



Advancing Technology for Humanity

IEEE EXHIBITS @ BM Birla Science Centre

IEEE Exhibits

IEEE Forum for Science and Engineering Exhibits
(IEEE Forum - SEE)

February 2014

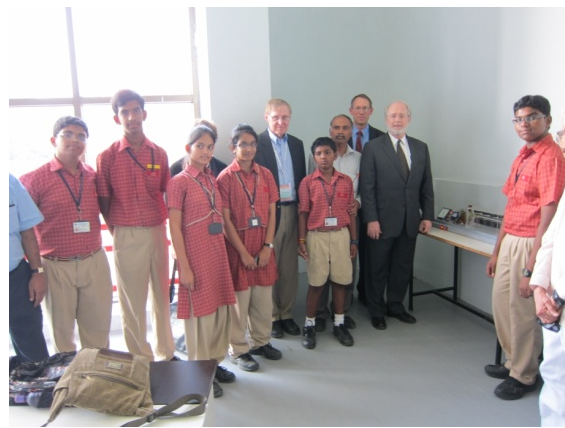
IEEE Exhibits @ BM Birla Science Centre, Hyderabad

IEEE Exhibits

The exhibits featured in the IEEE Exhibits are innovative methods to demonstrate complex scientific and engineering concepts to pre-university audiences. These include hands-on exhibits, multimedia presentations and teacher manuals. Hands-on exhibits enable visitors experiment, experience and learn through exploration.

Program objectives

- Provide educational interactive experiences for pre-university students of ages 13 to 18 in IEEE's fields of interest.
- Illustrate fundamentals of science, computing, and engineering and their applications.
- Help create interest in science and engineering as a career path.
- Develop exhibits at a low cost so that they may be easily replicated in Science and Technology Museums around the world.
- Contribute to public awareness and understanding of electrical and computing technologies and their applications.



Some of the volunteers who created IEEE Exhibits

IEEE Exhibits @ BM Birla Science Centre



Implementation

IEEE has provided the necessary funds, initially as a small challenge grant in 2010, and for the next three years as a major New Initiatives Grant. Birla Science Centre made available the infrastructure, including about 6000 square-foot museum floor space. The two organizations joined hands to create **IEEE Exhibits**. IEEE Forum for Science and Engineering Exhibits (**IEEE Forum-SEE**) consisting of IEEE members, museum personnel, and volunteers from industry and academia planned and executed the development of these exhibits. Between 16 and 20 exhibits are slated for development and fielding during 2010-13. More than 100 volunteers, including several college and high-school students, contributed in the development of these IEEE Exhibits.

Contact for more information

IEEE Forum SEE

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IEEE Educational Activities

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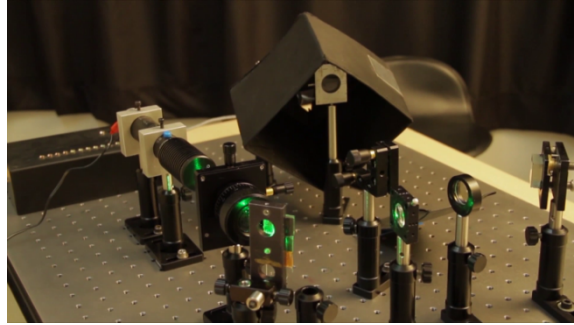
BM Birla Science Centre

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IEEE Exhibits @ BM Birla Science Centre

IEEE Milestone – Discovery of Raman Effect



A quest for exact science behind every day observations, such as why is the sky blue or why is the ocean blue, led to the discovery of *Raman Effect* by Sir Chandrasekhar Venkata Raman; and also won him the Nobel Prize for Physics in 1930.

A fully working replica of the original experiment, which resulted in the discovery of Raman Effect in 1920s is created as an IEEE Exhibit. In the original experiments, CV Raman and KS Krishnan used focused sun-light and later mercury arc lamp, as the light source. In the replica Exhibit at the Birla Science Centre, a green laser beam is used as the light source to facilitate a real-time viewing of the results. In this Exhibit, the visitor can see

- Fluorescence (scattered light as per Rayleigh principle at the wavelength of incident light,
- Raman Spectra at wavelengths different from that of the incident light.

In December 1998, American Chemical Society recognized the discovery of *Raman Effect* as an **International Historic Chemical Landmark** for its role as an analytical and research tool, and its applications ranging from non-destructive identification of minerals to the early detection of life-threatening diseases.

In September 2012, IEEE recognized the discovery of *Raman Effect* as an **IEEE Milestone** in electrical engineering and computing, which is a rare distinction given for a significant technical achievement that occurred at least twenty-five years ago in an area of technology represented in IEEE.

