Introduction of
National Centre for Physics (NCP)
Quaid-i-Azam University Campus
Islamabad

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I. Importance of Science and Technology

- At initial stages, human curiosity gave birth to science.
- The scientific knowledge was used to create technology for the benefit of humanity as well as its destruction.
- S & T brought prosperity and raised living standards but did not necessarily brought social justice.
- S & T is the foundation of agriculture, industry, business and modern facilities of life.
- The nations superior in S & T are dominant in the word.
- Without scientific and technological development along with social sciences, a nation can not become sovereign and independent in the present age. But the growth of social sciences is also dependent upon prosperity which comes through S & T.
- Scientific thinking is the base of creativity which plays important role in social development.

II. History of NCP

- At the time of independence (1947), Pakistan inherited only one University.
- Basic infrastructure for Science and Technology was created during 1960-69.
- Pakistan Atomic Energy Commission (PAEC) was created in 1956 and it initiated a program of training more than 500 scientists in early 1965.
- Quaid-i-Azam University was established in 1966 and played a major role in producing trained manpower particularly in physics.
- Prof. Abdus Salam came back to Government College, Lahore in 1951.
- He faced the choice between intellectual death or migration to the stimulating environment of the Western institutes.

- As a delegate from Pakistan at the plenary session of the IVth regular General Conference of the IAEA Council on 22 September 1960, Prof. Salam made the proposal for the creation of an international centre for theoretical physics. The idea was that the physicists from developing countries would come to this centre as a right to interact with their peers from industrially advanced countries without permanently leaving their own countries.
- A centre was established in Trieste, Italy in 1964 and it has been named after him as Abdus-Salam Centre for Theoretical Physics (AS-ICTP).
- In 1974 Prof. Salam made a proposal to PAEC to establish a centre in Pakistan on the pattern of AS-ICTP.

- Senior Pakistani physicists (including Prof. Salam's students and associates) made several attempts to get the Govt. approval and industrialists support to establish such a centre.
- In 1994, it was resolved to set up a National Centre for Physics (NCP) in QAU on the pattern of AS-ICTP. It came into existence in 1998. Prof. Riazuddin a student of Salam and a physicist of international repute became its founder Director. Till 2004, it was working on Ad-hoc basis.
- It was through the efforts of Dr. Ishfaq Ahmad that finally the NCP got the patronage of the President of Pakistan which resulted in getting the present charter in April 2004 and a very generous development grant for the construction of buildings and other infrastructure as well as an operational budget from the Government of Pakistan.

III. Vision, Aim and Objectives

Vision:-

The Centre will evolve into a Centre of excellence in the area of Physics and would establish itself on the pattern of Abdus Salam International Centre for Theoretical Physics (AS-ICTP), Trieste, Italy.

AIM:-

To foster through training and research, the progress of all branches of physics, paying special attention to the needs of Pakistani Universities and R & D organizations.

Objectives:-

To promote research in emerging fields of physics as per international norms of productivity and originality and to act as an entity for acquisition, generation, transmission and dissemination of knowledge in frontiers of physics for universities and R & D institutions.

IV. Present Status of NCP

NCP consists of following Institutes/ Departments/ Centers:

IV-1. Experimental High Energy Physics

Director (Research): Prof. Hafeez R. Hoorani

This department is mainly working in collaboration with CERN, the European Organization for Nuclear Research, founded in 1954.

- CERN Laboratory is at France-Swiss Border near Geneva.
- Its business is fundamental physics, finding out what the universe is made of and how it works. At CERN, the world's largest and most complex scientific instruments are used to study the basic constituents of matter-the fundamental particles.

- Large Hadron Collider (LHC):

  Two beams of subatomic particles called ‘hadrons’ either protons or lead ions will travel in opposite directions inside the circular accelerator.
- Particles will collide head-on at very high energies to create conditions just after Big Bang.
- Teams of physicists from around the word will analyze particles created using special detectors in a number of experiments at LHC.
- Pakistan will also receive data of certain experiments and our scientists will analyze it. Then they will send their results to CERN where a group of scientists will look at these results in the light of other available findings from different groups of scientists in the world.

