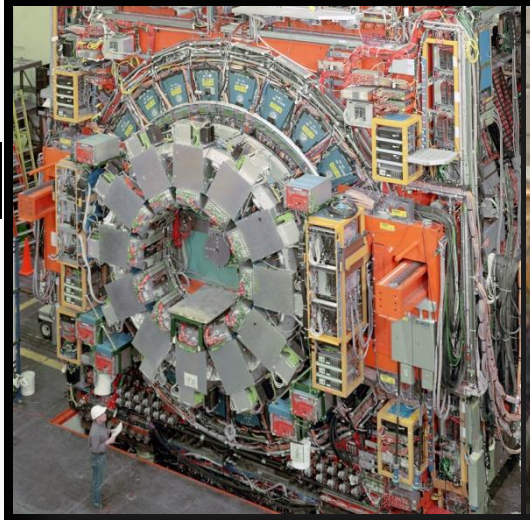

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RESEARCH AND COLLABORATION IN HIGHER EDUCATION

Introduction

- The tradition of science in India extends back to millennia with Aryabhatta, Bhaskara, Brahmagupta, Panini and others still celebrated for their foundational contributions to the fields of mathematics, astronomy, and chemistry.
- In the modern era, science and technology have been central to India's development efforts.
- The system of higher education in India has expanded rapidly during the last 50 years.
- Large Indian population; and a large fraction of it being young and trained in science and technology areas should have been a case of converting a burden into a valuable resource!

But, why?

- The best students still go abroad for further studies? The loss is not just a person, but often a whole new area of expertise or field of research
- We do not get the best minds to take up research in basic sciences in India?
- Indians lead major corporate and science and technology enterprises abroad and contribute to wealth and development of those countries? Daily dose of news!
- Majority of science students enrolled for Ph.D. want to do their doctoral thesis in theory, not on an experiment?
- Many passed out students even in science and engineering streams are not fit/equipped to take up a decent job!

Regulatory bodies

- National Policy on Education (1986) and Plan of Action (1992) advocated the establishment of an independent national accreditation body.
- National Assessment and Accreditation Council (NAAC) was established in 1994.
  - Make quality the defining element of higher education in India through a combination of self and external quality evaluation, promotion and sustenance initiatives.
- Association of Indian Universities (AIU) is a voluntary organization of all Indian universities.
  - Promote or to undertake programs to improve standards of instruction, examination, research, textbooks, scholarly publications, library organization and such other programs as may contribute to the growth and propagation of knowledge
- University Grants Commission (UGC), All-India Council of Technical Education (AICTE), National Accreditation Board (NAB)
- National bodies to coordinate Medical (ICMR), Agricultural (ICAR), Social Science (ICSSR), Scientific and Industrial Research (CSIR)
- Autonomous science and technology institutes under the purview of Department of Atomic Energy and Department of Science and Technology

What are the road blocks?

- How to balance the teaching load and research?
- Augmentation of research specific staff in the academic institutes.
- Severe shortage of laboratory, computer, library and other infrastructural facilities.
- Struggle to finish the prescribed syllabus; students not informed or introduced to the *real world.*
- Research and corporate establishments receive only the *finished product.*
- Academic and research institutes seems work in isolation, where as they should be working as a team and benefit from each other's efforts.

TIFR public outreach programme

- The Science Popularisation and Public Outreach Committee of TIFR develops programmes which will serve the following purposes:
  - Informing students and general public about the research work being done at TIFR.
  - Providing a platform for the teaching community to participate in continuing education and research to improve their professional skills.
  - Inspiring students to pursue a career in basic sciences.
  - Informing the public about the latest trends and developments in scientific research.
  - Conveying the importance of exciting new developments in science and technology.
  - Providing authentic information to journalists and science writers etc.
- This activity is an important part of TIFR's commitment to the community.

