India plays a mission critical role

in some of the biggest scientific experiments of our time

- India is now participating in Mega Global Science Projects
- India's highly educated and skilled talent base, infrastructure and research resources make the nation an ideal partner
- Research funding from GoI, multinationals, corporate houses and individuals

As India's first Mega Science Exhibition 'Vigyan Samagam' gets underway, the focus is on seven international mega science projects in which India is collaborating with other nations of the world : CERN (European Organization for Nuclear Research), FAIR (Facility for Antiproton and Ion research), INO (India-based Neutrino Observatory), ITER (International Thermonuclear Experimental Reactor), LIGO (Laser Interferometer Gravitational-Wave), SKA (Square Kilometre Array) and TMT (Thirty Meter Telescope). These collaborative projects are at the frontiers of science and technology and its results will have global relevance.

While the exhibition itself aims to highlight the value and impact of fundamental research, to a broad cross-section of audiences in India and around the globe, it brings home the fact

that India might well be among the leading nations in the world, capable of scientific collaboration and delivering quality scientific output. India's participation in Mega Global Science Projects places the nation in the league of global scientific leaders.

International research projects

Collaborating on some of the biggest scientific experiments of our time, the CERN (European Council for Nuclear Research) project of the "God particle" fame gives India full access to data generated at the world's largest particle physics laboratory. Indian scientists played an important role in building the Large Hadron Collider (LHC), the world's most powerful particle collider. They were also part of two important experiments - CMS and ALICE. CMS is one of the experiments that discovered the Higgs Boson, or the 'God particle'. ALICE created conditions that existed at the time of big bang. Technology developed in CERN went into making mammograms used to detect breast cancer, while the positron used in particle physics experiments gave the world PET (Positron Emission Tomography).

India is also a part of the international Facility for Antiproton and Ion Research (FAIR), Darmstadt, Germany for studying the building blocks of matter and the evolution of the Universe. The pioneering accelerator complex will use high-energy, precisely-tailored ion beams to mimic the conditions inside the core of stars and early phase of the universe. Indian scientists and institutions are a part of the team that is building NUSTAR (Nuclear Structure, Astrophysics and Reactions), CBM (Compressed Baryonic Matter) and PANDA (Antiproton Annihilation at Darmstadt) and the building equipment to be used at the heart of the FAIR accelerator.

India is collaborating with nine other nations to build the world's largest and most sensitive radio telescope - Square Kilometre Array (SKA). SKA will combine signals received from thousands of small parabolic and dipole antennas spread over a distance of several thousand kilometres across Africa and Australia and will be able to survey the sky 10,000 times faster, allowing astronomers to capture the faintest radio signals emitted by cosmic sources, billions of light years away from Earth.

TMT (Thirty Meter Telescope), a partnership project by CalTech, Universities of California, Canada, Japan, China and India is a project for building the most advanced ground-based telescope in the world. Made up of 492 individual segments, the telescope mirror will have a reflective diameter of 30 meters and will be 81 times more powerful than any other telescope. India will develop and manufacture 15 per cent of the mirror segments and assembly.

In another experiment, India is working with the European Union, United States, Japan, China, Russia and South Korea to build a little bit of the sun under laboratory conditions. An experimental nuclear fusion reactor is being built at Cadarache in south of France to harness fusion reaction to generate energy. This International-Thermonuclear-Experimental-Reactor

(ITER) project engages with the Institute for Plasma Research, Ahmedabad to contribute crucial parts of the Tokamak reactor's gigantic cryostat.

India is collaborating with several partner nations on various science research projects other than the ones mentioned above, each as sophisticated as the other. This includes the Human Genome Project, an international research project which attempts to construct human genes to understand and control the functions of each gene. Several research institutions in India now participate in the Genome Project.

It is obvious that India's highly educated and skilled talent base, infrastructure and research resources make the nation an ideal partner in projects of this magnitude.

Providing a fertile ground for research

In the first decade of this millennium, India built five new science institutions called the Indian Institute of Science Education and Research (IISER), along the lines of India's famous IITs. The IITs themselves have expanded to several more units, producing avant grade researches who are committed to their calling. In addition to these new research institutes, India has always conducted pioneering research through IISc, CV Raman Institute, Tata Institute of Fundamental Science, etc

Currently, India spends as much money on each researcher employed, as other developed nations do. In addition, philanthropic funding from corporate and individuals has started flowing in to this sector. US$ 32 m from Infosys cofounder Kris Gopalakrishnan has helped IISc establish a brain research centre. Indian-origin entrepreneur Prabhu Goel created a chair and a research centre at IIT Kanpur. Corporates and other donors have donated sums to other research institutions across the country.

With ample resources and several research institutions the number of home-grown researchers has gone up dramatically in the past decade, especially in chemistry, telecommunications, nano science and computer science. The emphasis now is on how researchers must create patents, stoke the startup ecosystem and help industry. The idea is that scientific pursuits should result creating patents and pave the way for commercial applications.

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