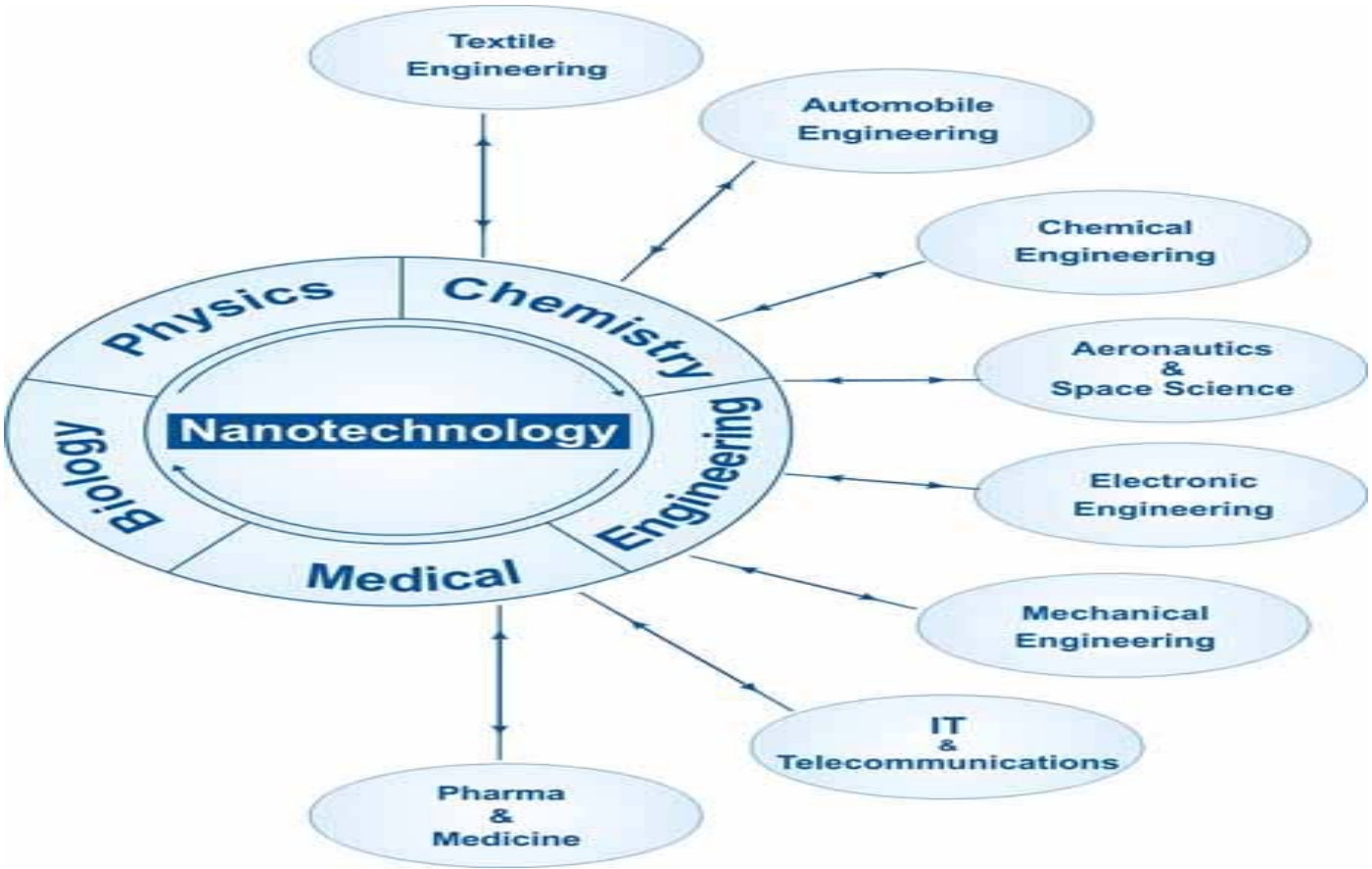
- Then scientists at CERN will compile final findings and report it in international journals including the names of all contributors.
- PAEC and NCP assembled and tested Resistive Plat Chamber (sub components of the big detector known as CMS). 320 RPCs were commissioned at CERN. PAEC has contributed to CERN by providing some other equipments as well.

IV-2. Centre for Nano-Sciences

Director: Prof. Dr. S. Tajammul Hussain

- ~1/80,000 of diameter of human hair
- Nano Meter = 10^{-9} (m) =(0.000000001) meter
- One CM = (0.01) Meter
- 2.5 nm cube contains thousand atoms (smallest integrated circuit today is 250 nm)

The Application of Nano Technology
Source: National Science Foundation (USA)



IV-3. NCP - 5MV Tandem (Pelletron) Accelerator

Director: Mr. Muhamamd Arif

- A 5 MV Pelletron Tandem Accelerator facility based on sophisticated state-of-art technology has been installed at Experimental Physics Directorate, NCP. It is functional for research and academic projects.

- The facility extends enormous opportunities for research to the young scientists, engineers and researchers both from national universities and R&D organizations.

- APPLICATION AREAS

- Materials science, Nuclear Physics, Solid State
- Physics, Biology, Environmental Science, Chemistry,
- Archeology, Geology, Nano-Technology

IV-4. GLOBAL CHANGE IMPACT STUDIES CENTRE (GCISC)

Director Dr. Arshad Muhammad Khan

GCISC was established on the initiative of Dr. Ishfaq Ahmad in 2002 as a Research Organization with a focus on Climate Change and related global issues.