This IEEE Exhibit includes a multi-media presentation and informative posters on the *Raman Effect* and its applications.



For more information, contact

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IEEE Milestone – First Millimeter wave Experiment



In 1895, Jagadish Chandra Bose demonstrated the generation, transmission and reception of millimeter wave frequencies. Bose was elected Fellow of Royal Society in 1920.

Bose generated electrical radiation at 5-millimeters wavelength, or about 60 Giga-Hertz frequency, with an electrical spark between a sphere and two concentric outer hollow hemispheres. At the time of these experiments, instruments did not exist for measuring millimeter wave frequencies. Wavelength of electric radiation was determined by using curved gratings. An open-ended waveguide was used as the transmitting antenna. A spiral-spring receiver, in which the spring pressure is finely adjusted to achieve optimum sensitivity, was used.

A working replica of the original experiment conducted by Bose is now created at the Birla Science Centre as an IEEE Exhibit. Frequency of operation in this replica Exhibit was measured to be between 59 and 61 Giga-Hertz using a spectrum analyzer.

The experiment of JC Bose was about 50 years ahead of others work in this area. The classic 'First Millimeter wave Communication Experiment' conducted by Jagadish Chandra Bose was recognized by the IEEE in September 2012 as an **IEEE Milestone** in electrical and computer engineering.

The Exhibit includes a short multi-media presentation and informative posters.



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Eddy Current Effects



This IEEE Exhibit is created by an IEEE member and volunteer from Hyderabad. The multi-media presentation is contributed by Wipro. In a practical experiment arranged on a table, visitors see a manipulative that has three channels:

- A non-metallic PVC channel with a sliding magnet placed in it.
- An Aluminum channel, with a sliding magnet placed in it.
- An Aluminum channel, with a sliding non-magnetic metal piece

Visitors conduct the experiment by simply tilting the three-channel assembly to the left, or to right, and observe that

- Magnet in the PVC channel falls freely due to gravity
 - Magnet in the Aluminum channel falls relatively slower compared to its fall in PVC channel
 - Non-magnetic metal piece in Aluminum channel falls freely due to gravity
- Visitors view the accompanying multi-media presentation to get a detailed explanation of the physics involved and practical engineering applications of eddy currents.



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Boolean Adder - How Computers Compute



The IEEE Exhibit Boolean Adder is created by the students of National Institute of Technology, Warangal; and mentored by IEEE Hyderabad Computer Society Chapter. The Exhibit provides a hands-on experience of an adder at work. The Exhibit shows the actual operation of an adder circuit with inputs provided by the visitor.

The accompanying multi-media presentation explains:

- Boolean numbers and Boolean algebra
- Binary logic, and how it is used in representing numbers
- How binary logic is used in carrying out mathematical operations, specifically the addition of numbers
- How an adder, which is a main building block of a computer, is constructed

The multi-media presentation also illustrates some contemporary applications in which computing devices play a crucial role.

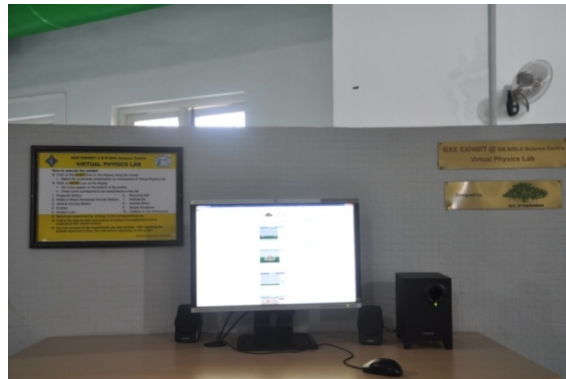


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Virtual Physics Lab



The IEEE Exhibit Virtual Physics Lab is developed by the International Institute of Information Technology, Hyderabad. This development was supported by the Government of India under Media Lab Asia project. There are ten experiments in the Virtual Physics Lab. In each experiment, the visitor first sees a video which explains the scientific concept and then has the opportunity to conduct experiments by changing the parameters, looking at the graphs and understand what is going on.

