

Public Lecture by Director General of CERN, at TIFR Mumbai

Press Release, TIFR, Mumbai

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Public Lecture on 21 Nov at 5pm



The Tata Institute of Fundamental Research announces a Public Lecture by Dr Fabiola Gianotti, Director General of CERN, (European Organisation for Nuclear Research) the world's largest particle physics laboratory.

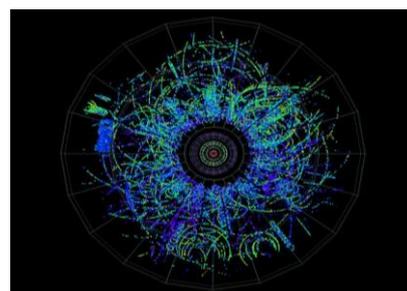
Dr Gianotti, received her Ph.D. in experimental particle physics from the University of Milano in 1989 and has been a research physicist in the Physics Department of CERN for over two decades. She has worked on several major CERN experiments, and has been involved in detector R&D, construction, software development and data analysis. From 2009 to 2013, she held the prestigious position of project leader for the ATLAS experiment at CERN during which period the ATLAS and CMS experiments led to the discovery of the Higgs Boson which was crucial to our understanding of fundamental physics.

Her lecture will describe the research and the unprecedented technological advances that have allowed the discovery of the Higgs Boson, the significance of this discovery to physics, and its relevance to our day to day lives. Future physics opportunities at CERN's Large Hadron Collider (LHC) will also be discussed.

Dr Gianotti has authored over 500 publications and is a member of several international committees, including the scientific advisory board of the UN-Secretary General and the National Academy of Sciences of the United States. She came to physics from an education steeped in ancient Greek, philosophy and the history of art. She was included among the "Top 100 most inspirational women" by The Guardian newspaper (UK, 2011), ranked 5th in Time magazine's Personality of the Year (USA, 2012) and included among the "Top 100 most influential women" by Forbes magazine (USA, 2013). In January 2016 she became the first woman director General of CERN.

India is an observer state of CERN's programmes and has engaged with CERN for over half a century, of which TIFR's association and active involvement with CERN goes back several decades.

In the early 1960s scientists from TIFR and Panjab University worked on experiments using Nuclear Emulsions exposed to beams from the proton-synchrotron (PS) machine at CERN. Later, groups at TIFR and other Indian universities participated in CERN-based international collaborations to use Bubble Chamber techniques to study various mesons that involved heavier than usual quarks produced in hadronic (proton-antiproton) collisions. This set the stage for long lasting, successful and continuing collaborations with CERN. By 1985 scientists from TIFR had joined L3 experiments at LEP, the large electron-positron collider at CERN which was replaced by the LHC, the world's most powerful particle accelerator, in 2002.

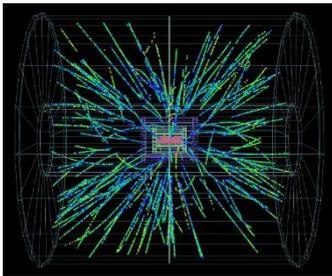


Leaders of the TIFR group, the late P.K.Malhotra and S.N.Ganguli, were instrumental in initiating India's commitment to the LHC project at CERN. TIFR hosted the first CERN-India collaboration meeting in 1994 and has hosted the visits of past CERN Director Generals notably Nobel laureate Carlo Rubbia and Chris Llewellyn Smith in the early 1990s, around the time when TIFR scientists started detector R&D activities for the next hadron collider, to study the radiation hardness of detector materials, utilizing facilities at BARC.

Indian scientists and engineers have been contributing to the LHC project through collaboration in experiments (CMS and ALICE), accelerator and grid computing, since the last 2 decades.

TIFR was one of the first groups to join CERN's CMS international collaboration around 1996, an experiment at the LHC that is searching for new physics. **For the LHC, scientists at TIFR and Panjab University built a part of the detector known as the hadron outer (HO) calorimeter.** By mid-2000, the LHC experiments embraced internet-based distributed computing technology for data analysis. **TIFR hosts the Indian Tier2 Grid Computing facility for the CMS experiment and is the nodal institute of the India-CMS collaboration** carrying out various responsibilities on behalf of India-CMS collaboration.

Several institutions in India have been contributing to all aspects of the CMS experiment, detector commissioning, calibration, monitoring, simulation studies, data collection, data certification, data analysis and publication of scientific results. This includes running various shifts at the CMS experimental site to ensure excellent performance of the detector during collisions provided by the LHC machine. Participation in remote shifts for the CMS experiment to monitor data flow and computing started at TIFR .



Run1 of LHC (2009 to 2013) provided proton-proton collisions mainly at 7 and 8 TeV and heavy ion collisions. After a 2 year shutdown the LHC machine in Run 2 (2015-2017) is now providing collisions at 13 TeV. Indian scientists have been very active in analysing this data and have contributed significantly to a large fraction of the nearly 600 papers published until now.

In 2012 CMS and ATLAS, the two main experiments at LHC, discovered the Higgs boson after a search spanning several decades. Scientists from TIFR as well as other parts of the country contributed to the simulation studies, computing, scrutiny and analysis of data leading to this significant scientific result.

In the last few years, several new groups have joined the CMS collaboration with funding support from DAE and DST. The Indian contingency comprises about 100 personnel. A large number of Ph.D. students are being trained in multiple aspects of experimental physics by working in the CMS international collaboration. This younger group of scientists will enhance India's contribution to the LHC in the future.

The LHC project will continue for the next 2 decades using a more intense beam than initially planned. In parallel, improvement in the accelerator sector will also take place. Intense R&D for hardware has already begun which will lead to a CMS detector that is prepared for a far more challenging environment.

In the last few years India has participated in the upgrade of the CMS experiment by contributing to the muon detection system as well as hadron calorimeter. India will continue to contribute to future upgrades of the LHC machine and the detectors. The associate membership of India in the CERN council will pave the way for India's access to high-technology areas, and allow Indian industries to bid on a competitive basis for various contracts floated by CERN. In addition, there will be huge opportunity for India's younger generation to participate in various training programmes of CERN.

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