Some of the major initiatives

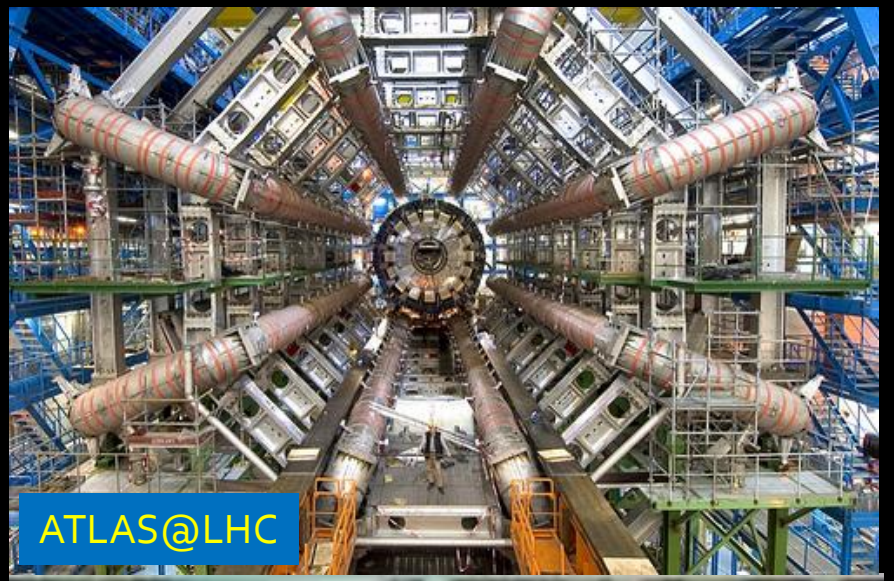
- Public lectures by Nobel laureates and other top scientists from all over the world; target audience being students and general public.
- Open house programmes, where Class X students listen to inspiring and informatory talks and interact with scientists in their labs; parents and science teachers accompany the kids.
- *Chai and Why*: Jointly organised by TIFR and Prithvi Theatre. A monthly forum to enable informal discussions of interesting scientific issues outside a traditional academic setting.
- Workshops for the college teachers. Introducing them to the frontiers of science and technology
- Teacher Researcher Interaction Program. The teacher is associated to a specific member of TIFR for 3 months per year.
- Visiting Summer Research Programme; Science academies' summer research fellowship programme for students and teachers
- Projects for final year science and engineering students. An opportunity to work on real research problems while still in college.
- *Invite a Lecturer* programme to deliver talks in the academic institutions
- Guided Astronomy shows and night sky observations
- Lectures at scientists' alma matter: Give back to the community!

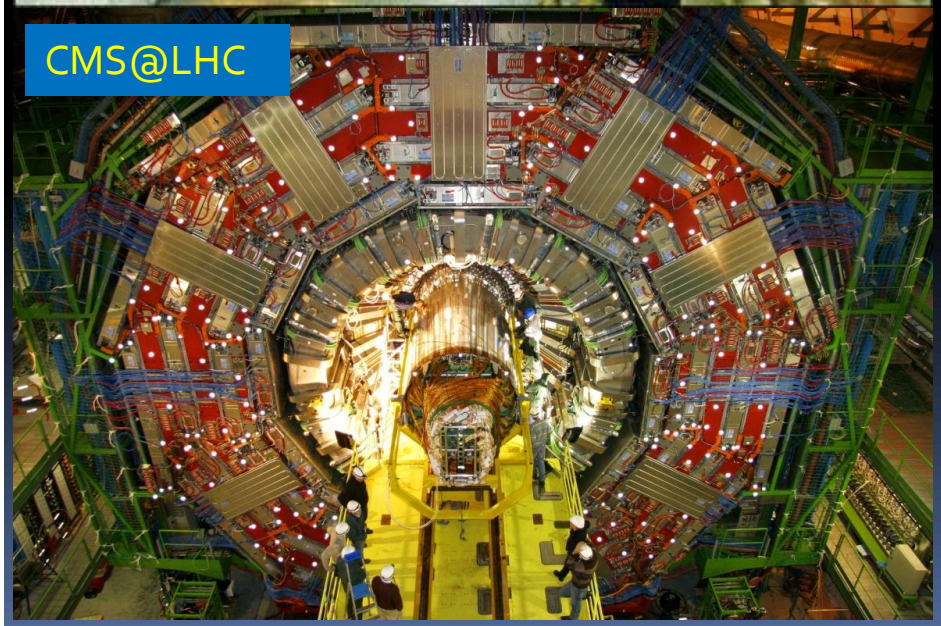
International Collaborations

- A new approach in the XI th Five Year Plan of Government of India, Planning Commission, 2006
  - Collaborative programmes to ensure that national priorities are taken care of.
  - The International Collaboration activities should be leveraged primarily aiming at complementing and supplementing ongoing national efforts in selected areas of basic research.
  - New initiatives aiming at developing and implementing mega S&T projects both in areas of basic sciences and other areas of need including societal needs also should be given due importance and priority.
  - International collaboration inputs should also be effectively used in developing world class facilities in selected areas in the country as well as for India's participation in major International S&T mega projects/initiatives.

