30 p.m
  - Session 2: 2:00 p.m to 5:00 p.m
• Games (Time: 9:30 a.m to 12:30 p.m and 2:00 p.m to 5:00 p.m)
• Demonstrations (Time: 9:30 a.m to 12:30 p.m and 2:00 p.m to 5:00 p.m)
MECHANICAL
ENGINEERING
(ME)

- Quiz
- Competitions (e.g. Mirror maze, Egg Suit, Paper Tower)
- Posters and demos of ongoing research
- Cybicle (Reverse Cycle)
- Live Science demos (e.g. Water Rockets, Acoustics, Robots, Compliant Mechanism)
Microbiology- We will illustrate bacterial growth on the agar-plates also there will be posters to reveal the emergence of the antibiotic resistance and its impact on the society.

Virology- Life-cycle of viruses such as HIV and HCV, in the human body will be displayed using posters.

Model Organisms- Demonstration of experimental animals such as C. elegans, rabbit, mouse, and their significance in experimental biology will be emphasised along with the posters.

Molecular Biology- Display of the DNA gels together with the protein gels.

Cell Biology and Cancer Biology- Cell division, vesicular trafficking will be displayed either using posters or PowerPoint presentations. Posters and models will
be used to demonstrate the formation, spread, and treatment of various cancer

- **Plant Biology** - experiments on plants as a model organism to study growth and development and also the impact of microbes on plant growth will be demonstrated using posters and presentations
Molecular Biophysics Unit (MBU)

- Demonstration of X-ray diffraction by protein crystals
- Visualizing Protein 3D structures in Virtual Reality (VR)
- Crossword, Pictionary and Jumbled words
- Physical models of biomolecules
- Intro to protein structure and NMR
- Interface of chemistry and biology
- Neuron model
- Protein Origami
- Lego blocks of Amino acids
- Model of Protein structure
- Sighting the crystals
• Posters showcasing the scientific research of the Department
• Displays centered around cancer, developmental biology, genetics, cell signaling, reproductive biology, aging and metabolism and structural biology
• Models/static displays of cells, plates, cultures etc. with video
• Interactive games
• H₂-Balloon
• Bleeding Vegetables/Burning Ice
• Iodine Crackers
• Fireball in hand/Gun cotton
• Turning Cu into gold
• Dancing Sodium
• Thermochromic System & Solvatochromism
• Cabbage pH color change
• Borax glue
• Magic mud or NEW or Chemiluminescence
• MB-Sugar color change
• Nylon experiment
- Anti-theft scanner
- Levitation of magnetic spinning top
- Measurement of speed of light using microwave oven
- Conservation of electromagnetic angular momentum
- Eddy current brakes
- Gravitational Lens
- Tesla coil
- Light and shadows
- Stroboscopic effect
- Sand Pool
- Ferrofluid
- Maglev train
- Angular momentum
- Standing waves using sand particles
- Thermoelectric windmill
• LED in liquid nitrogen
• Lenz’s law
• Touch me not circuit
• Gas flow sensor
• Models from ISRO
• Electrical Theremin
• Mercury Precession
• Tidal Locking
• Walking Robot
  - How the Robot Walks
  - How the Robot Learns to Walk
• Smart Poles with Drone Ports
  - Drone Port with Charging Pad
• Chemical Traffic Light
• Bleeding heart, Ginie in a bottle, Metal flower
• Elephant toothpaste, Magic milk
• Tindal effect
• Instant snow, Electricity from potato
• Preparation of Nylon and Rayon
• Chemical Clock, Colour Show
• Dry ice colour show
• Golden rain
• The Jumping Ring
• Young’s double slit experiment
SUPERCOMPUTER EDUCATION AND RESEARCH CENTRE (SERC)

- SERC Museum of Computer Hardware Archives!
- Posters on History of Computer Devices
- Videos on Inside a Supercomputer Centre
- Presentations, Demos and Videos on Supercomputing for Science, Engineering & Society
• Measuring noise pollution
• Drone for farmers
• Smart stick for the visually impaired
• Sleep pattern research
• Voice controlled vehicle
• Disorders of the adrenaline gland
• Floating waste cleaner
• CO2 to Oxygen converter
• Effect of music ragas on human brain

... and more
TAKE PART IN EXCITING CHALLENGES

- Rapid Chess
- Fast Cubing
- Math Blitz
  ... and more

LEARN ABOUT NIAS EDUCATION FOR THE GIFTED AND TALENTED CHILDREN

- How to join a NIAS Advanced Learning Centre?
- How to make your school a NIAS Advanced Learning Centre?
- What goes on at a NIAS ALC?
  ...and more
• Showcasing science exhibits and activity kits at the IISc Raman Building (ICTS-TIFR, old Physics building at IISc)