The experiments include:

- Simple Pendulum
- Friction between Surfaces
- Vertical Circular Motion
- Motion of a Projectile
- Collision between two Bouncing Balls
- Compound Pendulum
- Motion on Inclined Plane
- Collision in two Dimensions
- Horizontal Circular Motion (Potter's Wheel)
- Hooke's Law

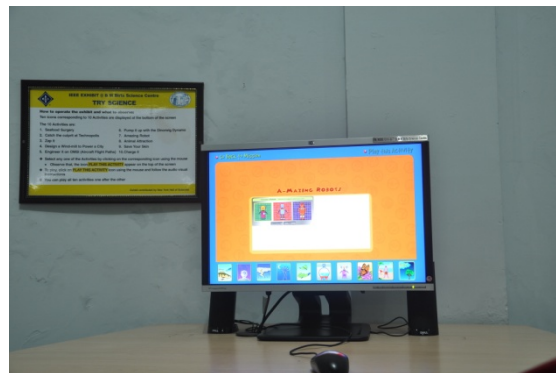


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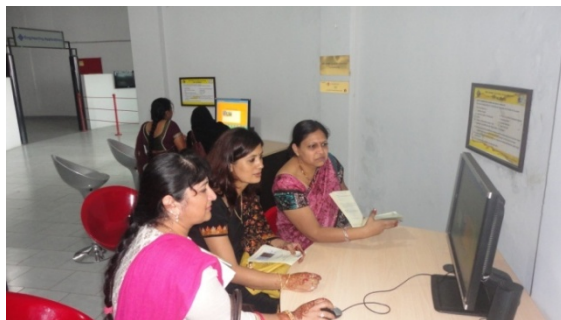
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Try Science around the World

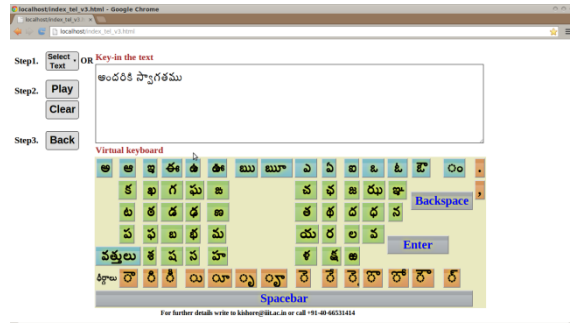
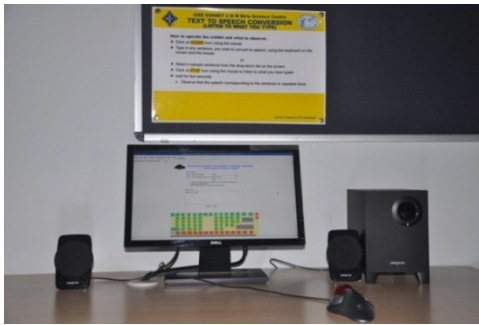


This exhibit is brought to you by the IEEE in association with the New York Hall of Science. The exhibit was first un-veiled by the New York Hall of Science in 2000 in partnership with the Association of Science-Technology Centers, IBM, and other science centers worldwide. Try Science is a great way to experience the excitement of science through interactive experiments. The ten simple experiments in this exhibit explain the principles of science, and how their applications play important roles in our every-day life.



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Listen To What You Type



This IEEE Exhibit presents a computer based text-to-speech conversion system developed by the International Institute of Information Technology, Hyderabad. This exhibit demonstrates the abilities of a computer to convert a given text into speech. Such conversion is achieved by enabling a computer to learn the correspondence between alphabets and sounds of speech. It involves natural language processing, signal processing and machine learning. Presently, this exhibit has six languages (English, Telugu, Kannada, Malayalam, Tamil and Hindi).

Accompanying short multimedia presentation describes in simple language the science involved in converting text to speech.



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Learn a Language Using Computer



This exhibit created by the Tata Consultancy Services for the IEEE, presents a computer which enables you to read and write Telugu, Hindi or Urdu. In this exhibit, visitors will see puppets showing how a word is formed through grouping of alphabets. They also create new words by re-arranging the alphabets. This computer based puppet-show also helps visitors learn how to pronounce words properly and communicate, and read. In this exhibit, the computer acts as the teacher, and helps visitors read and in three Indian languages – Telugu, Urdu and Hindi. Visitors can also perform basic arithmetic.



For more information, contact

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IEEE Exhibits @ BM Birla Science Centre



Inauguration of IEEE ExhibitsMrs. Nirmala Birla January 2012



IEEE International SymposiumDr Moshe Kam & Dr APJ Abdul Kalam November 2012



Inauguration of Exhibits created by Students

Visitors to IEEE Exhibits

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Dr Kalam with students at IEEE Exhibits



Dr Moshe Kam presenting Certificate to a student



Visit of Drs John Walz, Gordon Day and Peter Staecker December 2011



Past-Chairs of IEEE Hyderabad Section January 2012



Visitors at IEEE Exhibits

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Biometric and DNA Identification



Two exhibits created by IEEE volunteers from Hyderabad help to de-mystify the principles on which biometric and DNA identifications are done in practice. At the entrance station (called Registration Centre), the finger print and iris image are recorded along with photograph of the visitor. At another station (called Identification Centre) located some distance away, the visitor gives his/ her finger print and iris images (same finger and same eye) for biometric identification. His/her earlier recorded photograph appears automatically when the now recorded finger print and iris image match with the previously recorded image.