Age of collaborative research


LHC@CERN


ATLAS@LHC

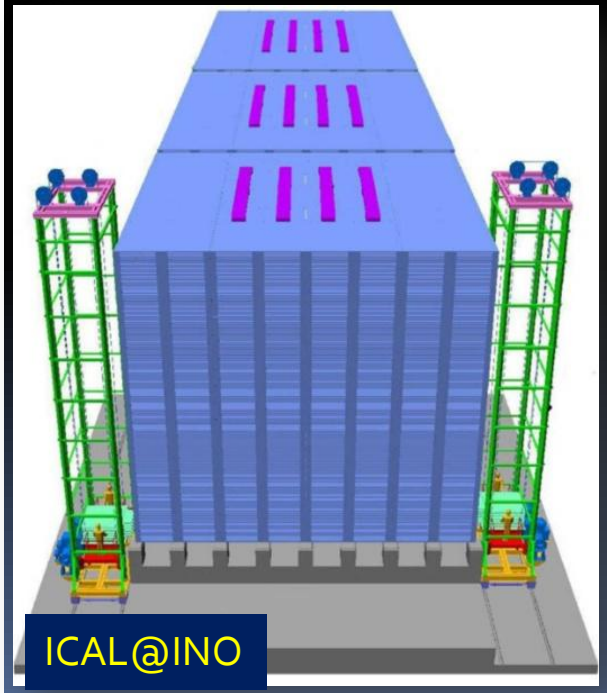

CMS@LHC

CMS Collaboration

The CMS experiment is one of the largest international scientific collaborations in history.

There are 3600 people working for CMS, 3000 of which are scientists and engineers. These people come from 183 institutes in 38 countries, spanning Europe, Asia, the Americas and Australia.

Mega science projects in India



- Mega science projects create an exciting opportunity for our young scientists to participate in cutting edge research and attract them to science by offering meaningful post graduate or doctoral programmes.
- Specifically, this could include organizing summer/winter schools, summer projects for B.Tech, projects for M.Tech students, and research programmes for students pursuing a Ph. D. in science or engineering.
- They enable the possibility of scientists from other countries to participate in such programmes in India, thereby creating greater opportunity for larger number of young Indian scientists to be exposed to their peers.

Catch them young

- Early collaboration between academic and research institutions.
- Students are indicators for fine tuning the areas and level of collaboration in research.
- Caltech (USA) for example has run the SURGE project since 1919.
- National Initiative on Undergraduate Science (NIUS), a major initiative of HBCSE (TIFR) concerning tertiary science education in India.
  - Initiating and guiding students over an extended period for proto-research.
  - Promoting undergraduate research are main goals of this programme.
  - Assist college teachers in setting up modest research programs who in turn would then locally mentor students.
- Jagadis Bose National Science Talent Search (JBNSTS) programmes for young students and teachers.
- Kishore Vaigyanik Protasahan Yojana (KVPY) programme.
- Diversity adds new dimension to research. They can offer something different! Treat them "not just as people to be schooled or taught but [look at] what they can contribute to what you are doing" (Nick von Tunzelmann, professor of science and technology policy at Sussex University)
- Will enhance secondary student preparation for higher education.

Good news, changing times

- Funding for education and research in the eleventh five-year plan, (2007 - 2012) includes a four-fold increase for education over the previous plan.
- Government spending on science research currently accounts for roughly 0.9% of GDP; the figure is expected to rise to 1.2% by 2012.
- Huge endowments and sponsorships by corporate sector
- Research infrastructure in India is improving rapidly
- Attractive pay packages for the personnel working in government funded research institutes; comparable to those in private sector
- Mega science experiments and huge research programmes are being approved and funded *routinely*; not necessarily confined to well known institutes or to big cities
- Opportunities to work with leading academicians and scientists through collaboration deputations and government fellowships
- Students should be aware of these home grown centres of excellence so that they may be motivated to stay back.

Some recent developments

- Universities from Europe, the United States and Canada are very eager to collaborate with and invest in Indian higher education institutions.
- India and US announced their first-ever higher education summit to be held in India in 2011, promising more joint projects and the possibility of involving the higher education sector in policy-level initiatives.
- A delegation of US higher education government officials and high-level administrators from 10 US colleges and universities, recently visited India as part of the International Academic Partnership Program, funded by the US Department of Education's Fund for the Improvement of Postsecondary Education.