In December 2006, GCISC was transferred to National Centre for Physics (NCP) as an autonomous organization.

GCISC Objectives

The main objectives of the Centre are:

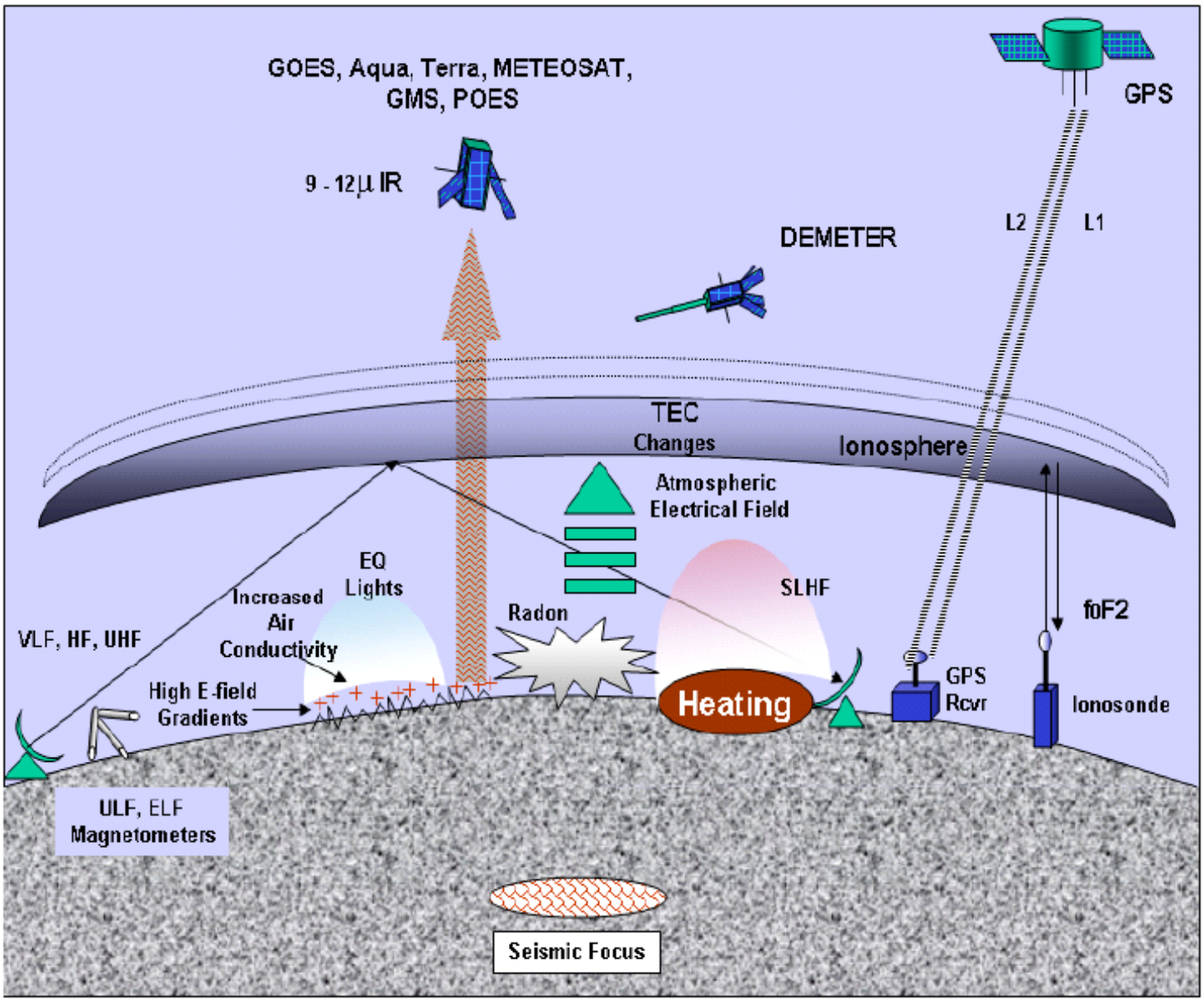
- to keep a track of the current and likely future trends of Climate Change;
- to develop a national capacity for Climate Change research;
- to analyse and evaluate the impacts of Climate Change on key sectors e.g. Food and Water security;
- to raise public awareness of Climate Change related issues.

IV-5. Centre for Earthquake Studies (CES)

Director: Dr. Ahsan Mubarak (S.I.)