An accompanying multi-media presentation describes, in simple language, the principles and techniques used in the identification of a person based on finger prints and iris images. Another multi-media presentation describes the principles, on the basis of which, an identification of a person is done from his/her DNA characteristics.



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Fleming's Left Hand Rule



This IEEE Exhibit is created by students of Andhra Mahila Sabha P Obul Reddy Public School, Hyderabad with mentoring provided by IEEE volunteers. Fleming's Left-Hand rule is a basic principle in electrical engineering.

The arrangement in this exhibit consists of a cylindrical rod made of conducting material (copper) placed over two parallel rails (brass), such that the rod is able to roll smoothly over the rails. The rails are placed between the poles of a permanent magnet. The rails are connected to a source of current. A hands-on interactive experiment can be conducted using this exhibit. Direction of current flow can be also changed to observe the direction of resulting thrust, or movement of rod.

This IEEE Exhibit and the accompanying multi-media presentation explain relevant basic principles in electricity and magnetism, nature of force on a current-carrying conductor placed in a magnetic field, and the Fleming's Left Hand Rule and its applications in the engineering of equipment.



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Electrical Resonance



This IEEE Exhibit is created by students of Bharatiya Vidya Bhavan's Public School, Jubilee Hills, Hyderabad; and mentored by IEEE volunteers. Resonance is a fundamental phenomenon in physics. It can occur in electrical and electronic circuits. It can also occur in mechanical structures, buildings and bridges. This exhibit enables the visitor to create parallel and / or series resonances in simple electrical circuits, and observe accompanying changes in current flowing through the circuit or voltage across a circuit.

Accompanying multi-media presentation explains:

- Principles of resonance
- Series resonance in electrical circuits
- Parallel resonance in electrical circuits
- Applications of resonance in electrical circuits
- Concepts of energy storage and energy transformations during resonance.
- Resonances in mechanical structures and buildings.

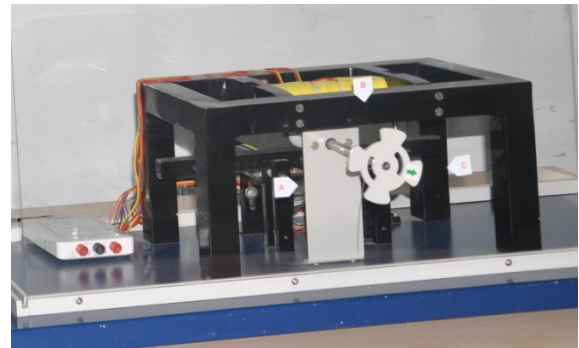


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Electromagnetic Induction



This IEEE Exhibit is created by students of Bharatiya Vidya Bhavan's Public School, Jubilee Hills, Hyderabad; and mentored by IEEE volunteers. This exhibit won an award for innovation from the Council of Scientific and Industrial Research. The Exhibit demonstrates the principle of Linear Variable Differential Transformer (LVDT) and enables the visitor to experiment and observe the change in electrical current caused by very small linear displacements.

Accompanying multi-media presentation explains:

- Relevant basics of electromagnetism
- Principle of mutual induction
- Working of LVDT
- Applications of LVDT

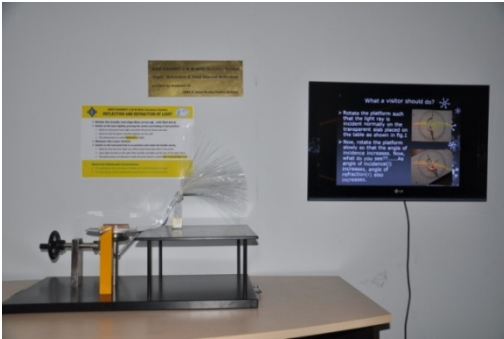


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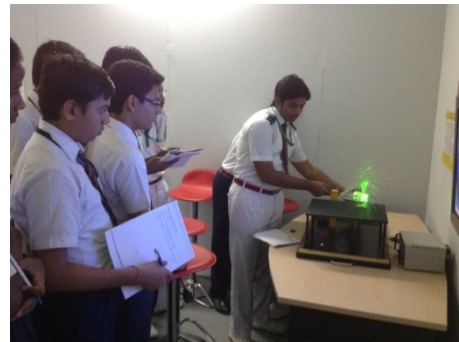
Light – Refraction and Total Internal Reflection



This IEEE Exhibit is created by students of Andhra Mahila Sabha P Obul Reddy Public School, Hyderabad, and mentored by IEEE volunteers. The hands-on interactive exhibit enables the visitor to change the angle of incidence of the light beam in a glass slab, and observe reflection and refraction of light.