Concluding comments

- Institutes especially from US,UK etc. depend heavily on foreign students in their doctoral programs. These students and post doctoral fellows in fact form back-bone of their research and academic programmes
- Studying abroad is OK, but will they come back?
- Meritorious students leaving the country amounts to brain-drain; we can only retain by providing them with right opportunities
- Must aim to attract foreign investments to augment infrastructure and to setup centres of excellence?
- These can be run even as successful business ventures!
- The talent remains with in the country resulting in research and academic prosperity.
- We need not look at far west to realise this formula, we just have to look over our left shoulder!

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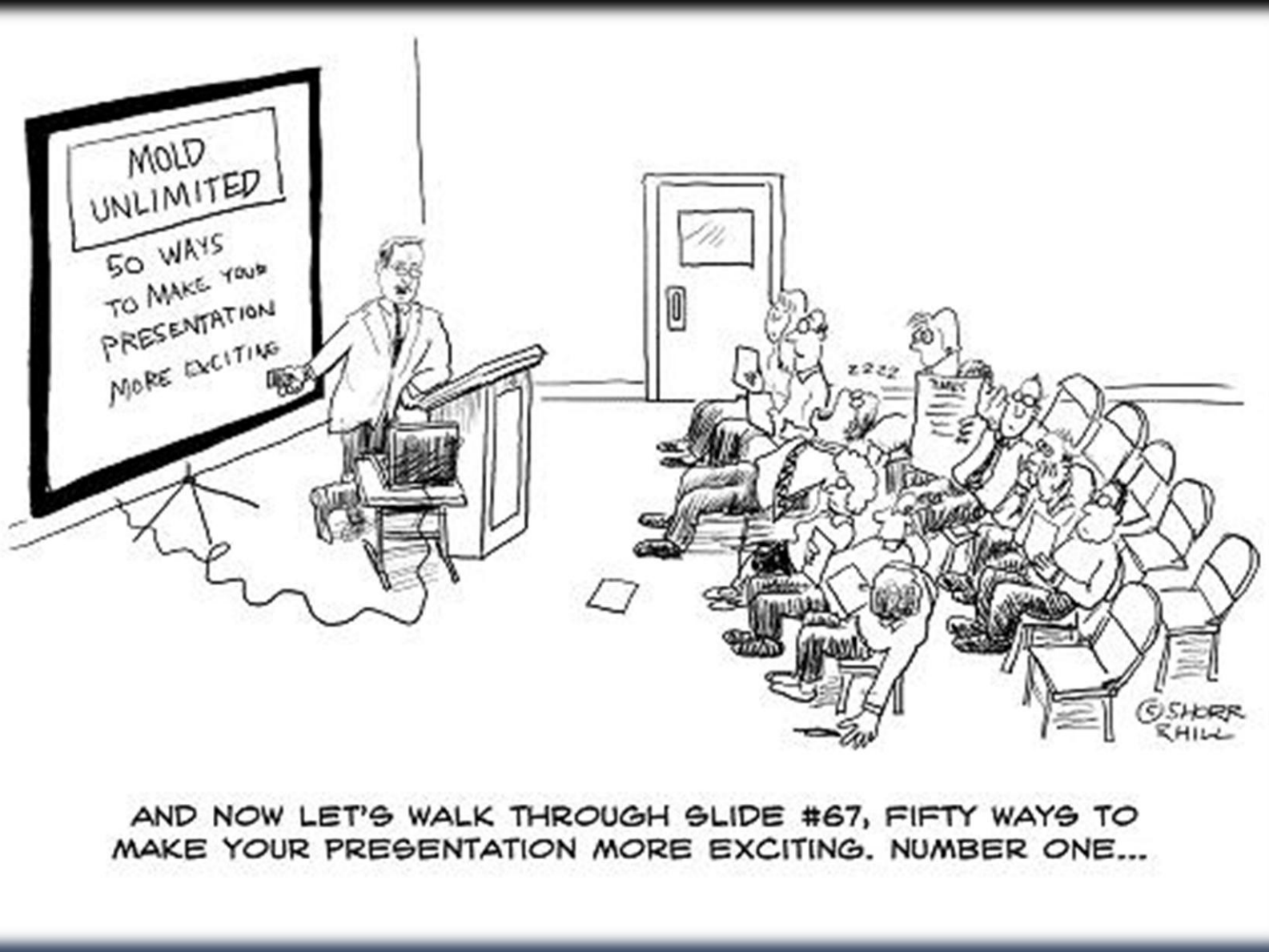

THANK YOU FOR YOUR ATTENTION