- Research and development on various techniques of Earthquake predictions, for example:
  - Statistical Method based on past Earthquake – Long Term
  - Gravity Method – based on detection data and analysis of very weak changes in gravity before occurrence of earthquake (1-10) days.
  - Atmospheric and surface changes in temperature of humidity before earthquakes (4-14) days.
- This Centre was established in 2006 and is under formation stage.
- Scientists are working on different techniques all over the world to predict earthquakes, but so far much success has not been achieved.

SCHEMATIC DIAGRAM OF OBSERVATIONAL PLATFORMS



IV-6. National Institute of Vacuum Science & Technology (NINVAST)

Diretcor : Dr. Asim Fasih Khan

- Mission Statement

  To strive for the excellence in the field of vacuum science and technology for the benefit of research and industrial sectors of Pakistan"

- Main Objectives

- Education & Research
- Short Trainings
- Industrial Support
  - Consultancy
  - System Design & Development
  - Equipment Repair & Maintenance

Research & Industrial Sectors

- Centrifuge
- Accelerator
- Fission & Fusion
- Coating & Metallization
- TV Picture Tubes, Bulb & Tube Light
- Medical & Pharmaceutical
- Oil & Ghee
- Semiconductor
- Solar
- Live Stock
- Plasma Sterilization
- Food Processing & Packaging

IV-7. Theoretical Physics Department (TPD)

(Being supervised by Dr. Hamid Saleem)

i. Condensed matter Physics.
ii. Particle Physics, Astrophysics and Cosmology.
iii. Fluid Mechanics & Plasma Physics.
iv. Atomic & Laser Physics, Nuclear Physics.
v. Advanced Computing for Scientific Research, Mathematical Modeling and simulation.
vi. Any newly emerging areas in Physics.

V. Research Work of International Standards

II-1. Publications in International Journals Having Impact Factors (2008):

S.#	Fields	No. of Papers
1.	Plasma Physics	09
2.	Theoretical High Energy Physics	08
3.	Nanoscience & Catalysis	07
4.	Global Change Impact Studies	01
5.	Quantum Computing	01
	Total	**25**

US Patents Registered in Nanoscience= 2

International papers with acknowledgements of NCP = 3

VI. Future Plans

- To produce high quality research papers in international journals of good impact factors each year. The patents should also be registered, if possible
- To have international collaborations for research in highly technical and advanced areas of Physics.
- To facilitate Pakistani universities/institute in establishing contacts with international universities/institutes.
- To promote collaborations among national universities/institutes to optimize the utilization of limited available resources.
- To have an interface with industry and be responsive to the needs of society.
- To organize conferences, workshops, short courses and lectures to develop science culture.

VII. Expectations from Society

- Universities and colleges should interact closely with NCP and send their proposals to promote physics research and teaching in the country.
- Industrialists should facilitate NCP to establish a link of basic research being carried out in Pakistan and local industry
- We also expect some donations from industrialists to support PhD students in different universities through NCP.
- The media should help NCP in its efforts to create awareness among the youth about the importance of science and technology. Scientific articles and news should appear in newspapers and local journals regularly. Electronic media should increase the coverage of academic and scientific activities and arrange special programmes on science. Media is already covering scientific events but much more is needed.
- Literary circles, social scientists and artists should have linkage with NCP to develop our society intellectually.

VI. Academic Activities

- Conferences/Workshops/Seminars/ Symposia (held in 2008):

1. Third International Symposium on Quantum Optics (August 5 – 7, 2008), jointly organized by Centre for Quantum Physics and national Centre for Physics at Centre for Quantum Physics COMSATS Institute of Information Technology, Islamabad.

2. International Conference on Physics and the World of Today, (December 18 – 20, 2008) organized by Karachi University, Centre for Physics Education, Karachi and supported by National Centre for Physics, Islamabad.

3. First National Winter Meeting on Particles and Fields (December 22 – 24, 2008), jointly organized by COMSATS, LUMS, NUST, PU, QAU, UMSNH and National Centre for Physics, Islamabad.

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- Conferences/Workshops/Seminars/ Symposia (to be held in 2009)

1. 11th National Symposium on Frontiers in Physics (29-31 Jan 2009) jointly organized by Pakistan Physical Society & NCP to be held in GC University, Lahore.

2. 2nd Italian-Pakistan Workshop on Relativistic Astrophysics (Jan 2009), jointly organized by Centre for Advanced Mathematics & Physics (CAMP), NUST & NCP due to be held in Italy.

3. Scientific Thinking, Creativity and Society (28th February, 2009) to be held at National Centre for Physics, Islamabad.

4. First NCP Scientific Spring – 2009 (6th – 9th April, 2009) to be held at National Centre for Physics, Islamabad.

5. Pakistan Institute of Physics International Conference – 2009.

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