In this hands-on interactive exhibit and the accompanying multi-media presentation, the visitor will learn about:

- Refraction and reflection of light
- Total internal reflection of light
- Application of these principles in optical fibers.



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Pick and Place Robot



This IEEE Exhibit is created by the students of Nitte Meenakshi Institute of Technology, Bengaluru; and won First Prize in an IEEE All-India Student Project Contest in 2009. Work on this Robot at the NMIT-Bengaluru was also partially supported by the Defense Research and Development Organisation – Centre for Artificial Intelligence Research. This articulated Robot has five degrees of freedom, and includes ‘intelligent vision’ using a charge-coupled-device (CCD) camera. The software modules enable a contouring of objects placed in workspace, segmentation of objects with the background, extraction of boundary profile of selected object for identification, and tracing the interpretation tree for identification of selected object. Visitor can interact with the Robot, and select a work piece which is to be picked-up. The Robot is pre-programmed to deposit the work-piece at a specific location.

Accompanying multi-media presentation describes the principles of operation of a Robot, and some example practical applications in which robots of this type are used.



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IEEE E-Scientia



IEEE E-Scientia Exhibit is created by volunteers of the IEEE Uruguay Section with support of the IEEE Educational Activities Board. This Exhibit has been specially duplicated for fielding at the BM Birla Science Centre, Hyderabad. Each participant is part of a space flight mission. For this purpose, visiting students have to build electronic circuits to provide power, propulsion, communications, life maintenance and defense for the spaceship. The circuits are built using educational electronic kits. Prior to building circuits, students undergo a brief familiarization and training via multi-media presentation. The main objective is to create awareness among high school students on how electronic devices work, and the role played by these devices in some challenging and advanced applications; and attract the attention of students to electrical, electronics and computer engineering fields.



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Green Energy



This exhibit has a roof-top 5400 watts peak solar photovoltaic power supply and 1000 watts peak wind-mill. Un-interrupted power supply with a back-up battery bank is part of the set-up. When there is inadequate power supply from Green energy sources, the UPS draws power from the mains grid. This exhibit provides electrical power to the seventeen IEEE Exhibits display stations located in the IEEE Exhibits area.



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Optical Fiber Communications



The exhibit consists of two stations, Station-A and Station-B, connected by a fiber optic communication link. This communication link has capability to carry audio, video, and digital information packets (data) simultaneously. Various components and parts of the communication link are labeled clearly to facilitate visitor understanding.

Visitors can speak from station-A to Station-B, watch a video stream, and view at Station-A and Station-B what a web-cam located at the other station is seeing

A multimedia presentation describes:

- Optical fibers for communication
- Frequency spectrum and its applications
- Fiber optic communications
- Concepts of multiplexing and bandwidth in communications.



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IEEE. tv



This is an informal Lounge area in which visitors can relax and watch selected pre-recorded programs from IEEE.tv website. Several posters in this area give information on IEEE and its activities



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AWARDS & RECOGNITIONS

For over a century, the IEEE has sponsored various programs to honor achievements in education, industry, research, and service. These awards and recognitions each have a unique mission and criteria, and offer the opportunity to praise distinguished colleagues, dedicated teachers, and corporate leaders who have made a lasting impact on humanity, technology, and the profession.

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{{The Institute of Electrical and Electronics Engineers (IEEE) is the world's largest scientific and technical society with a membership of around 430,000 members living in more than 190 countries. IEEE has 38 Societies and 7 Technical Councils covering different specializations across electrical and computer engineering to encourage scientific and technical advances and facilitate scholarly exchange of information}}



{{ BM Birla Science Centre, which is located in the heart of the city of Hyderabad in southern India is regularly visited by nearly 100,000 students from different schools and an equal number of other visitors every year. The Centre has a Planetarium and a floor dedicated to hands-on experiments, which is very popular with young students and their parents.}}



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IEEE – Hyderabad Section, <http://sites.ieee.org/hyderabad>

www.ieee.org/education_careers/education/pre-university/low_cost_exhibits.html